

How to Write Your First Research Paper?

Outline

- Preparing the data
- Writing a first draft
- Preparing the manuscript
 - Structure of a scientific paper
- Searching for a proper journal
- Submitting the manuscript
- Doing the revision
- Publication

Preparing the data

- Gather all important data, analyses, plots and tables
- Organize results so that they follow a logical sequence
- Limit the number of total figures (6-8 is usually a good number). Include additional data and multimedia in the supplementary materials
- Discuss the data with your advisor

First draft

- Most people's first drafts are terrible. "Good writing is **rewriting**" and you should make a serious effort at editing, rewriting, and fine-tuning before you give the manuscript to anyone else to read.
- Note good and bad writing styles in the literature. Some are simple and easy to follow, some are just too complex.
- Prepare figures, schemes and tables in a professional manner (Pay attention to data accuracy and significant digits)

Plagiarism

- Plagiarism is the practice of taking someone else's work or ideas and passing them off as one's own.
- Do not copy the phrases or exact sentences from other papers. There are several Plagiarism Checker software and you will be soon identified by them!

Do not use more words where fewer will do

- Do not use long words where short ones will do

For example:

"utilization" vs. "use"

"in order to" vs. "to"

- Do not use special words to make your writing seem more technical, scientific, or academic when the message is more clearly presented otherwise.

Use an outline to organize your writing

- When you first start a writing project, make an **outline of the major headings**. List the **key ideas** to be covered under each heading. Organize your thinking logic and the logic of your arguments at this level, not when you are trying to write complete, grammatical, and elegant sentences.
- Separate out the three tasks of: (1) **figuring out what** you want to say, (2) **planning the order and logic** of your arguments, and (3) **crafting the exact language** in which you will express your ideas.

Caption

- A caption (figure or table heading) should contain sufficient information so that a reader can understand a table or figure, in most cases, without reference to the text. Very simple tables and figures may require only a title for clarity, and exceptionally complex ones may require reference to the text for explanation.
- Do not leave caption writing to the end of the project; write captions when you organize your Results section and it will help you write the text.

Structure of a scientific paper

- Title
- Abstract and Keywords
- Introduction
- Methods/Theoretical Background
- Experimental Setup
- Results and Discussion
- Conclusions
- Acknowledgments
- References
- Supplementary Materials

Title

- Compose a title that is simple, attractive and accurately reflects the investigation. Good research paper titles (typically 10–12 words long) use descriptive terms and phrases that accurately highlight the core content of the paper

Keywords, Abstract and Title

- The title, abstract, and keywords play a pivotal role in the communication of research. Without them, most papers may never be read or even found by interested readers
- Most electronic search engines, databases, or journal websites will use the words found in your title and abstract, and your list of keywords to decide whether and when to display your paper to interested readers
- The title and abstract are often the only parts of a paper that are freely available online. Hence, once readers find your paper, they will read through the title and abstract to determine whether or not to purchase a full copy of your paper/continue reading

Keywords, Abstract and Title

- Finally, the abstract is the first section of your paper that journal editors and reviewers read. While busy journal editors may use the abstract to decide whether to send a paper for peer review or reject it outright, reviewers will form their first impression about your paper on reading it

Abstract

- An abstract is a **shortened version of the paper** and should contain all **information necessary for the reader** to determine:
 - (1) **what** the objectives of the study were;
 - (2) **how** the study was done;
 - (3) **what results** were obtained;
 - (4) and the **significance** of the results.
- **Frequently, readers of a scientific journal will only read the abstract**, choosing to read at length those papers that are most interesting to them. For this reason, and because abstracts are frequently made available to scientists by various computer abstracting services, this section should be **written carefully and succinctly to have the greatest impact in as few words as possible**.
- Although it appears as the first section in a paper, most scientists **write the abstract section last**.

Introduction

- **Why** is this study of scientific interest and **what** is your objective?
- This section discusses the results and conclusions of **previously published studies**, to help explain why the current study is of scientific interest.
- The Introduction is organized to move **from general information to specific information**. The background must be summarized succinctly, but it should not be itemized. **Limit the introduction to studies that relate directly to the present study. Emphasize your specific contribution** to the topic.
- The **last sentences of the introduction** should be a statement of objectives and a **statement of hypotheses**. This will be a good **transition to the next section, Methods**, in which you will explain **how** you proceeded to meet your objectives and test your hypotheses.

How to Cite Sources in the Introduction Section

- It is important to cite **sources in the introduction section of your paper as evidence** of the claims you are making. There are ways of citing sources in the text so that the reader can find the full reference in the literature cited section at the end of the paper, yet the flow of the reading is not badly interrupted.
- Note that articles by one or two authors are always cited in the text using their last names. However, if there are **more than two authors, the last name of the 1st author is given followed by the abbreviation et al.** It is acceptable, and encouraged, to cite more than one source for a particular statement. This gives the statement more validity in its context and suggests that your research was thorough.

Methods and Materials

- This section provides all **the methodological details necessary for another scientist to duplicate your work.**
- It should be a **narrative of the steps you took in your experiment** or study, not a list of instructions such as you might find in a cookbook.
- An important part of writing a scientific paper is **deciding what bits of information needs to be given in detail.** Do not quote or cite your laboratory manual!
- Sometimes, experimental details are given as **supplementary part!**

Results

- This section **presents the results of the experiment but does not attempt to interpret their meaning**. As with the Methods section, the trick to writing a good Results section is knowing what information to include or exclude. You will not present the raw data that you collected, but rather you will **summarize the data with text, tables and/or figures**. Use the text of the paper to state the results of your study, then refer the reader to a table or figure where they can see the data for themselves.

Note: In most papers nowadays:
1 section “Results and Discussion”

Do not include the same data in both a table and a figure.

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- It is best to present the data in a table unless there is visual information that can be gained by using a figure. For example, a figure is useful for reporting a regression analysis (line graph). Each table and figure has several lines of text in the caption that explain the information that is being presented; this is, they are made to stand alone. A table's legend appears above it, while the legend for a figure appears below the figure. If your table includes the results of a statistical analysis, be sure to provide the information necessary for the reader to properly evaluate the analysis (sample size etc.).

Discussion

- In this section, you are free to **explain what the results mean or why they differ from what other workers have found.**
- You should **interpret your results in light of other published results**, by adding additional information from sources you cited in the **Introduction** section as well as by introducing new sources. Make sure you provide accurate citations.
- **Relate your discussion back to the objectives and questions you raised** in the **Introduction** section. However, do not simply re-state the objectives. Make statements that synthesize all the evidence (including previous work and the current work).
- **Limit your conclusions to those that your data can actually support.** You can then **proceed to speculate** on why this occurred and whether you expected this to occur, based on other workers' findings.
- **Suggest future directions** for research, new methods, explanations for deviations from previously published results, etc.

Abstract

- Begin writing the abstract after you have finished writing your paper.
- First answer the questions “What problem are you trying to solve?” and “What motivated you to do so by picking out the major objectives/hypotheses and conclusions from your Introduction and Conclusion sections.
- Next, answer the question "How did you go about achieving your objective?" by selecting key sentences and phrases from your Methods section.
- Now, reveal your findings by listing the major results from your Results section.
- Finally, answer the question "What are the implications of your findings?"
- Arrange the sentences and phrases selected in steps and into a single paragraph in the following sequence: Introduction, Methods, Results, and Conclusions.
- Make sure that this paragraph is self-contained and does not include the following:
 - Information not present in the paper
 - Figures and tables
 - Abbreviations
 - Literature review or reference citations

Abstract

- Now, link your sentences.
- Ensure that the paragraph is written in the past tense and check that the information flows well, preferably in the following order: purpose, basic study design/techniques used, major findings, conclusions, and implications.
- Check that the final abstract
 - Contains information that is consistent with that presented in the paper.
 - Meets the guidelines of the targeted journal (word limit, type of abstract, etc.)
 - Does not contain typographical errors as these may lead referees and editors to “conclude that the paper is bad and should be rejected

Abstract

- First couple of sentences should focus on what the study is about. Include major findings in a style that a general readership can read and understand
- (*i.e., avoid detailed experimental procedures and data.*) Keep it short and effective.
- Be creative in generating curiosity

Introduction

- Start the section with a general background of the topic.
- Add 3-4 paragraphs that discuss previous works (Literature review)
- Point out issues that are being addressed in the present work.

Theoretical background

- The methodology and formulations can be described in this section.
- Do not forget to define all the parameters properly.

Example:

The vertical displacement, Y , is defined by Eq. (1).

$$Y = \sin(\omega t + \alpha) \quad (1)$$

where ω stands for the frequency, t refers to the time and α denotes the phase lag angle.

Experimental Section

- Divide this section into Materials & Methods, Characterization,
- Measurements and Data analysis

Results and discussion

These two sections can be combined or separate

- Describe the results in detail and include a healthy, detailed discussion
- The order of figures should follow the discussion themes and not the sequence they were conducted
- Discuss how your data compare or contrast with previous results.
- Include schemes, photographs to enhance the scope of discussion
- **13. Develop a strategy for your Discussion.**
- Many novice paper writers begin their Discussion section with a statement about problems with their methods or the items in their results about which they feel most insecure. Unless these really are the most important thing about your research (in which case you have problems), save them for later. **Begin a Discussion with a short restatement of the most important points from your results.** Use this statement to set up the ideas you want to focus on in interpreting your results and relating them to the literature. Use sub-headings that structure the discussion around these ideas.
- **Note: Often 1 “results and discussion” section!**

What to avoid

- Excessive presentation of data/results without any discussion
- Citing every argument with a published work

Conclusions

- Include major findings followed by brief discussion on future
- perspectives and/or application of present work to other disciplines.
- Important: Do not rewrite the abstract.
- Statements with “Investigated” or “Studied” are not conclusions!

Acknowledgments

- Remember to thank the funding agency and
- Colleagues/scientists/technicians who might have provided assistance

References

- The styles vary for different journals. (Use ENDNOTE, RefWorks)
- Some journals require complete titles of the cited references
- Please check for the accuracy of all citations
- Unless the person who reported a result is an important point in a statement, **literature citations should be parenthetical**, rather than in the body of the sentence: "... growth rates of > 80 cm are common in populations in Alberta (Marx 1982)." rather than "..., Marx (1982) found growth rates of >80 cm to be common in populations in Alberta.'

References

- This is the last section of the paper. Here you should provide an alphabetical (or numbered according to the occurrence in your paper) listing of all the published work you cited in the text of the paper.

Note: in most journals, listed and numbered according to sequential appearance in text!

- A standard format is used both to cite literature in the text and to list these studies in the Literature Cited section. Consult a recent issue of the respective journal for guidance.
- For papers published in journals you must provide the date, title, journal name, volume number, and page numbers. For books you need the publication date, title, publisher, and place of publication.

Reference management software

- Reference management software, citation management software or personal bibliographic management software is software for authors to use for recording and utilising bibliographic citations (references). Once a citation has been recorded, it **can be used time and again in generating bibliographies**, such as lists of references in articles.
- These software packages normally consist of a **database in which full bibliographic references can be entered, plus a system for generating selective lists or articles in the different formats required by publishers and learned journals**. Modern reference management packages can usually be **integrated with word processors** so that a reference list in the appropriate format is produced automatically as an article is written, reducing the risk that a cited source is not included in the reference list.
- Examples: **Endnote, BibTeX** ;
- Internet source for literature: **ISI/Web of Science**

Practical Tips

- In formal writing, you should **never use contractions** (didn't, can't, haven't...).
- The word "**data**" is **plural**, as in "the data *were* collected on January 21, 2001."
- **Direct quotes** should be avoided, unless you are presenting another author's specific definition or original label. You can usually **paraphrase the writing effectively and more concisely**, taking care to properly attribute the sources of your statements.
- **Read and re-read your references.** Consult a textbook or another reference to help you resolve any aspects of the paper you do not understand before you start writing.
- You should **review your writing** to make sure that each sentence presents one or two clear ideas. This will also help you organize sentences within paragraphs in a logical order.
- **Do not use slang.** Try to use precise, scientific terms where possible (without unnecessary jargon) and avoid colloquialisms and figures of speech: "somewhat" rather than "sort of," "many" or "a great deal" instead of "a lot."
- Your **word processor's spell-check and/or grammar-check function is not error-free.** It cannot tell you when to use "it's" and "its," and it cannot tell you that a particular sentence does not make sense. Give yourself enough time to proofread and correct your paper.

Supplemental materials

- Include methods, analysis, blank experiments, additional data

Selection of a proper journal

- Each journal specializes in a specific area of research. Hence its readership varies. A proper choice of journal can make a larger impact of your research.
- Get to know the focus and readership of the journal that you are considering. - general vs. specialized area journal

Selection of a proper journal

- Select 2 or 3 journals in the chosen area with relatively high impact factors. Discuss with your advisor and decide on the journal
- Find out the journal's submission criteria and format
- You must **adopt the style and level of writing that is appropriate for your audience**. Study them as they are manifested in a selection of highly regarded papers and in the "Instructions for Authors" for key journals.

• Check before submission that you:

- Numbered the text pages consecutively, beginning with the first or title page.
- Numbered your tables (typed separately from the text, not more than one on a page) consecutively in the order in which you want them to appear.
- Read the title and headings of each table objectively to determine whether the table can be understood without reference to the text
- Searched the text for references to tables to make certain that each table is referred to and that each of the references is to the appropriate table.

- Indicated by a marginal note a place for each table.
- Examined your text, tables and legends to make certain that each reference cited is accurately represented in the reference list.

- Examined your reference list to make certain that each work listed there is accurately referred to in the text, tables or legends.
- Examined each item in the bibliography section for accuracy of dates, wording, spelling and other details.
- Prepared adequate legends for all illustrations (double-spaced on a separate page)

- Made certain that illustrations are numbered consecutively in the order in which you want them to appear in your article, that each of them is referred to at least once in the text, and that each reference is to the appropriate illustration.
- Indicated by a marginal note a place for the figure.
- Reconsidered the appropriateness of your title and abstract and your index terms (if any).
- Reviewed the special requirements of the journal to which you are submitting your manuscript and made certain that you have met them.
- Carefully read your final typescript at least twice, the second time preferably on a different day.

- ~~In case of submission by mail: prepared as many copies of your text, tables and illustrations as are required.~~
 - or
 - In case of online submission: prepared the files according to the instructions for authors, and provided the software you have used.
-
- Kept for your files a complete copy of your manuscript and accompanying material.
 - Enclosed copies of releases for material requiring releases.
 - Included on the first page of the typescript the address to which letters, proofs and requests for reprints should be sent.

Note:

nowadays, tables and figures are usually inserted in the (electronic) manuscript at appropriate positions, with captions included. Refer to “author instructions“ in case!

Cover Letter

Dear Professor:

Please find enclosed our manuscript "*Cluster Formation and Rheology of Photoreactive Nanoparticles*".

We studied *the cluster formation of photoreactive nanoparticles upon irradiation, and the effect of this process on the rheological behavior of dilute colloidal dispersions.*

Since our work should be of interest to many readers of, we have decided to submit our paper to your journal, hoping you will find it acceptable for publication.

Sincerely

• Tense and mood

- Write in **past tense unless you are describing present or future situations**. Use the **active voice rather than the passive voice**.
- For example, ~~instead of writing "The food was eaten by the pig"~~, write "The pig ate the food". The active voice is easier to read and reduces the sentence length
- It can be acceptable to write in more than one tense in the literature review e.g. "Brown (1995) showed that the brain is more fully developed at birth than other organs". In this case the **present tense** can be used for the second half of the sentence because it gives **knowledge that is universally accepted**.
- **Materials and methods should be written in the past tense**. "The experiment was designed in the form of a 6 x 6 Latin square." Remarks about Results should mainly be in the past tense. "When a high protein diet was fed to rabbits they grew rapidly."

Submission process

- Read the finalized paper carefully. Check for accuracy of figures and captions. Are the figures correctly referred to in the text?
- Get feedback from advisor and colleagues.
- Make sure the paper is read by at least one or two colleagues who is not familiar with the specific work.
- Provide a cover letter to the editor along with a brief paragraph highlighting the importance of this work and names of possible reviewers.
- Have all coauthors approve the finalized version of the paper
- Submit the paper online

Writing

- The authors should make every effort to make a good presentation with proper usage of English grammar.
- Ask a colleague to comment on your paper before sending it for publication.
- “English is not my Native Language” is not a valid justification for reviewer who cannot comprehend.
- Reviewers do not wish to review papers that are not readable. Badly written papers are often recommended as “**REJECT**” by the Reviewers

Journal decision

- **Acceptance without revision**

You need **take no further action until the proofs** reach you, except perhaps write a note thanking the editor.

- **Minor revisions requested (“accepted“)**

Consider the suggestions carefully, and if you agree that they will improve the paper, **modify or rewrite sentences or sections as necessary**. Retype any heavily corrected pages before you return the paper to the editor, but enclose the original corrected paper as well as the retyped copies. In your covering letter sent with the revised version, **thank the editor and referees for their help and enclose a list of the substantial changes made in response** to their suggestions; if you have rejected one or more of the recommendations, explain why.

What is the journal decision

- **Major revisions requested (“further consideration“)**

You will have to **think hard if the effort is worth while**. You may eventually decide that the paper is better as it is, and proceed to try another editor (another journal) in the hope that he will agree with you.

- **Rejection**

If the editor says the article is too specialized or outside the scope of the journal, your best course is to **send it to another journal**, first modifying the style to comply with the instructions of that journal.

If the article is rejected because it is said to be too long and in need of changes, consider shortening and modifying it according to the criticism – and then submit it to a different journal (if the editor had wanted to see a shorter version he would have offered to reconsider it after revision!).

What is the journal decision

- **Rejection (continued)**

If the editor thinks the findings reported are unsound or that the evidence is incomplete, put the paper aside until you have obtained more and better information, unless you are sure that the editor and his advisers are wrong.

Consider contesting the decision only if you honestly think, after considerable reflection and at least one night's sleep, that the editor and referees have made a superficial or wrong judgement. In this case write a polite letter explaining as briefly as possible why you think the editor should reconsider his decision.

When a revision is required

- The manuscript is usually reviewed by 2-3 reviewers. They point out deficiencies and/or suggestions to improve the scientific content.
- Read their comments carefully. (If reviewer misunderstands a point, the point probably needs revision or additional support.)
- Do not blame the reviewer for his/her misunderstanding! Be polite and respectful when disagreeing a reviewer's comment
- Include a point-by-point explanation of changes made in the text in response to reviewers' comments
- Once again, carefully read the paper for its accuracy in presenting the data, then submit the revised version
- Once accepted for publication you should receive the final proof within a month. This is one last chance to make any final corrections.

When a revision is required

- **18. Take editorial comments seriously.**
- It may be clear from an editor's comments that they did not understand the point you were making. If so, that is a **clear indication that you need to improve your writing**. Also, an editor, no matter who they might be, has invested their time to help improve the quality of your writing. Respect their investment.

What to do in case of rejection

- Do not get discouraged. Read editorial comments and discuss with advisor/students/collaborators. Find out how you can make this study stronger and acceptable for publication.
- Do not just turn around and submit the paper to another journal.
- Read carefully the comments and find ways to improve the scientific quality of the papers

What to do in case of rejection

- Carry out additional experiments and improve the quality of scientific discussions. (Journals often look for papers with quantitative and mechanistic information that represent new physical insights)
- Rejected papers can be resubmitted if and only the concerns of the reviewers are adequately addressed and new results are included.
- If you have questions, please feel free to contact the editorial office.

Congrats!

for having a published paper

- Now, you have a published paper. Other researchers can read your paper and use your findings in their own works. When a researcher uses your paper, he or she mentions your paper in his or her research work or cites your paper.
- More citations to your paper by other researchers mean that your paper has more to share with the scientific world.

Think about quality rather than quantity

- Do not think about publishing a lot of papers. If you do your best to do a good research work, at the end, one or two paper can finally be published. If you have 10 published papers from a research work, then you are probably in a wrong way.

Thanks for your attention

Any question?

