In the Name of God

How to write and publish a scientific paper

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Agenda

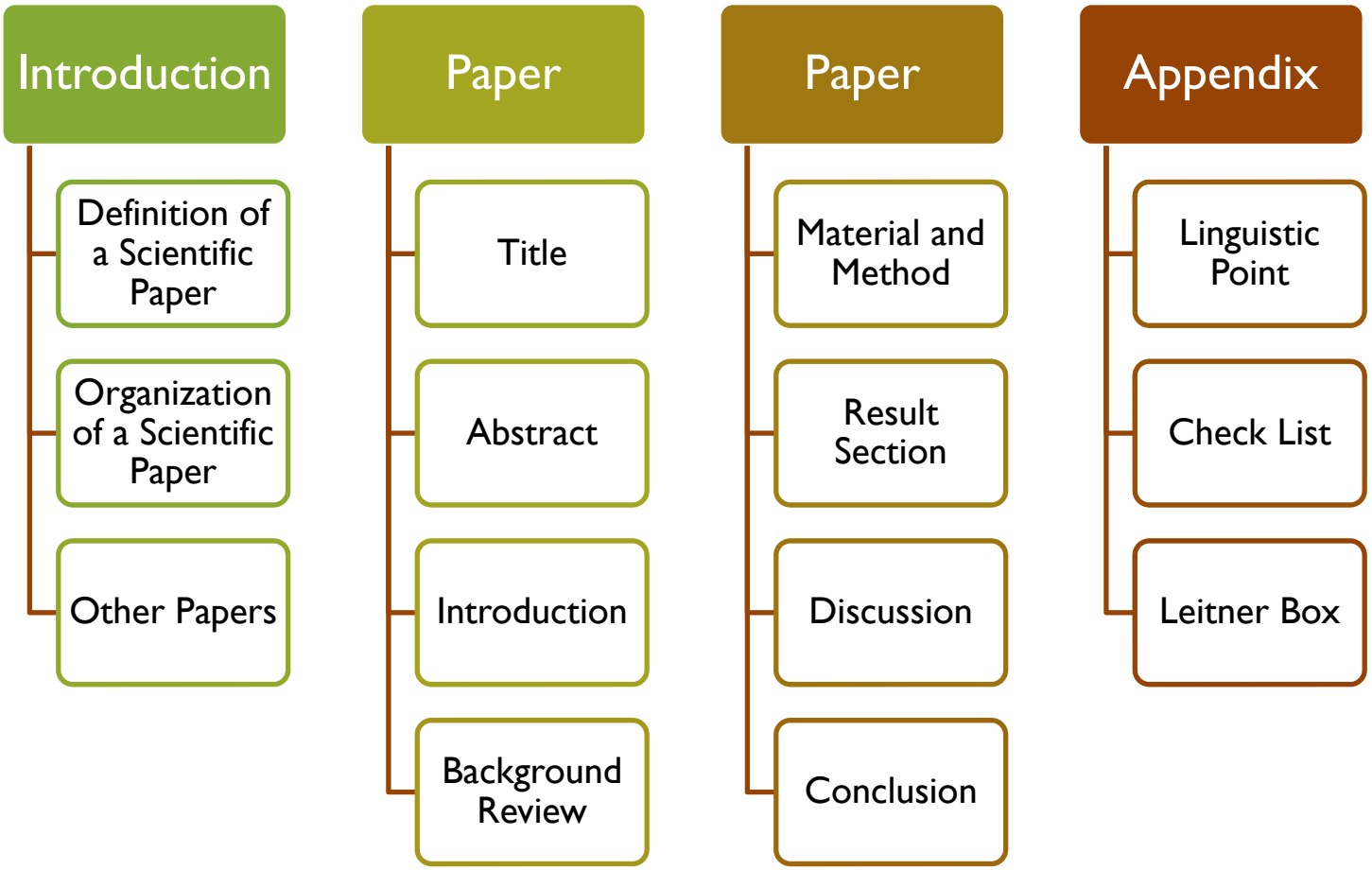
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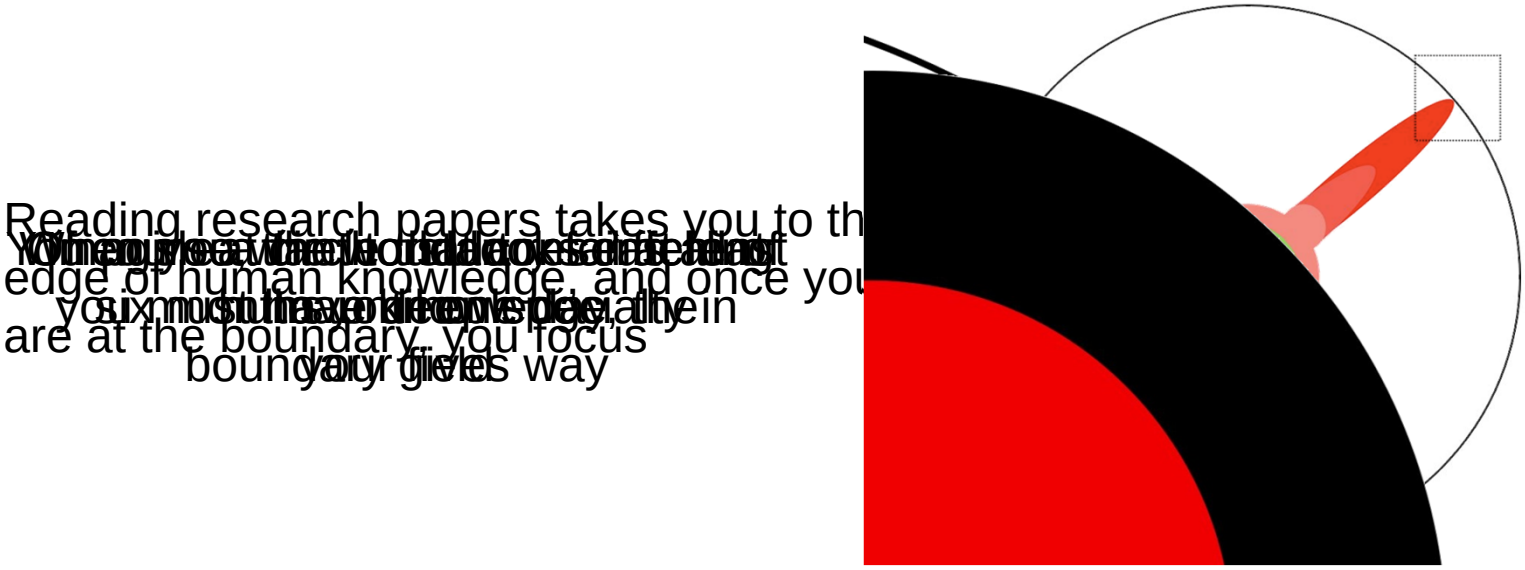
Illustration of Research Process

- The science circle gets pushed by doing research



Introduction

- If a tree falls in the forest and there is no one there to hear it fall, does it make a sound?
- Money produced science. And science produced papers.
- The key characteristic of scientific writing is clarity.
- The best English is that which gives the sense in the fewest short words.
- Repeat the description of main contribution four times: in the Title, Abstract, Introduction, and Text.

Definition of a Scientific Paper

- A scientific paper is a written and published report describing original research results.
- A potential users of the data can (1) evaluate observations, (2) **repeat experiments**, and (3) evaluate logical processes.
- Research is a **problem solving** exercise, differing it from development, implementation, or another type of work.
- Abstracts, Theses, Conference Reports, and many other types of literature are published, but such publications do not normally meet the test of valid publication.
- A scientific paper is not **literature**. The preparer of a scientific paper is not an author in the literary sense.

Definition of a Scientific Paper (Cont…)

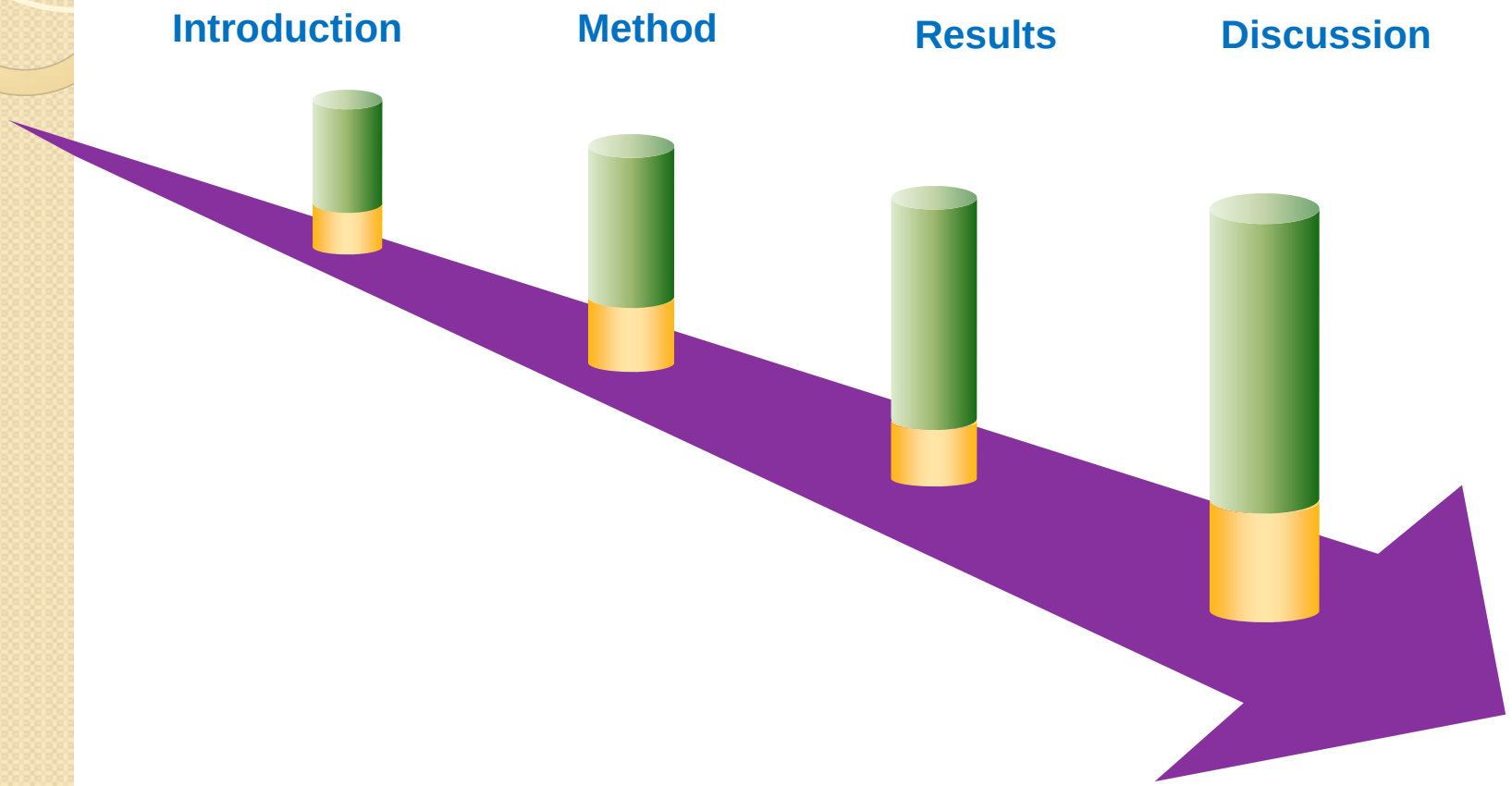
- Even if a scientific paper meets all requirements it is not validly published if it is published in the **wrong place**.
- A relatively poor research report, but one that meets the requirements, is validly published if accepted and published in the **right place**.
- The writing process become an easy task if: The easy task is the one in which you know exactly in what order it must be done.
- You should know what is considered as sign of plagiarism in a new manuscript submission?

Organization of a Scientific Paper

- The Introduction, Methods, Results, and Discussion (IMRAD) format, came into almost universal use in research journals.
- Editors supported IMRAD because they became convinced that it was the simplest and most logical way to communicate research results.
- The logic of IMRAD can be defined through four question forms as follows below:

What question (problem) was studied?	How was the problem studied?
What were the findings?	What do these findings mean?

IMRAD



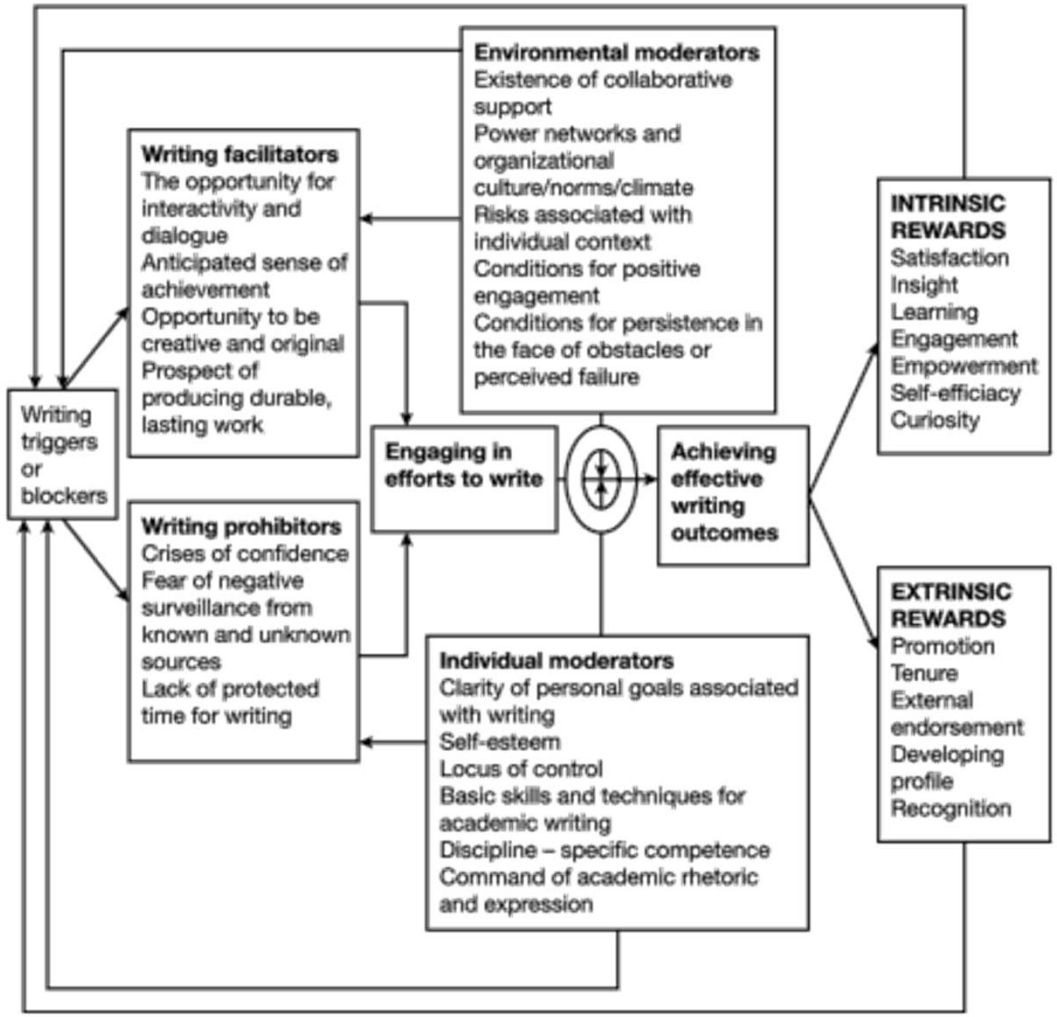
Organization of a Scientific Paper

- Many primary journals publish "'Notes" or "Short Communications," in which the IMRAD organization is abbreviated.
- Various types of organization are used in descriptive areas of science. Go for Instructions to Authors of your target journal.
- If the immediate discussion seems necessary, and a combined Results and Discussion section might then be desirable.
- Scientific text is **precise, impersonal and objective**.
- It typically uses the third person, the passive tense, complex terminology, and various footnoting and referencing systems.

Organization of a Scientific Paper

- During writing, the mind performs all or most of the following functions:
  - monitoring the thematic coherence of the text;
  - searching for and retrieving relevant content;
  - identifying lexical items associated with this content;
  - formulating syntactic structures;
  - inflecting words to give them the necessary morphology;
  - monitoring for appropriate register;
  - ensuring that the intended new text is tied into the immediately preceding text in a way that maintains cohesion;
  - formulating and executing motor plans for key strokes that will form the text on screen;
  - establishing the extent to which the just-generated clause or sentence moves the text as a whole nearer the intended goal; and
  - revising goals in the light of new ideas cued by the just-produced text.

Social Model of Writing



Other Papers

- The review paper is designed to summarize, analyze, evaluate, or synthesize information that has already been published.
- Is It Useful? **From the best review papers come new syntheses, new ideas and theories, and even new paradigms.**
- A conference report is a paper published in a book as part of the proceedings.
- Conference is hold to publish the initial steps of your research in which you can receive feedback from the experts' reviewers.

Other Papers

- Some of the material reported at some conferences (especially the exciting ones) is in the form of preliminary reports.
- But the vast conference literature that appears in print normally is not primary.
- If original data are presented in such contributions, the data can and should be published (or republished) in an archival (primary) journal.

How To Prepare Title

- The selected title of an article should describe the main contribution and the essence of the basic ideas used.
- The meaning and order of the words in the title are of importance to the potential reader.
- 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.
- The title of a paper is a label. Because it is not a sentence, with the usual subject, verb, object arrangement.
- In conclusion, it is fundamentally important that the author provide the right "keys" to the paper when labeling it.
- Without question, most excessively long titles contain "waste" words. For example "Studies on," "Investigations on," and "Observations on.

How To Prepare Title(Cont...)

- Titles should almost never contain abbreviations and jargon.
- An opening A, An, or the is also a "waste" word. Certainly, such words are useless for indexing purposes.
- Article titles phrased as questions also become meaningless, and "question" titles should not be used.
- The hanging title (there is a colon substitutes) is considerably better, and a leading scientific journal, Science, is a proponent of hanging titles.

How To Prepare the Abstract

- The abstract should provide a brief summary of each of the main sections of the paper: Introduction, Materials and Methods, Results, and Discussion.
- The abstract should (1) state the principal objectives and scope of the investigation, (2) describe the methods employed, (3) summarize the results, and (4) state the principal conclusions.
- It is only logical that the reviewer will often reach a preliminary conclusion, and that conclusion is likely to be the correct one.
- Usually, a good abstract is followed by a good paper.

How To Prepare the Abstract(Cont...)

- What is the Problem?
- What is the importance of the Problem.
- What is your method (Solution) to solve the Problem.
- What is your improvement in comparison to previous methods.
- What is the importance of your results (Methods).

How To Prepare the Abstract(Cont...)

- Which tense should be used in writing Abstract?
- The Abstract should not exceed 250 words and should be designed to define clearly what is dealt with in the paper.
- The Abstract should be typed as a single paragraph.
- References to the literature must not be cited in the Abstract (except in rare instances, such as modification of a previously published method).
- **NOTE:** Some experienced writers prepare their title and Abstract after the paper is written.

How To Prepare Keywords

Key words typically:

allow readers to judge whether or not an article contains material relevant to their interests;

provide readers with suitable terms to use in web-based searches to locate other materials on the same or similar topics;

help indexers/editors group together related materials in, say, the end-of-year issues of a particular journal or a set of conference proceedings;

How To Prepare Keywords

Ten ways to produce effective keywords and phrases

1 Use simple, specific noun clauses. For example, use variance estimation, not estimate of variance.

2 Avoid terms that are too common. Otherwise the number of 'hits' will be too large to manage.

3 Do not repeat key words from the title. These will be picked up anyway.

4 Avoid unnecessary prepositions, especially in and of. For example, use data quality rather than quality of data.

5 Avoid acronyms. Acronyms can fall out of favor and be puzzling to beginners and/or overseas readers.

How To Prepare Keywords

Ten ways to produce effective key words and phrases

6 Spell out Greek letters and avoid mathematical symbols. These are impractical for computer-based searches.

7 Include only the names of people if they are part of an established terminology, for example Skinner box, Poisson distribution.

8 Include, where applicable, mathematical, computer techniques or statistical philosophy or approach.

9 Include alternative or inclusive terminology if a concept is, or has been, known by different terminologies.

10 Note areas of applications where appropriate.

How To Prepare the Introduction

- A bad beginning makes a bad ending.
- In the Introduction you should have a "hook" to gain the reader's attention. **Why did you choose that subject, and why is it important?**
- Do not keep the reader in suspense; let the reader follow the development of the facts.
- The problem with the surprise ending is that the readers become bored and stop reading long before they get to the punch line.
- Reading a scientific article isn't the same as reading a detective story. We want to know from the start that the butler did it.
- This road map from problem to solution is so important that a bit of **redundancy with the Abstract** is often desirable.

How To Prepare the Introduction(Cont)

- The Introduction should includes:
  - A problem statement of the research under consideration. The essence of the proposed solution, and why it is expected to be better under the same conditions.
  - A short list of existing solutions and what their drawbacks are.
  - State the method of the investigation. If deemed necessary, the reasons for the choice of a particular method should be stated.
  - The reader should be able to correctly understand what the important aspects of the contribution are, and how good the contribution is.
  - What type of analysis (theoretical, experimental, simulations, implementations, etc.) was performed.

How To Prepare the Introduction(Cont...)

- It is a wise policy to begin writing the paper while the work is still in progress. This makes the writing easier because everything is fresh in your mind.
- Writing in six directions at once! No
- You should have in mind (if not on paper) a temporary title and an outline of the paper.
- You should also consider the level of the audience you are writing for.
- If you have **previously published a preliminary note** or abstract of the work, you should mention this (with the citation) in the Introduction.

How To Prepare the Introduction(Cont...)

- The Introduction is the **proper place to define any specialized terms or abbreviations** that you intend to use.
- Conditions, context, assumptions, and limitations of the research should be stated.
- Make Bullets for your novelties at the end of introduction.
- The structure and content of the rest of the document is normally outlined at the end of an introduction in a single paragraph.

How To Prepare the Literature Review (Related Works)

- There might be related work section that gives a full literature review.
- It should collect known results relevant to the problem stated, whether or not they are used in the proposed contributions.
- Do a really thorough literature review on the suggested topic.
- There are three separation lines to state your work: in the abstract, introduction, and between the literature review and the rest of the text.
- In summary, the literature review should be a critical one, focused around desired outcome and contribution relevant.
- It should discuss advantages and drawbacks of known solutions that are relevant to the problem studied.
- It should discuss the relevance of each reviewed item to the topic studied and newly proposed solutions.

How To Prepare the Literature Review (Related Works) Count

- Existing solutions and their criticism should be limited normally to only those directly relevant to the contribution.
- Every discussed reference may not exactly solve the same problem; it solves the same problem, but makes different assumptions about the system.
- It does not meet certain desirable properties.
- Finally it depends on your research area.

How To Prepare the Material and Method

- In Materials and Methods, you must give the full details.
- Most of this section should be written in the **past tense.**
- You should provide enough detail so that a competent worker can **repeat the experiments**.
- Maybe some readers escape this section. However, when your paper is subjected to peer-review, a **good reviewer** will read the Materials and Methods **carefully**.
- If there is serious uncertainty that your experiments could be repeated, the reviewer will **recommend rejection** of your manuscript no matter how **awe-exciting** your results.
- Methods are similar to cookbook recipes. Questions such as **"how"** and **"how much"** should be precisely answered by the author.

How To Prepare the Material&Method(Cont...)

- For methods, the usual order of presentation is sequential.
- After stating the input and the output of an algorithm, the key idea should be described (clearly and concisely) before discussing steps.
- The most common error is to state the action without stating the reason of the action.
- Consider your reader can not follow the process and conclude yourself each section instead of leaving it to the reader.
- Important new concepts, and new ideas, should be illustrated by examples and figures as appropriate, to help the reader in understanding them.
- A new example or diagrams is welcome if it offers something essentially different and insightful compared to previous ones.
- Captions deserve special attention.

How To Prepare the Material&Method(Cont...)

- If your method is new (unpublished), you must provide all of the needed detail.
- If a method has been previously published in a standard journal, only the literature reference should be given with minor description.
- Do not make the common error of mixing some of the Results in this section.
- A good test is to give a copy of your finished manuscript to a colleague and ask if he or she can follow the methodology. **Why?**
- It is quite possible that your colleague will pick up a glaring error that you **missed** simply because you were **too close to the work**.

How To write Result Section

- It is the core of paper.
- You shouldn't start the Results section by describing methods that you omitted from the Methods section.
- There are usually two parts in the Results section.
  - First, you should present the data.
  - Second, you should give some kind of overall description of the experiments, providing the big picture.

How To write Result Section(Cont...)

- In the innovation viewpoint, the emphasis is rather on the validation of the new idea, without comparing it with something else that exists.
- In the scientific point of view, the new solution should be compared with competing solutions under particular assumptions, metrics, and models.
- Analysis could be analytical, by simulation, or by implementation.
- Unfair comparison is a comparison with solutions that use different metrics and assumptions from the one used in new solution.

How To write Result Section(Cont...)

- The primary task is to identify assumptions, metrics, models, and parameter values for which the new solution is better than existing ones.
- Assumptions refer to the simplifications made in the model used so that the solution can be easily understood.
- In the manuscript you should present representative data rather than endlessly repetitive data.
- The most common fault is the duplication in words of what is already evident to the reader from examination of the figures and tables.
- It should be presented in the past tense.

How To write Result Section(Cont...)

- It is often important to define even the negative aspects of your experiments.
- The results should be short and sweet, without verbiage.
- It is the Results that compose the new knowledge that you are contributing to the world.
  - The earlier parts of the paper (Introduction, Materials and Methods) are designed to tell why and how you got the Results.
  - The later part of the paper (Discussion) is designed to tell what they mean.

How To Write the Discussion

- It is usually the hardest section to write. And, whether you know it or not;
  - Many papers are rejected by journal editors because of a **faulty Discussion**, even though the data of the paper might be both valid and interesting.
  - Even more likely, the true meaning of the data may be completely **unclear by** the analysis presented in the Discussion, again resulting in rejection.

How To Write the Discussion

- What are the essential features of a good Discussion?
  - Try to present the principles, relationships, and generalizations shown by the Results.
  - bear in mind, in a good Discussion, you discuss--**you do not repeat** the Results.
  - Point out any **exceptions or any lack of relationship** and define worried points.
  - Show how your results and interpretations **agree (or contrast) with** previously published work.
  - Discuss the theoretical **suggestions** of your work, **as well as any possible practical applications**.

How To Write the Discussion (Cont...)

- Compare and discuss yours to others. Not others together.
- The authors should search for scenarios in which their solution is the best.
- It is much better that authors criticize their own work and demonstrate good judgment than to leave such “pleasure” to the examiners and referees.
- Reader of a paper should never find himself/ herself asking "So what?“

How To Write the Conclusion

- It states what has been achieved by the current research, and discusses major advantages and drawbacks of the new solution.
- Some people read only the abstract and the conclusion Thus, important things missing in the abstract should be placed in the conclusion section.
- State your conclusions as clearly as possible and summarize your evidence for each conclusion.
- The most important part of the conclusion section is to list future work that can be done using the results of the current article.
- Good writing, like good music, has a fitting peak.

Essential Words and Phrases

- The word jargon has three main meanings:
  - phrases used by a particular trade, profession, or group, for example, medical jargon
  - unintelligible or meaningless talk or writing, gibberish
  - any talk or writing that one does not understand.

- jargon used by any professional group may not be understood by members of other professions.

- Some words are not acceptable in scientific writings For example: enough=an adequate amount of, many=a considerable number of.

- Some words have more than one meaning so bring the correct one.

- Do not use words like "obviously" or "clearly," which may insult the reader's intelligence.

Check List

1. Does your paper have a proper abstract?
2. Does the abstract briefly summarize the introduction, the methodology, the results, and the discussion from the main portion of your scientific paper?
3. Does the introduction describe the purpose, scope, and background of the research reported in the paper?
4. Is your description of the methodology detailed enough that someone like you could read it and use your description as directions to successfully duplicate your research?
5. Does the section on results contain suitable graphs to illustrate the significant trends in your group's data ?
6. Does the discussion contain thoughtful observations of conditions and events which may have influenced your results?
7. Are your sections properly identified?

Summery

- One recommendation is to follow a + - + pattern in the introduction and the main text.
- It is important to check if the article has an overall flow, a smooth transition from topic to topic, from familiar information to new information.
- Terms should be normally defined before using them, and should be used precisely and consistently, ambiguities should be avoided.
- English descriptions and English text has preference to mathematical symbolism wherever possible, for smoother reading.
- In some cases, the best approach is to give a math expression followed by its "decoding" with analogous statements in English.

Summary

- What is the Problem?
- What is the importance of the Problem.
- What is your method (Solution) to solve the Problem.
- What is your improvement in comparison to previous methods.
- What is the importance of your results (Methods).

References

How to Write and Publish a Scientific Paper a book by Robert A. Day and Barbara Gastel. ISBN: 1573561657, Publisher: Oryx Press.l.

Ivan Stojmenovic “How to Write Research Articles in Computing and Engineering Disciplines” in IEEE Transactions on Parallel and Distributed Systems, Vol. 21, No. 2, February 2010.


Thanks