

The image shows the cover of a spiral-bound notebook. The cover is a light beige or tan color with a fine, woven fabric texture. A silver metal spiral binding is visible along the left edge. The notebook is set against a dark brown background.

How to Write a Scientific Paper

A General Guide

Structure of a Paper

Scientific writing follows a rigid structure to follow independently of the chosen Journal

A paper can be read at several levels:

- Some people just will refer to the title
- Others may read only the title and abstract
- Others may look only at figures and figure legends
- Others will read the full paper for a deeper understanding



Key Elements of Publishing

- Ethical Issues
- Style and language
- Structure of paper
- Components of paper
- Article submission/journal selection
- Publisher's process/peer review

Ethical Issues

- Disclosure of Conflict of Interest
- Acknowledgment of funding sources
- Image manipulation guidelines
- Online submission - supplemental information (datasets, videos)

See: Blackwell Science - Best Practice Guidelines on Publishing Ethics

[http://www.blackwellpublishing.com/
Publicationethics/](http://www.blackwellpublishing.com/Publicationethics/)

Style and Language

- Refer to the journal's author guide for notes on style (see Publishing Skills Web-Bibliography for examples)
 - Some authors write their paper with a specific journal in mind
 - Others write the paper and then adapt it to fit the style of a journal they subsequently choose
- Objective is to report your findings and conclusions clearly and concisely as possible

Style and Language

- If English is not your first language, find a native English speaker to review the content and language of the paper before submitting it
- Regardless of primary language, find a colleague/ editor to review the content and language of the paper

See: Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication

<http://www.icmje.org/>

The questions to ask yourself
first...



A graphic of a spiral-bound notebook with a brown cover and a white page. The spiral binding is on the left side. The text is written on the page.

Is the paper worth writing?

- What's in the literature?
- “So What?”
- It's a lot of work (average 20-30 drafts).
Don't do it unless its worth it.


What do I have to say?

- A single question clearly stated with adequate evidence for the answer.
- Try stating the question and its answer in one simple sentence.

Is it one or more papers?

- Putting too much in one paper makes it diffuse and less compelling than if its focused



A graphic of a spiral-bound notebook with a brown cover and a white page. The spiral binding is on the left side, and the page is slightly aged with some faint smudges. The text is written on the page in a black serif font.

OK, So you want to/need to
write a paper --> next questions

- a. What is the right format for the message
(original article/review?)
- b. What is the right audience?
- c. What journal should I choose?



What Journal should I choose?

- Select your journal carefully
- Read the aims and scope
- Think about your target audience and the level of your work – do you have a realistic chance of being accepted?
- **Follow the guidelines** in the notes for authors and include everything they ask – it makes the editor's job easier...
- Articles should **not** be submitted to more than one journal at a time

Which journal?

- i. Is the topic of my paper within its scope and format?
- ii. Would it match my audience?
- iii. Ask mentor or other senior researchers: appropriateness
- iv. Impact Factor
- v. Consequences of wrong decision: time lost; failure to publish

Author Priorities for Journal Selection

- Key (Determining) factors
 - Impact Factor
 - Reputation
 - Access to the target audience
 - Overall editorial standard
 - Publication speed
 - International coverage
 - Open Access
- Marginal (Qualifying) factors
 - Experience as a referee
 - Track record
 - Quality and colour illustrations
 - Service elements

Calculation for journal impact factor*

A= total cites in 2015

B= 2015 cites to articles published in 2013-14 (this is a subset of A)

C= number of articles published in 2013-14

D= B/C = 2015 impact factor

**Weights review articles heavily and is higher in scientifically better populated fields*



A scientific article as a critical argument

- a. Statement of problem; posing a question
- b. Presentation of evidence
- c. Assessment of the validity of the evidence in the face of ..
 - a. strengths/weaknesses
 - b. other evidence
- d. Conclusions


Literature Search First

- What has been done and what can you say that's new?
- Be thorough in your search:---a high sensitivity/low specificity search.



The Process of Paper Writing

- Create an outline first
- Plan on multiple drafts:
 - Filename with dates
 - One filename written over with new draft
- Tables/figures early: prompt more analysis
- Deadlines for you and coauthors



The Title Page: title; authors and their order

- a. Establishes responsibilities in paper writing
- b. Only include those who have made an intellectual and/or practical contribution to the research
- c. Order of the names of the authors can vary from discipline to discipline
- d. If some people have equally contributed, they deserve co-authorships

The Title

- Describes the paper's content clearly and precisely including keywords
- Is the advertisement for the article
- Does not use abbreviations and jargon
- Search engines/indexing databases depend on the accuracy of the title - since they use the keywords to identify relevant articles

The Abstract

- **Briefly** summarizes (often 150 words) the problem, the method, the results, and the conclusions so that
 - The reader can decide whether or not to read the whole article
- Together, the title and the abstract should stand on their own
- Many authors write the abstract last so that it accurately reflects the content of the paper

The Abstract

- It's a minipaper:
 - Introduction (usually 1-2 sentences)
 - Methods (often longest part)
 - Results
 - Discussion is limited to concluding statement
- Like a paper, requires many drafts, most oriented to presenting argument concisely

The Introduction

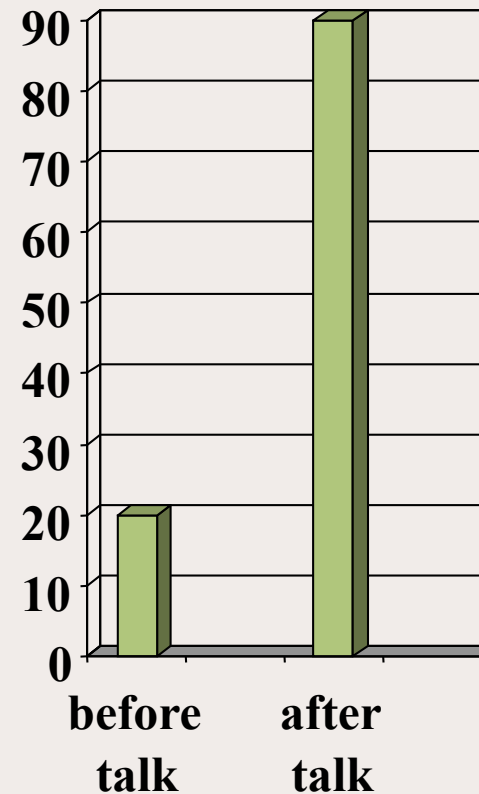
- Clearly state the:
 - Problem being investigated (draw audience in)
 - Background that explains the problem
 - Reasons for conducting the research
- Summarize relevant research to provide context
- State how your work differs from published work and identify gaps in knowledge
- Identify the questions you are answering
- Briefly describe the experiment, hypothesis(es), research question(s); general experimental design or method

The Methods Section

- Provide the reader enough details so they can understand and replicate your research (should include subheadings)
- Write clearly enough to be understood by nontechnical reader and be replicated
- Explain new methodology in detail; otherwise name the method and cite the previously published work
- Include the frequency of observations, what types of data were recorded, etc.
- Be precise in describing measurements and include errors of measurement or research design limits

The Results Section

- Organize around tables/figures
- Present tabular results selectively in text
- Past tense
- No interpretation; just the facts!
- Tables should stand on their own



The Results Section

- Objectively present your findings, and explain what was found
- Show that your new results are contributing to the body of scientific knowledge
- Follow a logical sequence based on the tables and figures presenting the findings to answer the question or hypothesis
- Figures should have a brief description (a legend), providing the reader sufficient information to know how the data were produced

The Discussion Section

- 1st paragraph: answer question/hypothesis
- Remainder:
 - Evidence pro and con: literature review
 - Strengths/limitations of your study
 - Implications of findings (be conservative)
 - Other findings of your study
- Last Paragraph: conclusion

The Discussion Section

- Describe what your results mean in context of what was already known about the subject
- Indicate how the results relate to expectations and to the literature previously cited
- Explain how the research has moved the body of scientific knowledge forward
- Do not extend your conclusions beyond what is directly supported by your results - avoid undue speculation
- Outline the next steps for further study

References

- Whenever you draw upon previously published work, you **must** acknowledge the source
- Any information not from your experiment and not 'common knowledge' should be recognized by a citation
- How references are presented varies considerably - refer to notes for authors for the specific journal
- Avoid references that are difficult to find
- Avoid listing related references that were not important to the study
- Avoid putting too many self-citations

Getting Tense!

PAST and PRESENT

- When quoting *previously published work*, refer to it in *present tense* (e.g. penicillin treats strep throat)
- When describing your *own study*, refer to work in *past tense* (e.g. we tested a new antibiotic for strep throat)



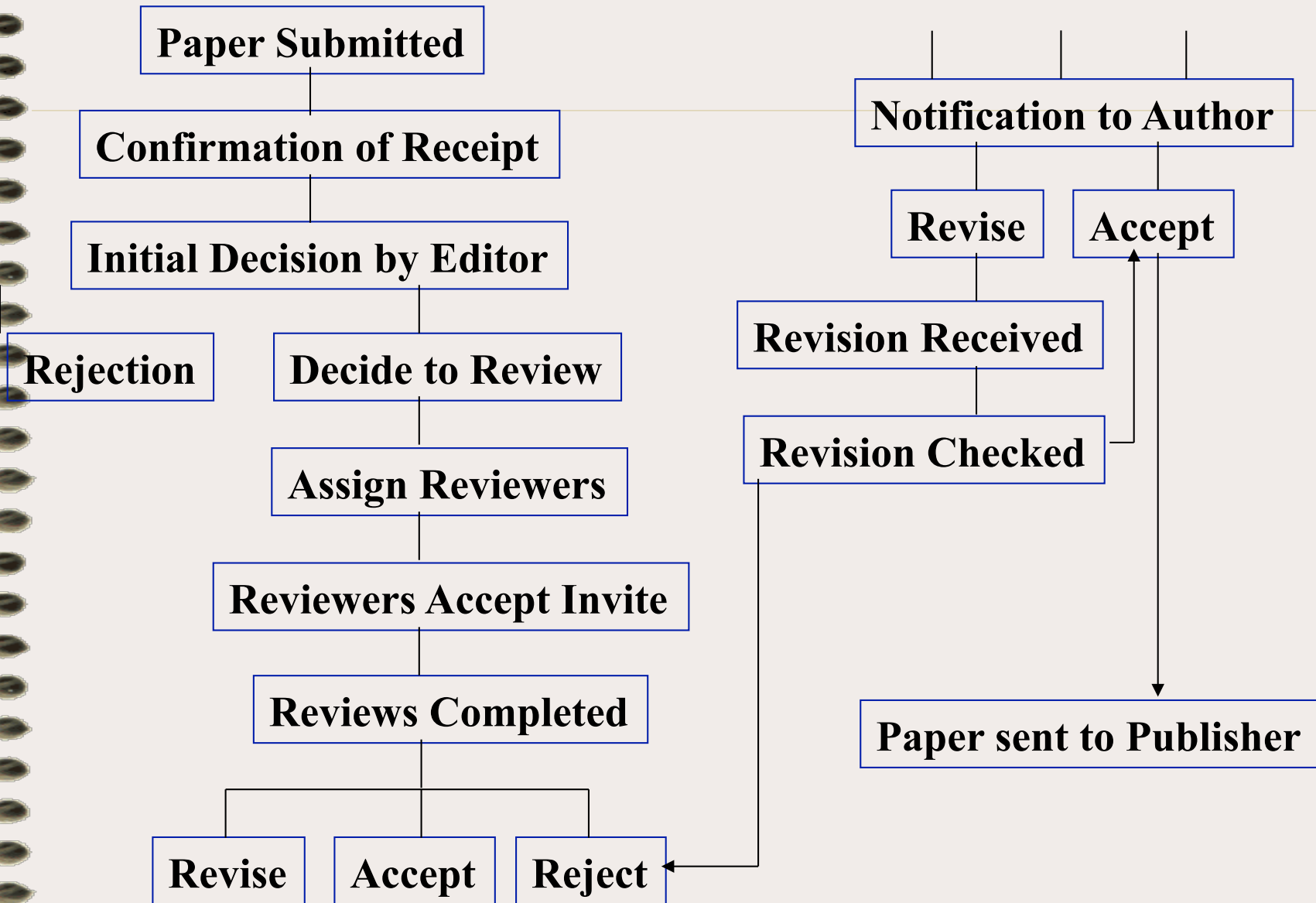
Proofread before Submitting

- ✓ Are terms used consistently throughout?
- ✓ Do numbers in abstract match numbers in text and tables?
- ✓ Do citations in text match references?
- ✓ Are Syntax and Grammar acceptable

After Submission

- Most journal editors will make an initial decision on a paper - to review or to reject
- Most editors appoint two referees
- Refereeing speed varies tremendously between journals
- Authors should receive a decision of Accept, Accept with Revision (Minor or Major), or Reject
- If a paper is rejected, most editors will write to you explaining their decision
- After rejection, authors have the option of submitting the paper to another journal - editor's suggestions should be addressed

Overview of Peer Review Process





Getting the Reviews of Your Paper

- “The reviewer is always right.” (whether they are or not!)
- Don't respond quickly. Digest reviews.

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Publishing Tips

Editors and reviewers are looking for original and innovative research that will add to the field of study; keys are:

- ✓ For research-based papers, ensure that you have enough numbers to justify sound statistical conclusions
- ✓ For a larger study, it may be better to produce one important research paper, rather than a number of average incremental papers

If your paper was rejected...

- Was it sent out for review? If not, consider changing type of journal
- If reviews don't suggest changes, send it out quickly to another journal



Quiz session.....



The good scientific paper ...

- A. Is focused on a specific question(s).
 - B. Covers a broad spectrum of disease or methodologic questions
- Less is More.

In a good scientific paper ...

- Ⓐ: Abstract and tables and figures are understandable without reading whole paper.
- B. Abstract and tables and figures are understandable only with reading whole paper.

In a good scientific paper ...

A: Writing is in passive voice (e.g. it was found that...).

B. Writing is in active voice (we found that...).

C. Writing mixes active and passive voice.

In a good scientific paper ...

A: A term defined in the methods section is used again and again (a rose, a rose, a rose)

B. Various synonyms for a term are used to prevent reader boredom. (a rose, a flower with a thorny stem, a fragrant flower)

➤ Define a term and use it consistently. Otherwise, you'll confuse the reader.

In a good scientific paper ...

A: Writing is flowery

B. Writing is concise

➤ Generally, the shorter, the better