Guide for Scientific Paper Writing

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A. HOW TO WRITE A SCIENTIFIC PAPER

Style

In all sections of the paper, present tense should be used to report background that is already established. For example, The cell membrane is the barrier which separates the inside of the cell from the outside. Use future tense for work that you will do. For example, We will test the hypothesis that some anti-microbial agents can permeate the cell membrane during division to inhibit growth. Always use past tense to describe results of a specific experiment, especially your own. For example, Application of the antibiotic Chloramphenicol restricted growth of *E. coli*.

Article Title

- Your title should be specific in describing the experiment you performed.
- It should be an informative summary of the paper. Select the words in a title carefully for clarity and accuracy.
- Long titles are unappealing to readers. However, shorter titles may not be sufficiently specific, and therefore not as informative.
- All important aspects of the paper should figure in the title.
- A title should be a label, not a sentence.
- Pay attention to the association of words. Faulty word order may allow different interpretations – possibly changing your meaning – and may introduce grammatical error.
- If you use series titles, submit all series.
- Consider more than one title, and ask colleagues which one is a better description of your paper.

Authors and Addresses

- Consider following information:
    - Who did the work
    - Where they did it
    - Where they are now
    - Their relative involvement
    - To whom correspondence should be addressed
- Give full name of each author, use initials only for middle names.
- Degrees and titles are not required.
- Give the institutional address for each author following the journal style.
- If the author has moved away from where the research was carried out, give their present address as footnote.
- Include the corresponding address of the corresponding author (email compulsorily, phone, postal address).
- No one should be given authorship unless they were significantly involved in the creation of the paper (conception, design, data collection, analysis and manuscript writing). For example, do not include heads of departments simply because they are the senior member of staff.
- Every attributed author must see and approve the final draft of the paper before you submit it to a journal. However, journals may have different policy if each author should be responsible for the full content or not.
- Reviewers may discriminate against a paper with too many authors (they may not believe this number of people truly wrote the article), and may also discriminate against a paper with only one author (since the research has not been verified by a collaborator).

Abstract

- The Abstract is a summary of the study, with the primary emphasis on results and conclusions.
- Very briefly present the question(s) asked, the experimental design, a summary of observations, and list conclusions.
- Be very succinct - the abstract should be a single paragraph, no more than one page. It should stand on its own; therefore, do not refer to any other part of the report, such as a figure or table.
- Avoid long sections of introductory or explanatory material.
- As a summary of work done, it is written in past tense.
  Summarize the information given in all sections of the paper (eg introduction, materials and methods, results and discussion).

- Compose the abstract with great care. Editors frequently decide to accept or reject a paper (and readers decide to read it completely or not), after only reading the abstract.
- Confine it in a single paragraph. Include all important information but exclude unnecessary details.
- Do not cite others' work in the abstract since it is a summary of your paper and your research.
- Write in the past tense. Information from any published source can be written in the present tense.
- Information not stated in the paper should never be given in the abstract.
- Abbreviations should not be used unless they are commonly accepted terms.
- Write an abstract after you have completed and finalized the entire paper.

Introduction

- Keep the introduction brief, but do indicate the purpose of the experiments performed as well as present appropriate background.
- Make sure that the reader knows enough to appreciate the relevance of the work and why it is appropriate to ask the question that you will address with your study.
- Always state the hypothesis and/or objectives in your introduction.
- Consider following pints:
    - Nature and scope of the problem
    - Literature review
    - Rationale (reasons why the study was carried out)
    - Objective (what was done)
    - Materials and method (an outline of how the research was performed, and the reasons for selecting a particular method)
- Include only important references.
- Define specialized terms on first mention.
- If the abbreviations used are not very common, give their full form on the first mention.
- Ensure your introduction with continuous flow of information and ideas.

Materials and Methods

- Document all methods performed in your study.
- Summarize in your own words what you did.
- While it is tempting to report methods in chronological order in a narrative form, it is usually more effective to present them under headings devoted to specific procedures or groups of procedures.
- Describe in detail how the results were obtained so that a peer can repeat the procedure.
- It should be reproducible.
- Write in the past tense.
- For materials considered following three important points:
    - exact technical specifications
    - quantities
    - preparation method and source
- For industrial products, avoid trade names unless the nature or constituents of the product differ from one manufacturer to another.
- Use scientific nomenclature (genus, species and authority) for living beings. Local and national names may be given once in the paper, if it assists in understanding.
- Try to make sub-headings of this section consistent with that of result.
- Avoid using more than 3 levels of heading.
- Report date of experiment conducted and georeferences of experimental site.
- Methodology need to be described in detail. More detail is required for unusual and innovative procedures.
- Remember that this section should only describe the methodology – it should not present the results (do not mix results into this section).
- Statistical analysis must be pertinent and thorough enough to ensure the accuracy of the conclusions. Degree of freedom and level of certainty should be reported in order to facilitate evaluation of conclusions (see statistical guidelines below).

Results

- Raw data are never included in your scientific paper unless they are needed to give evidence for specific conclusions which cannot be obtained by looking at an analysis, or summation, of the data.
- Analyze your data, then present them in the form of figures (graphs), tables, and/or descriptions of observations. Data in this form are called converted data.
- Figures are preferable to tables, and tables are preferable to straight text.
- By presenting converted data, you make your point succinctly and clearly.
- The table or figure should then be presented, complete with title. The title should explain what the table or figure is showing.

- Do not draw conclusions in the results section. Reserve data interpretation for the discussion.
- Write clearly in the past tense.
- The most common mistakes in this section are the inclusion of unnecessary data and their double presentation, eg repeated in a table or a figure as well as within the text.
- Only those variables that affect results should be given in tables or graphs. If the data do not conform to a clear trend, it can be stated in a few words or a sentence.
- Write concisely – scientific papers should enable fast comprehension of the research, and not present lengthy discussions or opinions. For example do not use it is clearly shown in figure 3 that the rate of growth depends on temperature but use rate of growth depends on temperature (figure 3).
- Select only meaningful data from the collection; present them only once – in text or table or figure.

Discussion

- Interpret your data in the discussion.
- Decide if each hypothesis is supported, rejected, or if you cannot make a decision with confidence.
- Do not simply dismiss a study or part of a study as "inconclusive".
- Make what conclusions you can, then suggest how the experiment must be modified in order to properly test the hypothesis(es).
- Explain all of your observations as much as possible, focusing on mechanisms. When you refer to information, distinguish data generated by your own studies from published information or from information obtained from other students.
- Refer to work done by specific individuals (including yourself) in past tense.
- Refer to generally accepted facts and principles in present tense.
- Decide if the experimental design adequately addressed the hypothesis, and whether or not it was properly controlled.
- Finally, where do you go next? The best studies open up new avenues of research. What questions remain? Did the study lead you to any new questions? Try to think up a new hypothesis and briefly suggest new experiments to further address the main question. Be creative, and don't be afraid to speculate.
- Deal with how observed facts are related, how the present study agrees or disagrees with previous studies, and how the study might be extended in order to test or make a hypothesis.
- Present clear and valid reasoning and argument. Regardless of how important the research is, if it is not carefully considered and discussed within the article, then the overall research results are undermined.
- Analyze perfectly and draw believable conclusions – make sure this is not a fault of your paper.

Acknowledgements

- Acknowledge for
  - significant technical help received from others
  - grants, fellowships or other financial assistance
- Do not thank someone without identifying the nature of the assistance
- Do not thank peer reviewers. Do not thank someone just for inspiration.

Citation in Text

- Literature citations in the body of your paper should be in parentheses and contain only the author's last name and the date; for multiple authors include the last name of the first author, et al and the date. For example: (Joshi 2005), (Ganga et al 2004).
- If the author's name is used in the text then just the date in parentheses is sufficient. For example: Shrestha (1949), Adhikari et al (2005).
- Use the proper form for citations. Order citations in ascending by year.

References

- Include sufficient but not too many references: you need to provide a citation (reference) every time you state a fact that is not generally known, or if you are showing how your work has built on that of others.
- Review articles usually require high numbers of references. Too many references may indicate an inability to discriminate and select appropriately – you need to show good judgment in the selection, there is no right or wrong number of references to include in any article.
- The references indicate about the quality of your work: if they are all old and refer to work that is now out-of-date, then this may invalidate your findings because the ideas and facts developed in recent times may contradict the ones you cited. Including upto- date references shows that you are aware of recent research and have taken this into account with your own work.
- The minimum requirements in a reference are Author, Date, Title (readers usually decide on the basis of the title whether or not they need to consult a given reference), Inclusive pagination (this information allows the reader to distinguish between a single-page communication and a ten-page paper. It also helps them to decide whether to read the source, or even purchase a copy), Journal (publication) name (this is essential in allowing the reader locate an article or chapter)

- Three common mistakes found in references and their citations are (all waste the editor's time and increase the likelihood of rejection):
  a) Not all the citations in text are listed in the references and not all the references are cited in the text. (This usually happens when the paper is revised, so care must be taken to avoid this.)
  b) No uniformity in the presentation of references. (This indicates carelessness, and may make the editor/reviewer/author think that your research work is also carelessly done.)
  c) Incomplete information given about the references. (This may be interpreted to mean that you have not read the reference, but are including it to add support to your work.)
- To avoid missing references (or text citations) make a careful cross-check on the final draft of your paper before submission. This can be done on the computer or manually by checking the text against the references.
- All finalized references must be converted to the journal style. There are some software packages, such as EndNote.com, that can convert them to international journal styles, otherwise you need to follow the author guidelines, and also compare with articles published within the journal.
- If you are unsure as to which information to include within a reference, give all information you have available – more information is better than too little.

Tables

- Construct tables or figures only if there are large amounts of data. Few data should be given in text.
- Do not present data both in tables and figures. Where the results describe a trend a figure is more helpful than a table. Where the exact value is important, a table is of more value.
- For easy reading, put different variables of same parameter in the same column. This also makes the table compact and good-looking.
- Common abbreviations can be used without definition; others should be defined in a table footnote if they are not defined in the accompanying text. Be brief, but be clear.
- Number the figures and tables in separate sequences. All tables and figures must be cited within the text.

Illustrations

- Unless three dimensions are actually needed, avoid 3D figures.
- For the sake of legibility, the background should always be white.
- Do not use a shade of colour (or different percentage of grey) in bar diagrams. Even if the journal has a high quality multicolour print, the distinction of bars can not be represented while making normal photocopy of the article. Use easily distinguishable patterns to distinguish the separate bars.
- If the legends are in very tiny boxes, it is very difficult to distinguish the pattern or shade in them – ensure these key boxes are easily read.
- Submit the figures in final size using the font size and line weights actually desired (usually 8pt Arial or Helvetica for the text and 0.5pt for the line weights). When unnecessarily big figures are greatly reduced by the journal, the lines and letters may become too small or thin. Avoid using FULL CAPITALS or bold as they make the artwork ugly and difficult to read.
- Mention the sources for illustrations within the legend to the figure (check the journal) style.
- Distinction in line graphs can be made by using solid and dotted lines, and by using different symbols for data points in the same type of line.
- Putting lines of different thickness gives more choices, however, you should avoid it as far as possible (it may be hard to distinguish when printed). Use of the same data point in solid and open style offers more choices.
- Avoid using a pi-chart in most instances. In a scientific paper other chart types are almost always more helpful than a pi-chart which does not easily allow for comparison between data.
- Provide a descriptive legend or title to every figure; this may contain explanatory information about the illustration.
- While scanning photographs, maintain a resolution of 300ppi (or dpi) or more. But line artwork (charts, etc.) needs a higher resolution – 700ppi for example.
- If possible, use a proper drawing package to prepare your artwork, and supply to the publisher as a high resolution jpeg or eps files. Consult experts for this.
- Electronic artwork as Excel or Word pictures is acceptable, but can sometimes cause problems for the publisher. Avoid PowerPoint illustrations.

B. TIPS TO PUBLISH YOUR RESEARCH WORK

Publication is extremely important for all researchers, as it provides their work with credibility, and ensures that their results, findings and conclusions are disseminated to the research community.

Before submission – preparing your article

- Is the title accurate, informative and concise?
- Does it have an abstract that correctly summarises the actual information in the article – is it easy to read, comprehensive, yet short enough (approx 250 words is usual)?
- Are your study objectives or hypotheses clearly stated?
- Does your article say something new – does it add to the body of information in your subject area? (If it is a review article, is it sufficiently inclusive to represent all the arguments and give a fair and comprehensive review of the topic?)
- Is your article well organised? Have you used appropriate subheadings to separate the different sections of the paper for clear understanding?
- Does the methodology correctly and clearly explain how you carried out the research?
- Can it be replicated by another researcher elsewhere?
- Is the prose clearly written, is the standard of English good enough to make the article clear and easy to read?
- Are the results correctly and clearly presented? Can they be understood easily without misinterpretation?
- Have you included enough necessary details to make readers understand your write-up?
- Is the discussion clear, and does it include sufficient acknowledgement of different perspectives and interpretations?
- Does your reference list correctly match the citations given in the text?
- Have you used the referencing style specified by the journal you want to submit to?
- Are the references complete and accurate? Do they include the authors' names, article title, publication information including dates and page numbers?
- If there are any figures and tables, are they understandable without reference to the text? Are they required – do they add to the understanding? (Do not illustrate unless something cannot be easily explained in the text.) Are they clearly, completely and correctly labeled?
- Does your article contain information on principal action to be taken and recommendation for further research by other researchers?
- Have you asked colleagues to read and comment on the text? Seek opinions from friends and peers before you submit your article for publication, as they will give you suggestions for improvement.
- Have you acknowledged individuals and organisations that made substantial financial and technical contributions towards the publication of the article?

Selecting a journal for publication

- Select a journal that already publishes in the same subject area as your article.
- Select a journal that publishes material similar to yours.
- Be realistic about your choice of journal: match the quality of your research to the quality of content that the journal publishes – aim high, but do not be unrealistic.
- Publication enhances your career – but only if you choose suitable outlets – check the policy of your organisation.

Submitting your article

- Submit your article to only one journal at a time – submit to another journal only if your article has been rejected.
- Read the journal's guidelines for authors and make sure your article conforms to its requirements.
- Ensure that the focus of your article complies with the aims and scope of the journal – otherwise the editors will not be interested in it.
- Submit your article only through the recommended means specified by the journal (by email, post, etc). Make sure the format you use for the article is acceptable to the journal
- Send a short polite letter to the editor to accompany your article.
- Make sure you provide full contact details for correspondence – your name, affiliation, address, country, telephone number(s), email, etc.
- Make sure you send all necessary materials required to publish the article (do not forget the illustrations, etc).
- Keep copies of all material you send (paper and electronic files), as the journal will probably not return anything to you.

The publishing process – what you should expect after submission

- When you have submitted an article, you should expect an acknowledgement – but this may take several weeks – if you do not hear from the journal, contact the editor to make sure your article has been received by the journal.
- If the journal feels that your article is totally unsuitable, the board of editors will immediately reject it.
- Your article will be sent out to reviewers – these are subject specialists in your area who will read the article and return comments to the journal about the article's acceptability. In your letter you may suggest suitable reviewers
- Usually the reviewers will not be told your name – and you will not be told who has reviewed your article – this is to avoid undue bias.
- Once the article has been reviewed the journal will reply you, providing feedback from the reviewers – this may take several months. If you do not hear from the journal for a very long time after the acknowledgement (say six months to one year), you should write to enquire on the status of your article.

Revisions

- It is unusual for any article to be accepted by a journal without some revisions being requested.
- Revisions may be minor (eg change references order), or major (eg methodology unclear).
- Make revisions as requested by the editor – if there are any of the recommended revisions that you disagree with, contact the editor to discuss.
- The revised article needs to be returned to the journal (remember to retain a copy). Do not delay in doing this.
- It is not uncommon for some articles to undertake several revisions.
- It is possible that after revision the article is rejected – although it is unlikely unless you failed to revise the article satisfactorily.

Rejection

- Do not be disheartened to receive a rejection letter – it may not be due to the quality of the article, but because the subject is inappropriate for the journal.
- If the journal gives you reasons for rejecting the article, consider their comments seriously – other journals may have similar concerns about your article.
- If your article is rejected, you can submit it elsewhere – but remember there are reasons for rejection and you should revise your article before submitting it elsewhere (and remember to conform to the author guidelines of your newly selected journal).

Acceptance

- When your article is accepted you will receive confirmation from the journal (by email or post).
- Ask when you should expect publication.
- Check to see if the journal will provide you with printed copies of your article (offprints), or a copy of the issue in which it appears, or an electronic file of the final article (usually in PDF format).
- Ensure you are aware of your rights regarding the article – discuss with the journal if you are unsure.

The publishing process – what you should expect after acceptance

- The journal will usually publish your article in the next possible issue of the journal.
- After editing and typesetting your article, the editor will send it to you for proofreading before finally publishing it.
- At this stage you are expected to read carefully through the article and correct technical, spelling and grammatical errors. Make sure your main points have not been lost to editing.
- This is the last opportunity you have to make minor corrections on your article; therefore you must check the tables, illustrations, units of measurements, etc, to make sure they are correctly presented. You should also check that you have provided accurate data.
- Make your corrections on the article and return it to your editor promptly to meet the journal's publication deadline – if you are late you may need to wait for the next issue.
- After you have seen proofs, check whether the article has been published by contacting the editor after a short time.

Citation

- Until your article is accepted by a journal you should simply cite it as "in preparation".
- Once your article has been accepted and you have a confirmation letter from the editor of the journal, you should cite it as "in press" with the name of the journal.
- Do not give full citation (volume/issue/year/pages, etc) until the article has been published.

Copyright

- SAS-N own copyright on the article

- This will restrict your re-use of the article – e.g., you may not be able to post it on your institutional website, etc – you must check this with the journal.

After publication

- Once your article has been published you can draw other people's attention to it by citing it in your subsequent related works. You can also order copies of the article (offprints or reprints) and send to relevant organisations and individuals who will make use of it.
- If your publication is a result of funded research you should ensure that the funders receive a copy of the article.
- If possible, deposit the electronic version of the final article in an online repository – either run by your institution, or a more general archive – this will give your article more prominence (remember to include its publication citation). But you must check your copyright restrictions to ensure the journal is willing to let you do this.

C. REFERENCES AND FURTHER READING

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Day RA. 2004. How to write and publish a scientific paper. 5th edition. Oryx Press, see www.inasp.info/psi.

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SSC. 2000. Informative presentation of tables, graphs and statistics. Statistical Services Center. The University of Reading, UK.

WHO. 1998. WHO editorial style manual. World Health Organization, Geneva.

Zell HM. 1998. A handbook of good practice in journal publishing. 2nd Revised Edition. The International African Institute and African Books Collective, London and Oxford.

Useful websites

APA reference style – although the book is only available in print for sale, this website gives examples of references in APA style – very useful. <http://www.english.uiuc.edu/cws/wworkshop/ >

Citations – useful guide on how to cite internet (online) publications. <http://www.apastyle.org/elecsource.html>

Cordova S. How to write a scientific paper. New Mexico Junior Academy of Science http://www.nmas.org/JAhowto.html.

Smart P and J Falaiye. How to publish your research work. This resource is available on the INASP website. www.inasp.info/psi or www.inasp.info/pubs.

INASP Resources on website: www.inasp.info/psi/resources. International Network for the Availability of Scientific Publications (INASP 58 St Aldates Oxford OX1 1ST UK Email: inasp@inasp.info

Mainali KP, Editor, Himalayan Journal of Sciences, Kathmandu, Nepal, URL: www.himjsci.com

Notes on the Structure of a Scientific Paper: These guidelines were prepared with the aid of Robert Day's entertaining book How to write and publish a scientific paper (ISI Press, Philadelphia, l979). http://aerg.canberra.edu.au/pub/aerg/edupaper.htm Instructions for authors and http://www.mco.edu/lib/instr/libinstq.html Connects you to the instructions for authors of hundreds of biomedical journals.

SciDevNet. How do I write a scientific paper? http://www.scidev.net/ms/howdoi/index.cfm.

Writing styles for humanities: http://www.kyvl.org/html/ref/subwriting.shtml. This website gives a wide range of links to websites detailing how to write papers in different humanities areas.