How to write a scientific paper?

Presented by

Zahra Lari

Outline

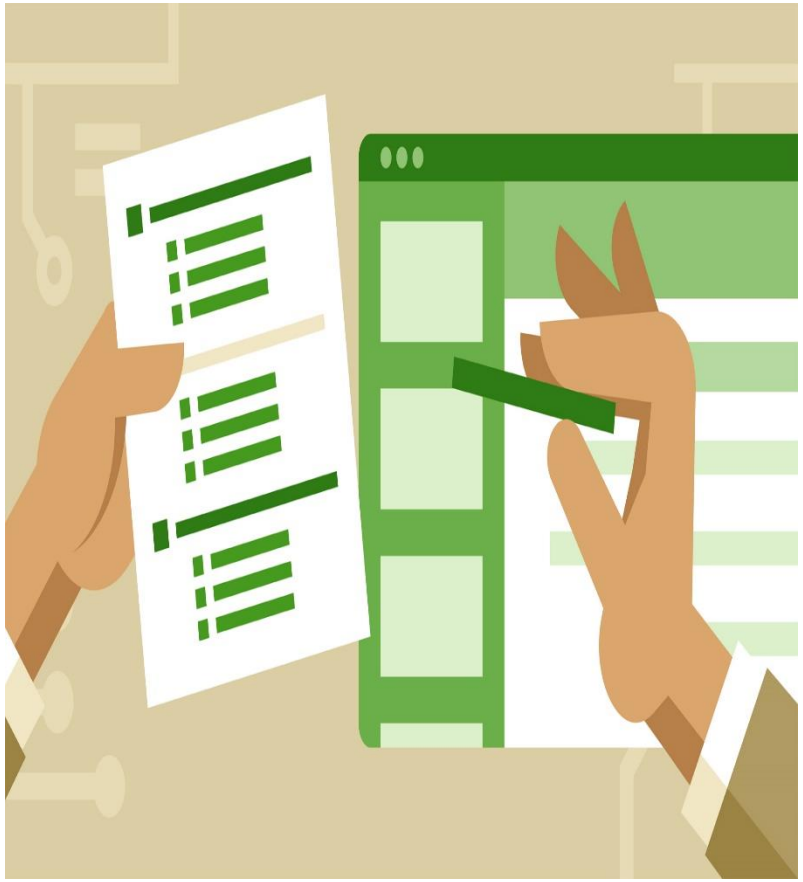
- ✓ **Different types of papers**
- ✓**Structure of a journal paper**
- ✓**Choosing a Journal**
- ✓**Preparing manuscript**
- ✓**Submitting manuscript**
- ✓**Revision and acceptance**

The questions you must ask yourself….

- Have I done something new , interesting and challenging?
- Is my work related to a current hot topic?
- Have I provided solutions to some difficult problems?
- Does the paper contain sufficient new material?

Aspects of writing a paper

- **Contents**
- **Language**
- **Figures and Tables**



Types of articles

✓**Original articles**

- **Rapid communications/Short communications**
- **Letter**

Review papers or perspectives

Literature review

Critical review

Meta analysis

Steps of maturation of article

Choosing the target journal

- Choose a credit journal

✓ JCR

✓Quarter

✓Impact factor

✓Turnover time

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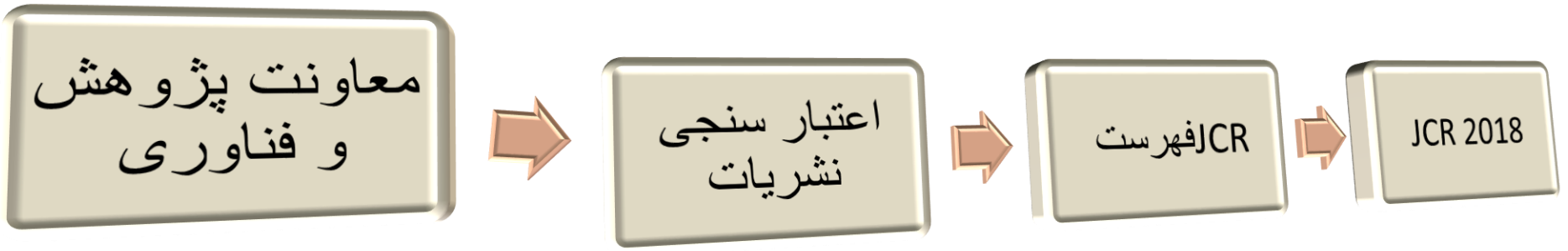


- Find a good paper from a respected journal and use it as a model for your own writing.

Quality of the writing reflects the quality of the research.

What to check in journals?

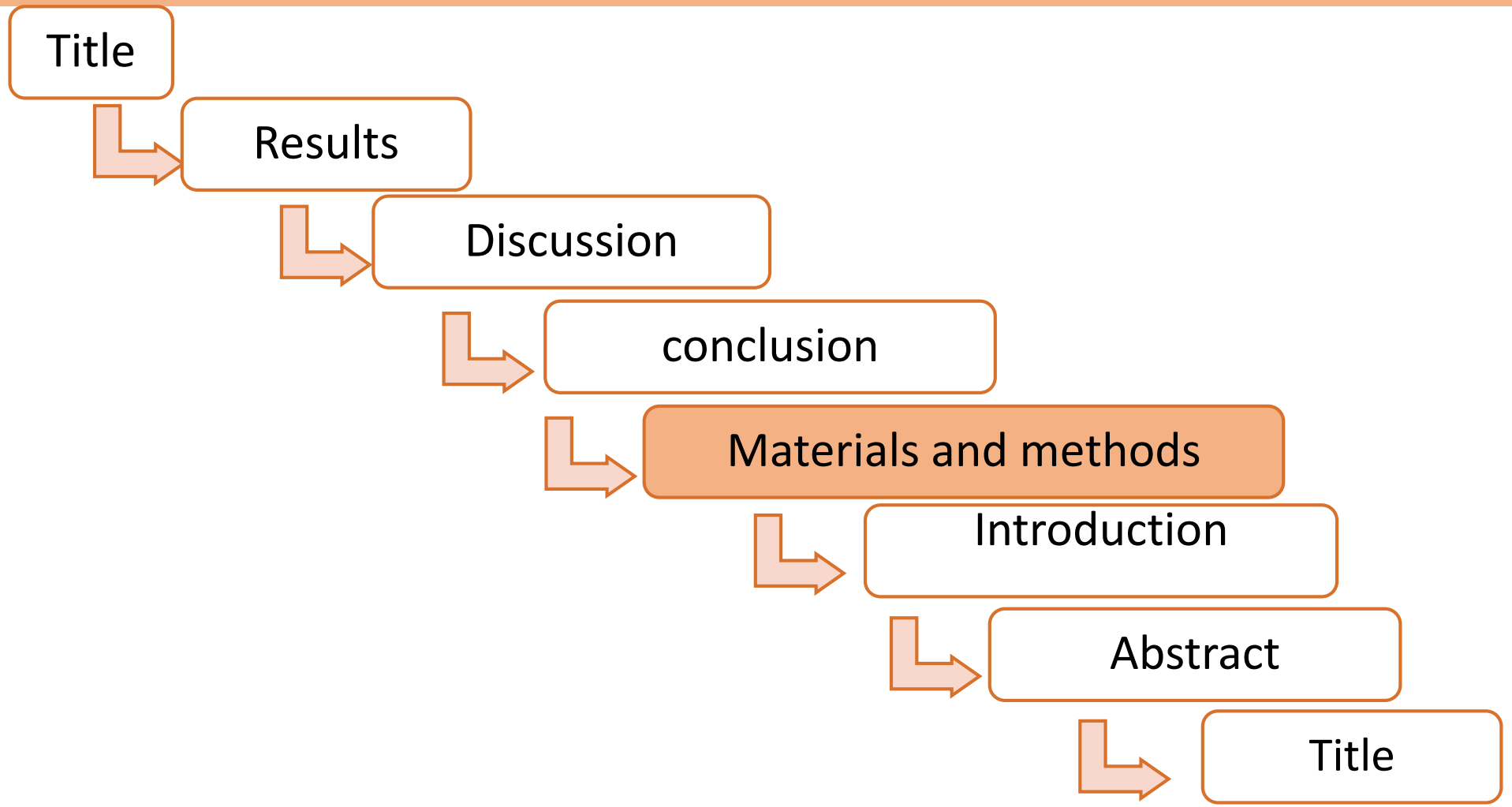
- Editorial guidelines,
  - References citation
  - Structure
  - Nomenclature
- Submission procedures,
- Fees for publishing open access,

If your research is not very challenging, focus in more humble journals with lower Impact Factors.

Structure of articles

1. Title , Authors
2. Abstract, Keywords, Highlights
3. Introduction
4. Methods and materials
5. Results / Results and Discussion
6. Discussion
7. Conclusion
8. Acknowledgement
9. References

The order of writing



Title

Indicative

The effectiveness of bed nets in controlling mosquitoes at different seasons of the year

Informative

Bed nets control mosquitoes most effectively when used in the rainy season.

Question-type

When are bed nets most effective when used to control mosquitoes?

Main-subtitle

Bed nets effect on mosquitoes: Their effectiveness when used only in the rainy season

Title

- Chemical Capture of CO2 by Glycine Salt Solution
- **Heat dissipation in slab gel electrophoresis: The effect of embedded TiO2 nanoparticles on the thermal profiles**
- **Embedded ceria nanoparticles in gel improve electrophoretic separation: a preliminary demonstration**
- **How plants sense the temperature?**

Authors

- Who are the authors?
- The order of names
- The affiliation
- Correspondence

Authors

- Credit for authorship should be based on:

✓- Substantial contributions to research design, or the acquisition, analysis or interpretation of the data

✓- Drafting the paper or revising it critically

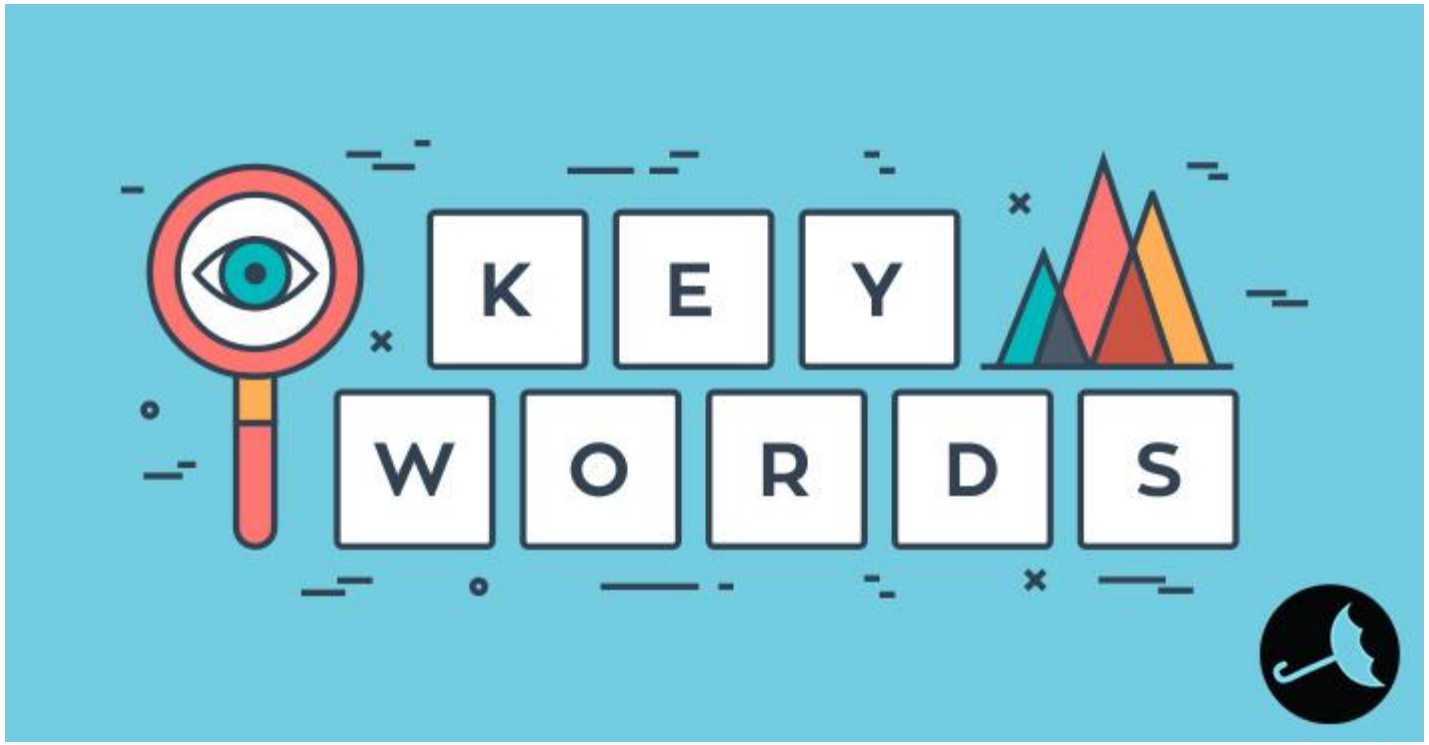
✓- Approval of the submitted and final version

Affiliation

Department of ……., Faculty of ……..,
Ferdowsi University of Mashhad, Mashhad, Iran

Highlights & Keywords

- For some journals writing some highlights is necessary.



Title page sample

Photosynthetic aspects and lipid profiles in the mixotrophic alga *Neochloris oleoabundans* as useful parameters for biodiesel production

Costanza Baldisserotto [a,1], Cecilia Popovich [b,c,1], Martina Giovanardi [a], Alessandra Sabia [a], Lorenzo Ferroni [a], Diana Constenla [d], Patricia Leonardi [b,c], Simonetta Pancaldi [a,*]

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[c] *Laboratorio de Ficología y Micología. Dpto. de Biología, Bioquímica y Farmacia, Universidad Nacional del Sur, San Juan 670, 8000 Bahía Blanca, Argentina*
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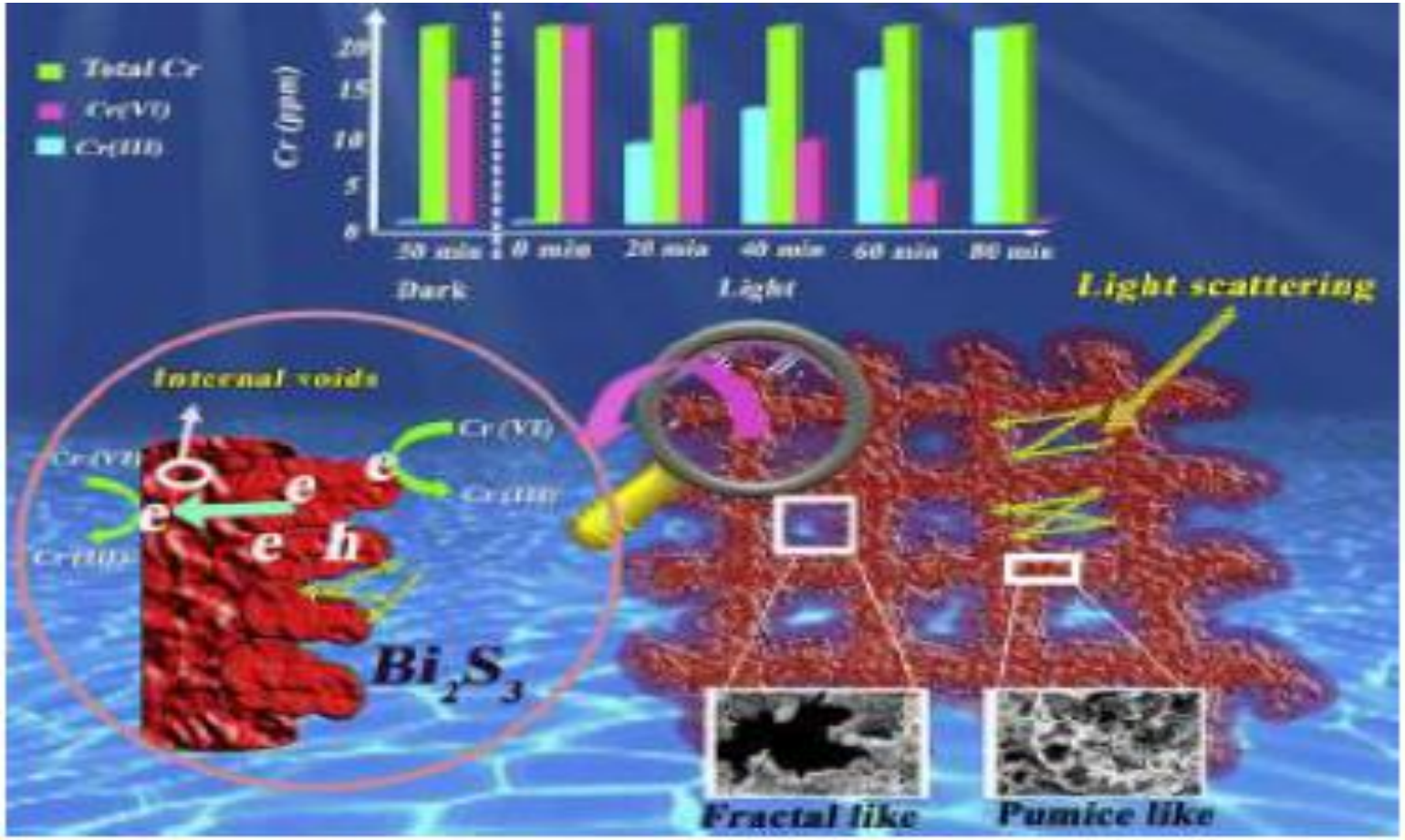
Mixotrophy
Photosynthetic apparatus
PSII
Lipid profiles
Ultrastructure

ABSTRACT

Since fossil fuels are expected to run out within few decades, attention has increasingly been focused on renewable energy sources, including microalgae. *Neochloris oleoabundans* (Chlorophyta) has a capability to accumulate lipids, in particular triacylglycerols (TAG), useful for biodiesel production; furthermore, it can grow mixotrophically. The present work deals with two fundamental steps of mixotrophic cultivation with glucose (late exponential – 6 days – and late stationary – 14 days – phases of growth), focusing on the relationship between photosynthesis and lipid production. Results confirmed that the use of glucose induces a high biomass productivity, which is associated to a rapid cell replication until day 6 followed by cell enlargement until day 14. At day 6, mixotrophic cells contained numerous stromatic starch grains, while at day 14 lipids were highly accumulated and starch tended to reduce. Photosynthetic pigment and protein content decreased under mixotrophy. The degree of photoinhibition under high light was not significantly affected by mixotrophic cultivation at both experimental times. The creation of a reducing environment due to the photosynthetic activity, together with alterations of N:C ratio, promoted the lipid synthesis. Neutral lipids increased under mixotrophy and oleic acid was the major component, while linolenic acid decreased; these aspects match requirements for biodiesel production.

Graphical abstract



Abstract

- Shortened version of the paper (abstract)
- *Frequently, readers will only read the abstract.*
- Has the greatest impact in as few words as possible.
- 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) The significance of the results

Abstract

- ✓Write the abstract section last.
- ✓Do not go in details.
- ✓Do not cite to any reference.
- ✓Do not use repetitive sentences.

A good abstract…

Methanol crossover is one of the major problems which reduces the performance of direct methanol fuel cells -DMFCs-. Utilization of methanol tolerant cathode electrocatalysts with comparable activity, lower cost, and higher durability than those of current Pt-based electrocatalysts is an essential step towards commercialization of DMFCs. In this research, for the first time the performance of hydrothermally produced nitrogen-doped reduced graphene oxide -NRGO- with nitrogen content of 4.6 wt% was compared with that of commercial 20 wt% Pt/C as cathode electrocatalysts of passive DMFC. The polarization curves of cells with various methanol concentrations -1.5, 3.0, and 4.5 M- were recorded. The results suggested the cell with NRGO cathode could operate at higher optimum methanol concentration in contrast to the cell with Pt/C cathode. The results showed that at the same methanol concentration the maximum power density, the fuel efficiency, and the current stability for the cell with NRGO cathode are higher than those of Pt/C cathode about 208%, 269%, and 77%, respectively. Higher temperature of cathode current collector of the cell with Pt/C cathode, in spite of its lower power output, presented an evidence of oxidation of permeated methanol on its cathode surface. Also, EIS measurements clarified that COads oxidation reaction, an intermediate of methanol oxidation reaction -MOR-, on cathode side of cell with Pt/C cathode implies a relatively huge impedance on the overall cell operation. By contrast, in the case of cell with NRGO cathode due to its inertness towards MOR, the overall cell impedance significantly reduced.

The body of an article

Introduction	Materials & Methods	Results	Discussion
• What did you/others do? • Why did you do it?	• How did you do it?	• What did you find?	• What does it all mean?

Before starting to write

- Make an outline of the major headings.
- List the key ideas to be covered under each heading.
- Organize the logic of your arguments at this level.
- Separate out the three tasks of

Figuring out what you want to say,

Planning the order and logic of your arguments,

Crafting the exact language in which you will express your ideas.

The structure of paragraph

Topic sentence

- Needs to state ONE idea clearly.

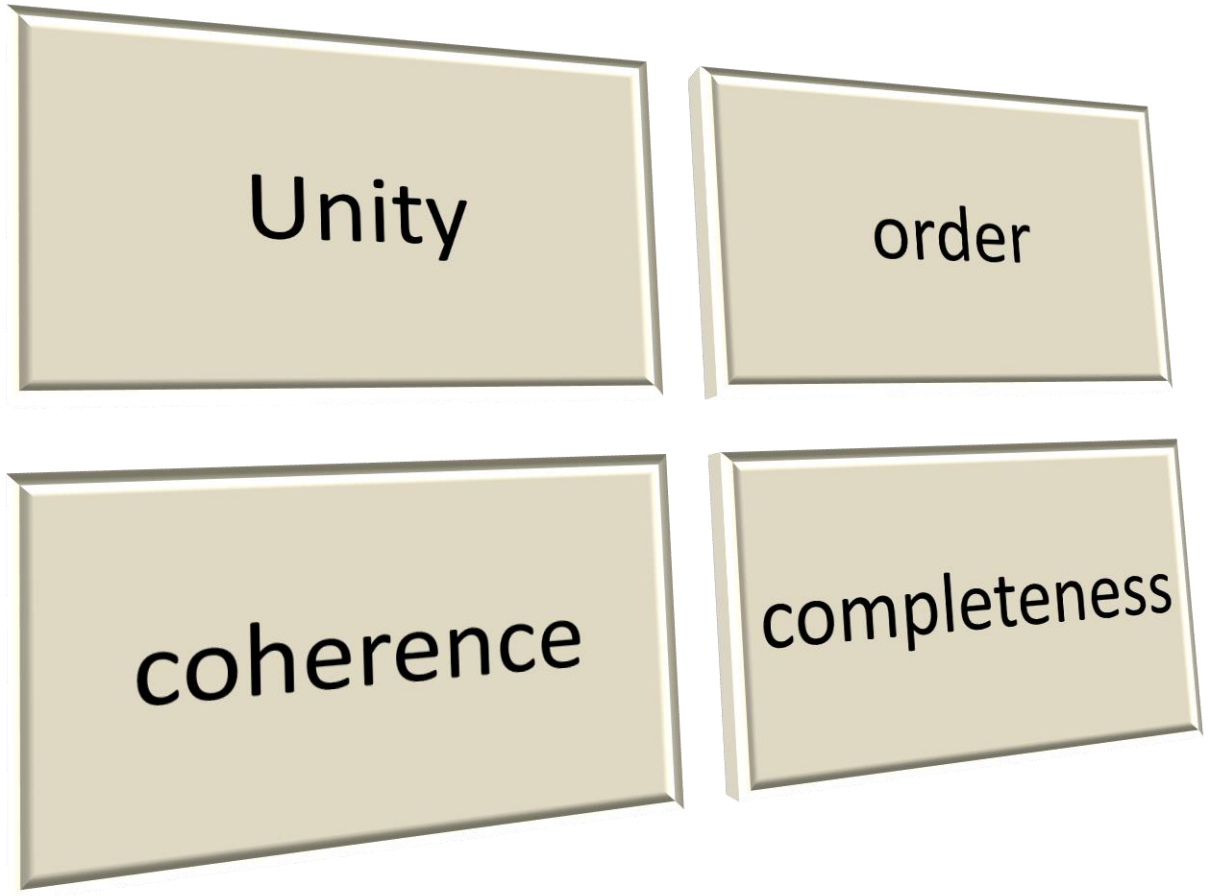
Supporting sentences

- Elaborates and explains the idea introduced in the topic sentence.
- Provides evidence and examples.
- Explains the evidence or example included - why is it relevant?

Concluding sentence

- Back to the main idea of the paragraph;
- Go to the next paragraph

The elements of a good paragraph



Introduction

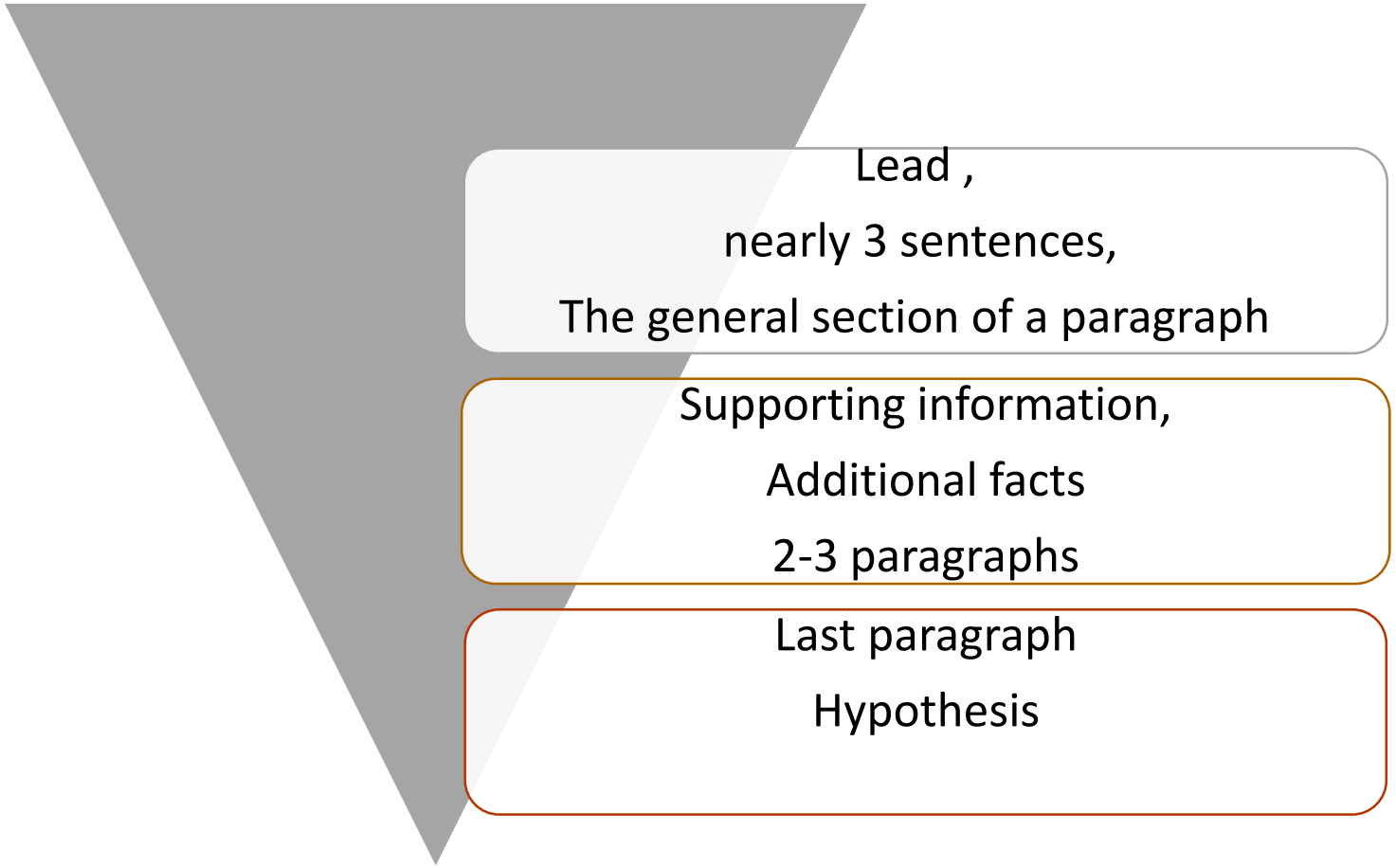
- ✓**One of the hardest part**
- ✓Why is this study of scientific interest ?
- ✓What is your objective?
- ✓Discusses the results and conclusions of previously published studies.
- ✓Emphasize your specific contribution to the topic.
- ✓Include the novelty of your research according to other studies.

Introduction

- ✓The article must provide a sufficient background on the subject.
- ✓It should:
  - ✓Describe the scientific topic of the paper.
  - ✓Provide background information on that scientific question .
  - ✓Contain a clearly-stated scientific question/hypothesis.
  - ✓Summarize the conclusions drawn from the authors' research.

Introduction

✓ Limit the introduction to studies that relate directly to the present study.



Introduction

- Cite the original reference not the review or book.
- Some sentences need more than one reference.
- Cite the references in the same sentence in the order of year or alphabet.
- When citing a reference, focus on the ideas, not the authors.

Introduction

- A combination of past (for other results) and present tense (for accepted facts).
- It was shown that the brain is more fully developed at birth than other organs (Brian et al. 2018).
- Write for permission to reproduce any previously published tables or illustrations.

Materials &Methods

✓Methodological details necessary for another scientist to duplicate your work

✓Narration of the steps in your experiment not a list of instructions

✓Experimental details can be given as supplementary part.

✓Company where some materials are prepared needs to be included.

✓Passive form is more common than active form.

✓Use the past tense.

Materials &Methods

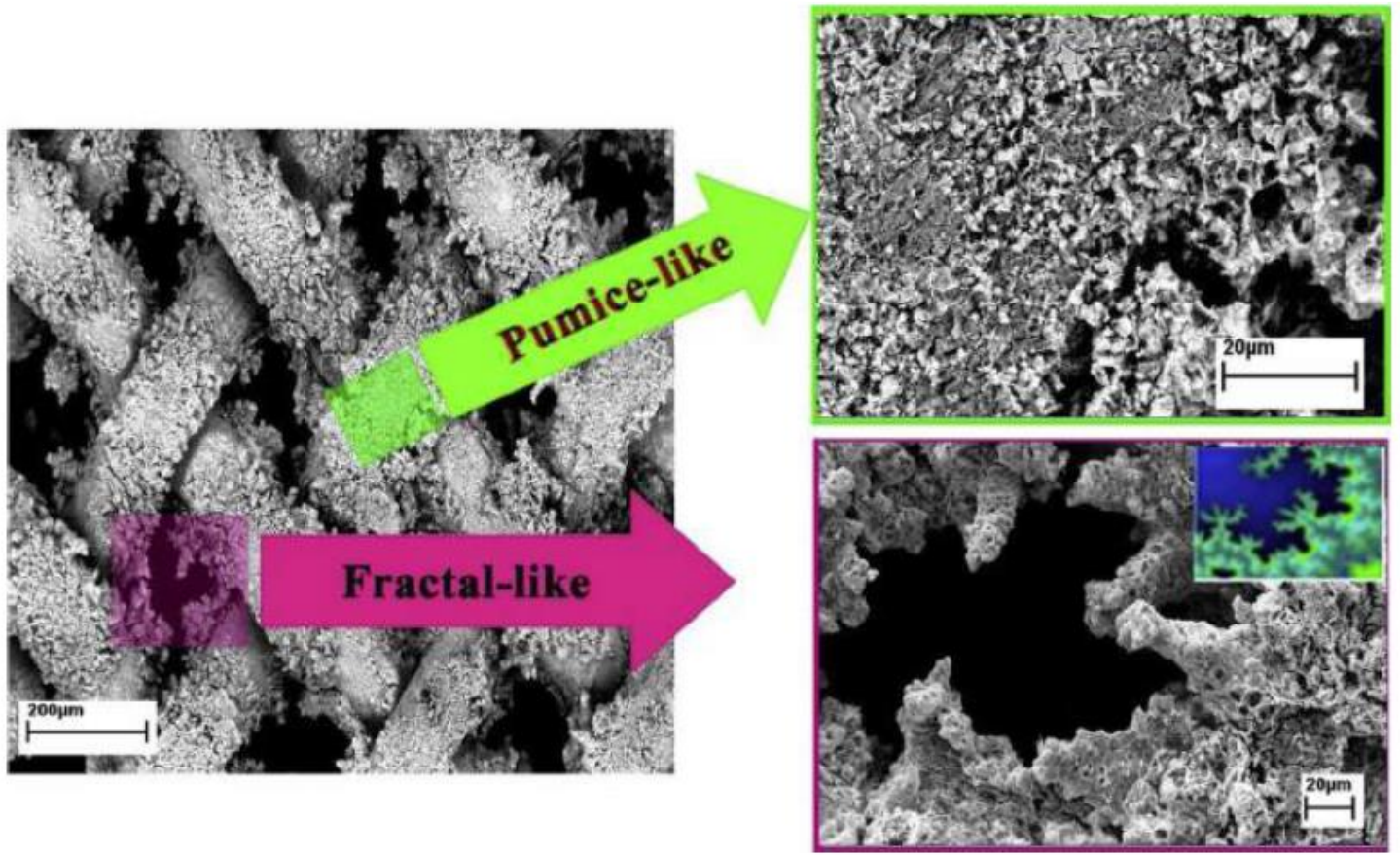
- ✓The place of experiment
- ✓The condition of experiment
- ✓The full name of organism
- ✓Brand of chemicals and properties of organisms
- ✓Cite to the main procedure.
- ✓Explain your experimental design and statistical analysis.

Results

- ✓Draw tables and/or figures and summarize the data with text.
- ✓Text the results of your study, then refer to a table or figure to see the data.
- ✓Writing results the best way to discover the analyses and figures need to be done.
- ✓Do not report your results generally. Go in details.
- ✓Report only what you found not others.
- ✓Present the results of the experiment not to interpret their meaning.
- ✓Write in the past tense, use the present tense when discussing results and conclusions.

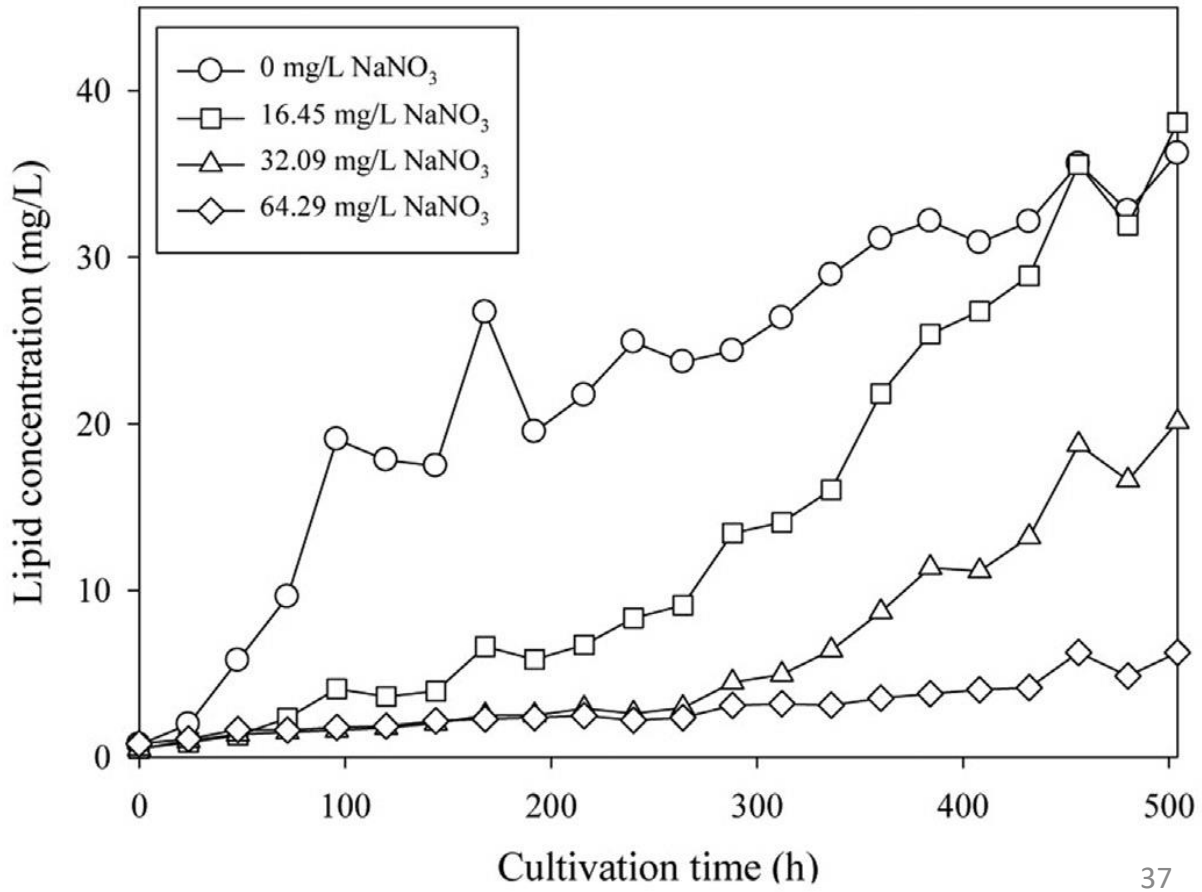
Results, images

- For microscopic images , magnification, techniques, staining …..must be included.

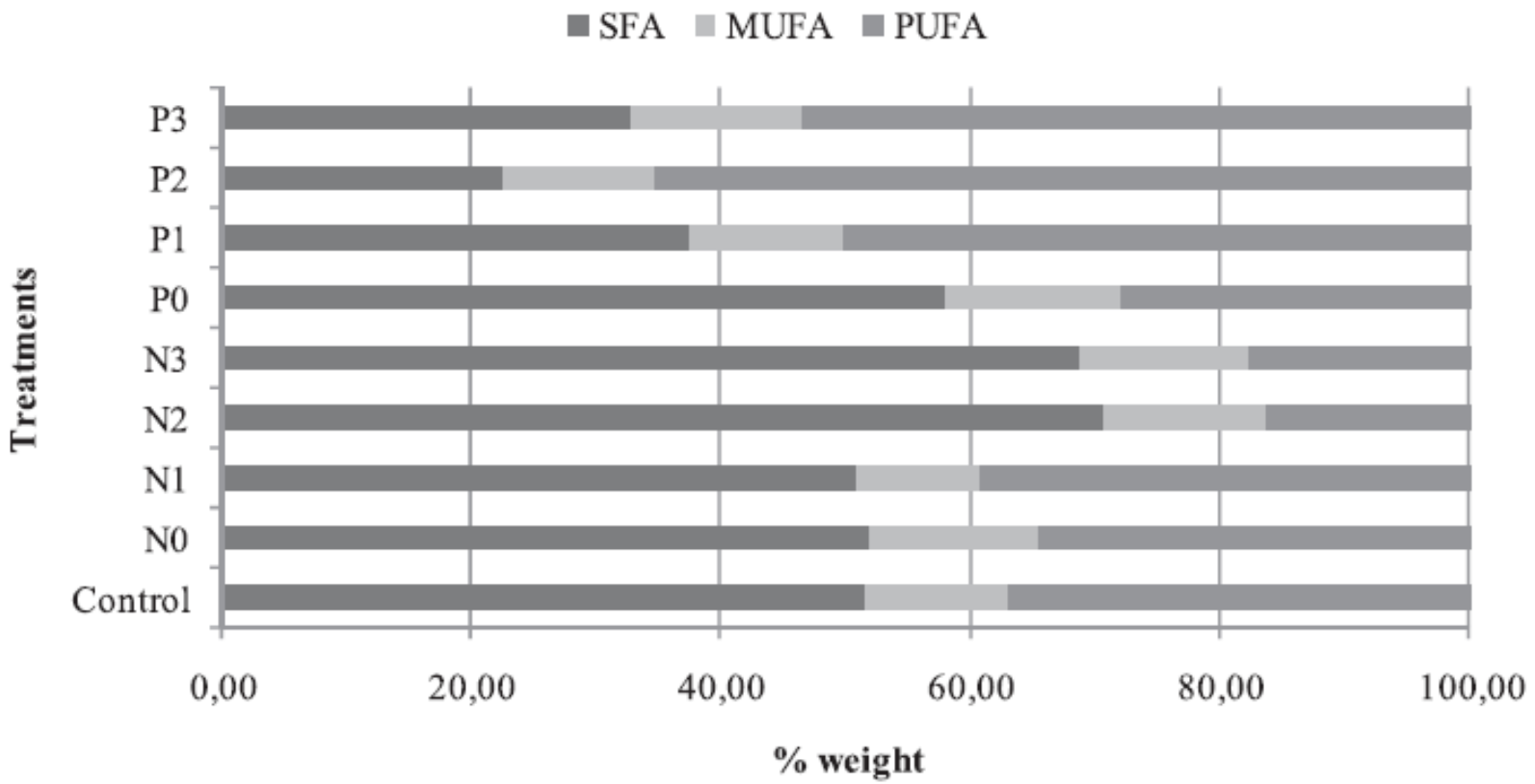


Results, graphs

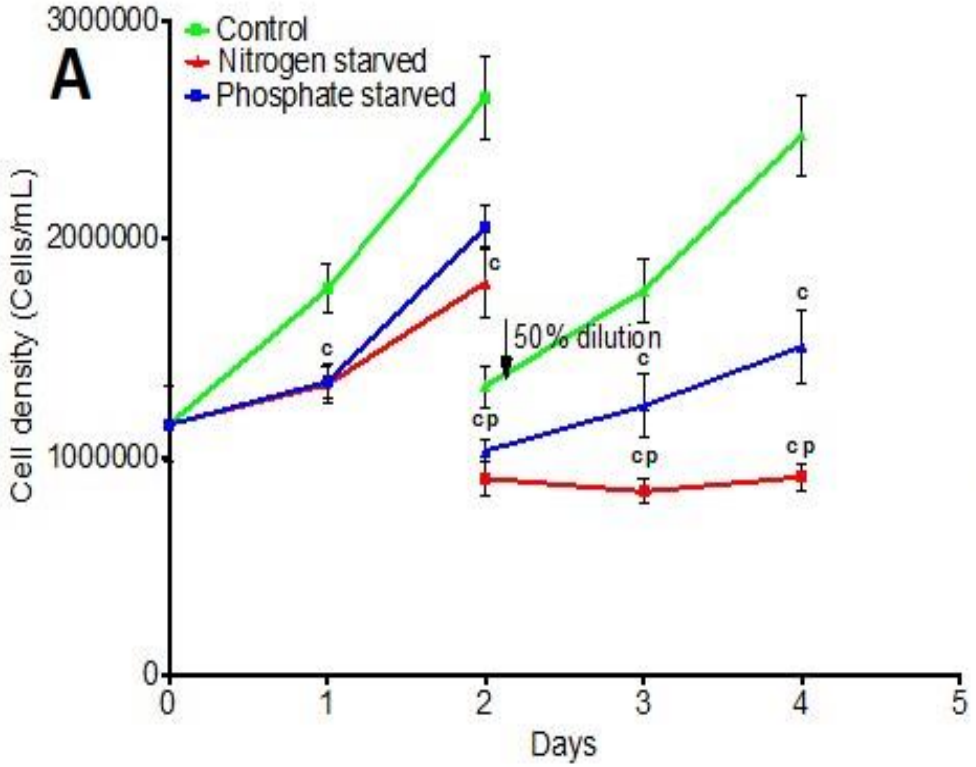
- What you must care about graphs…..
  - Type of chart
  - X and Y axis
  - Legend
  - Error bars
  - Significance letters

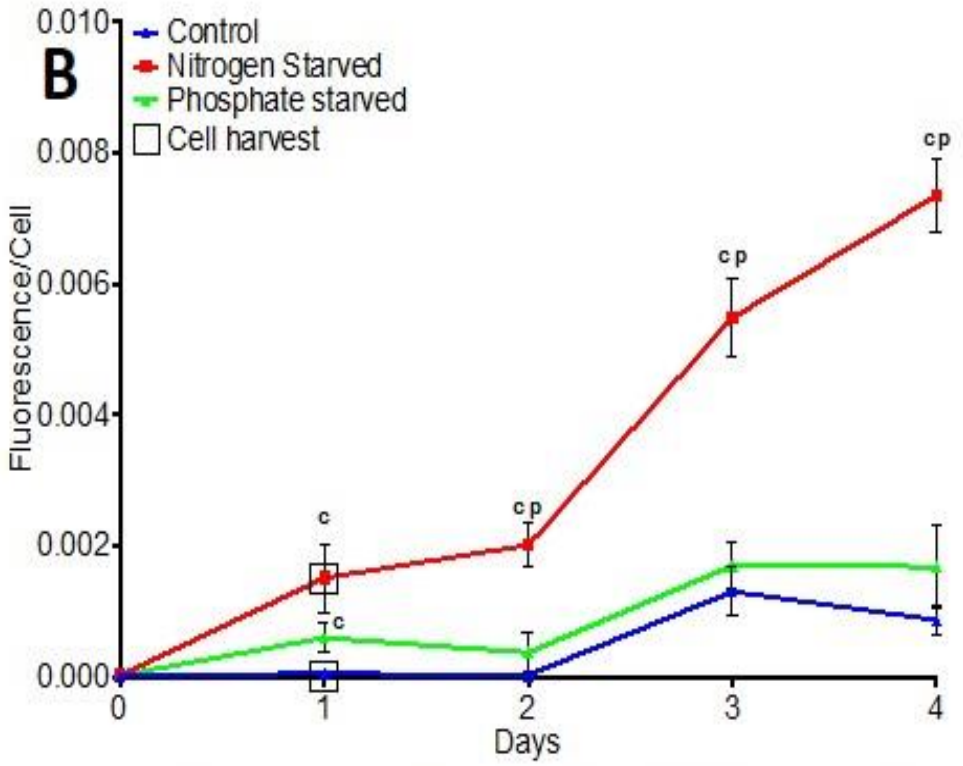


Results, graphs



Results, graphs





Results, tables

- For tables:

The same decimals for all columns or rows

The label needs unit.

Significance letter

Kinetic parameters	Autotrophic media				
	Walne	W-10	W-20	W-30	W-40
X_o (g dcw/L)	0.218 ± 0.076^{a}	0.200 ± 0.065^{a}	0.257 ± 0.081^{a}	0.283 ± 0.028^{a}	0.315 ± 0.085^{a}
X_{max} (g dcw/L)	0.827 ± 0.127^{c}	$1.042 \pm 0.124^{b,c}$	1.481 ± 0.043^{a}	1.505 ± 0.165^{a}	1.360 ± 0.069^{a}
λ (h)	$127.47 \pm 27.50^{a,b}$	$113.08 \pm 26.94^{a,b}$	$111.73 \pm 15.70^{a,b}$	94.41 ± 9.00^{b}	98.74 ± 13.65^{b}
μ (h^{-1})	0.0023 ± 0.00023^{c}	$0.0031 \pm 0.00086^{a,b,c}$	0.0045 ± 0.00095^{a}	$0.0042 \pm 0.00021^{a,b}$	$0.0027 \pm 0.00021^{b,c}$
Pr (mg dcw/L/day)	39.39 ± 6.02^{e}	57.87 ± 7.06^{d}	$82.26 \pm 2.414^{a,b}$	94.08 ± 10.30^{a}	$75.54 \pm 3.857^{b,c}$
P_{max} (mg lipid/L)	101.15 ± 18.25^{c}	153.96 ± 18.78^{c}	281.32 ± 8.26^{b}	376.02 ± 14.16^{a}	259.10 ± 13.23^{b}
Pr (mg lipid/L/day)	4.82 ± 0.73^{e}	8.55 ± 1.04^{d}	15.63 ± 0.45^{b}	20.89 ± 2.28^{a}	$14.40 \pm 0.74^{b,c}$
P_{max}/X_{max} (mg/g)	122.29 ± 26.67^{b}	147.80 ± 71.49^{a}	189.98 ± 13.55^{a}	249.79 ± 43.18^{a}	190.56 ± 27.63^{a}

The steps of writing results

- ✓Decide which data muse be included.
- ✓Present them in a graph, table or image.
- ✓Write the caption for each figure or table.
- ✓Captions should not merely name a table or figure.
- ✓Provide the information necessary for the reader to evaluate the analysis (sample size, etc.).
- ✓Show others don't tell them.

Results

- ✓**<u>Do not include the same data in both a table and a figure.</u>**
- ✓Present the data in a table unless there is visual information : a figure is useful for reporting a regression analysis (line graph).
- ✓Number tables and figures separately beginning with 1.
- ✓Refer in the text to each figure or table in your paper.
- ✓Order of figures is important.
- ✓Tables generally should report means ± standard deviations.
- ✓Avoid using figures that show too many variables or trends at once.

Results and discussion

In each paragraph the results and discussion are explained.

Discussion

- Limit your conclusions to studies that your data can actually support.
- Suggest future directions for research, new methods, explanations for deviations from previously published results, etc.
- Each paragraph briefly comes back to results.
- Use a combination of past and present tense .

Conclusion, one of the hardest parts

- The last words the author uses are remembered.
- Include a brief summary of the paper's main points.
- Use some phrases….to conclude, to summarize, as it was shown in this study.
- Rephrase your original idea and restate your words.
- **Point to broader implications.**

Acknowledgements

- Acknowledge people who have made minor contributions to the manuscript.
-
- Who have read and commented on your manuscript before submission.
- State your funding sources (if any).
- Authors should not be acknowledged.

References

- Make sure you give a full citation.
- Consult a recent issue of the respective journal for guidance.
- Provide an alphabetical or numbered according to the occurrence in your paper listing (guideline of journal).
- Read and re-read your **references.**

Some suggestions

- **Take editorial comments seriously.**
- **Know your audience and write for that specific audience.**
- **Your supervisor/professor is not to teach you grammar and spelling.**
- **Do Not Turn in a First Draft!**
- **Make your writing flow and resonate.**
- **Use word processors effectively .**

Some suggestions

- ✓Good English is critical in science writing.
- ✓**Do not use more words where fewer will do (**not more than 30 words in length).
- ✓It is also important to bear in mind the following considerations.
- ✓Avoid long sentences and bring them into small words.
- ✓A sentence should contain one idea or two related ideas.

Scientific writing

- Avoid **abbreviations** (min, Oct, max, ...) except common terms like ATP and DNA, units of measure (m, g, cm, °C), and mathematical or chemical formulas.
- Never begin sentences with an abbreviation or number.
- Introduce an **acronym** first and then use it (*G. max* instead of *Glycine max)*.
- **Chemical elements** are not proper nouns. do not capitalize them.
- Only the first letter of the symbol is a capital letter, nitrogen (N), carbon (C),….

Scientific writing

- Never use **contractions** (didn't, can't, haven't...).
- The subject and verb need to agree (data … plural).
- Do not use general words such as significant, high.
- Analyze your results to determine whether they are statistically significant.

Scientific writing

- A pronoun usually deputizes for the nearest previous noun of the same number .*The cow ate the food; it was white*
- Some words have alternative spelling e.g grey, gray; between the American and British spelling. Be consistent.
- Other words are already plural such as people and equipment,
- Some adjectives are absolute and cannot be modified such as sterile.
- All units of measure must be metric or SI. Be consistent.

Common differences in spelling

AE	**BE**	**AE**	**BE**
color	colour	center	centre
organization	organisation	dialog	dialogue
traveling	travelling	defence	defense
recognize	recognise	analyze	analyse

- **Tenses**

AE	**BE**
burned/was burned	burnt/was burnt
learned/has learned	learnt/has learnt

Concise Oxford Dictionary (BE)

Random House Dictionary (AE)

Scientific writing

- Be modest and do not use I, instead *"The present writer"* or *"The author of this communication".*
- Avoid overuse of the word "*the*".
- **The excessive use of the pronoun *"it"* :** *It would thus appear that*" can be replaced by "*apparently*".
- **It should be mentioned, noted, pointed out, emphasized, etc….. Can be omitted.**
- 20-year-old
- Prepositions are not words to end sentences with.

Punctuation

- A comma is put in a sentence to denote a brief pause between groups of words:

I will show you the paper about which I was speaking, but it is not as useful as I first thought.

- to separate subclauses:

Professor Brown, who is in charge of recruiting for the University, said that the latest estimates were higher than those for this time last year.

- Finally to separate all items in a list except for the last two:

The following items may be imported duty free into Azania: Animals, cereals, plants, fruit, trees, legumes and nuts.

✓A colon **(:)** when a list or explanation follows.

- *Here are three examples of familiar sequences: one, two, and three*

✓A semi colon **(;)** is used to separate two or more related clauses provided each clause forms a full sentence.

- DHA (22: 6) is a 22 carbon chain with six cis double bonds; the first double bond is located at the third carbon from the omega end .

✓To separate references (Mühlroth et al., 2013;W.L. Yu et al., 2011)

Plagiarism

What you need to check before submission?

- Are the methods and experiments can be replicated again?
- Are the results presented adequately?
- Is the discussion relevant, concise and well documented?
- Are the conclusions supported by the data presented?
- Is the language acceptable?
- Are figures and tables adequate and well designed?, are there information duplicated? Are they too many?

What you need to check before submission?

- Look at the articles you have consulted to prepare your manuscript.
- Number the text pages consecutively, beginning with the title page.
- Insert the line number.
- Numbe the tables consecutively in the order you want to appear.
- Read the title and headings of each table to determine whether the table can be understood without reference to the text.
- Search the text for references to tables and graphs.

What you need to check before submission?

- Make certain that each reference cited is represented in the reference list.
- Make sure that each work is referred to in the text, tables or legends.
- Examine each item in the bibliography section for dates, ...
- Reconsider the appropriateness of title and abstract.
- Review the special requirements of the journal.
- Read your final typescript at least twice, the second time on a different day.

What you need to check before submission?

- Prepare as many copies of text, tables and illustrations as required.
- Keep a complete copy of your manuscript and accompanying material.
- Include on the first page of the typescript the address to which letters, proofs and requests for reprints should be sent.

Note:

Tables and figures may be inserted in the (electronic) manuscript at appropriate positions,with captions included or it seperate file.

The properties of a good manuscript

- **It provides insight into an important issue** .
- **It develops a framework or theory.**
- **It stimulates new, important questions.**
- **The methods used to explore the issue are appropriate** (for example, data collection and analysis of data).

The properties of a good manuscript

- **The methods explain why and how the data support the conclusions.**
- **Connections to prior work in the field or from other fields are made.**
- **The article tells a good story.**

Submitting the manuscript

Letter to the editor

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.

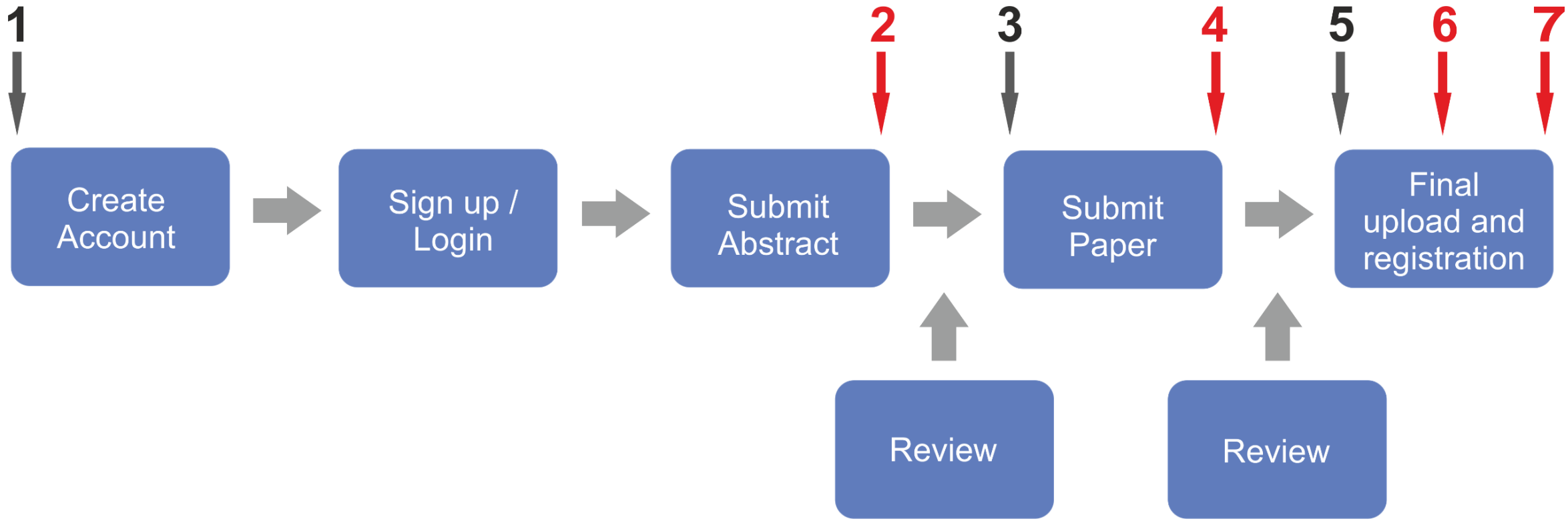
Sincerely

……

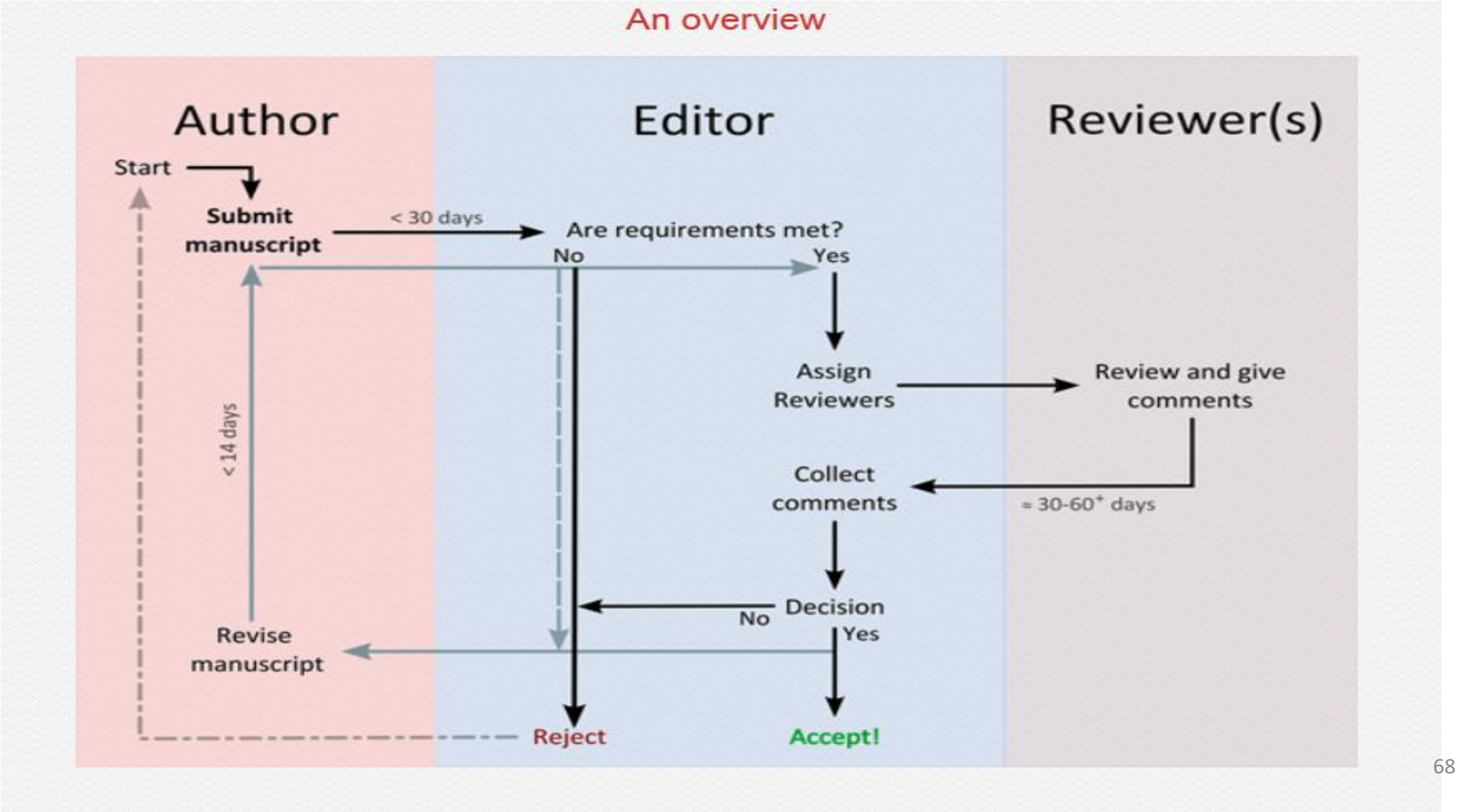
Authors must declare.....

- Submitted work is their own.
- Submitted work has not previously been published in full.
- Submitted work is not being considered for publication elsewhere.
- Appropriate methods were used to minimize animal suffering.

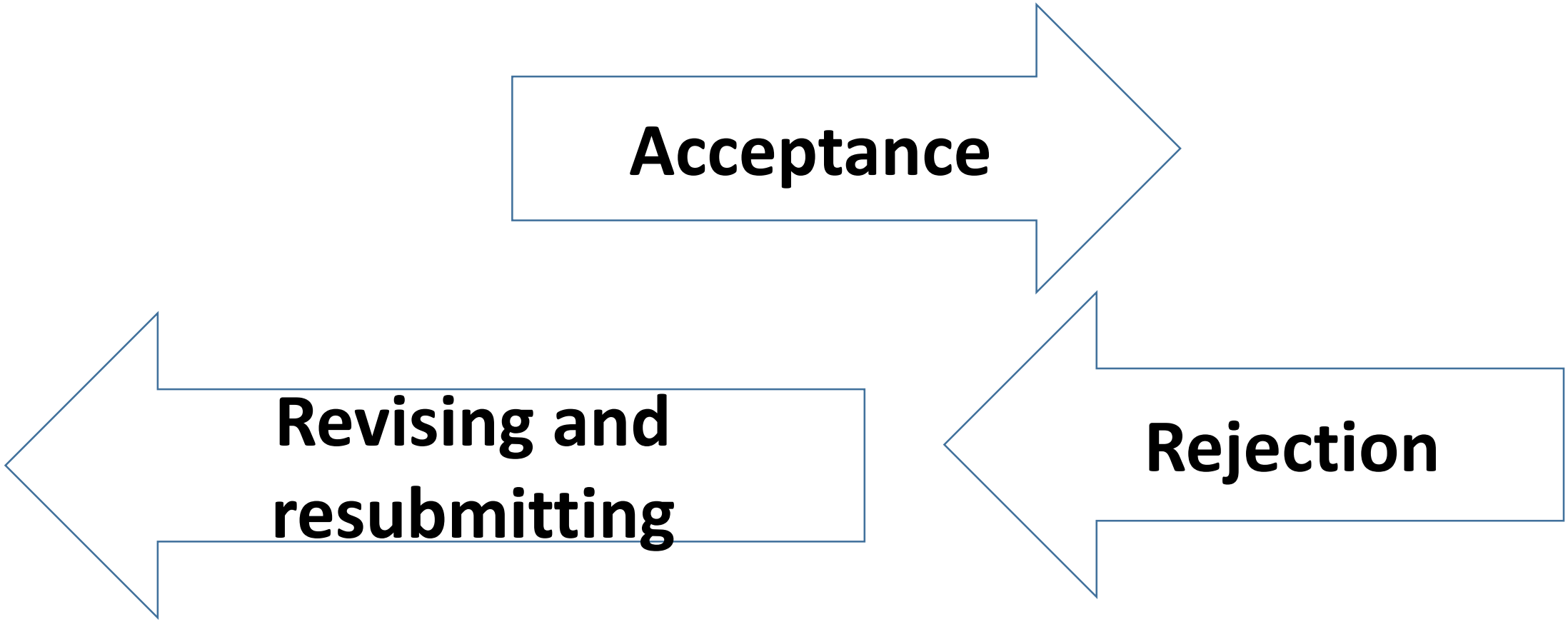
Process of submission



Process of submission



Destiny of manuscript



Editor decision

- **Acceptance without revision**
- **Minor revisions**
- **Major revisions**
- **Rejection**

Responding to the author

- **Acceptance without revision**
  - Write a note thanking the editor and wait for proof.

- **Minor & major revisions**
  - Consider the suggestions carefully.
  - 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.
  - 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.

Revision

- Your manuscript may need second and third revisions.
- Not all revisions end to acceptance.

Rejection

- Improve the manuscript according to reviewer comments.
- You may need to complete your experiments and rewrite the manuscript.
- Send it to another journal after modifying the style to comply with the instructions of that journal.

Some reasons to reject articles

It fails the technical screening.

- Suspected to plagiarism,
- Currently under review at another journal.
- lacking key elements such as the title, authors,….
- The English is not sufficient for the peer review process.
- The figures are not complete or are not clear enough to read.
- The article does not conform to the Guide for Authors for the journal.
- References are incomplete or very old.

Some reasons to reject articles

- **It does not fall within the Aims and Scope.**
- **It's incomplete.**
- **The procedures and/or analysis of the data is seen to be defective.**
- **The conclusions cannot be justified on the basis of the rest of the paper.**

  The arguments are illogical, unstructured or invalid.

  The data does not support the conclusions.

  The conclusions ignore large portions of the literature.

Some reasons to reject articles

- **It's simply a small extension of a different paper, often from the same authors.**

  Findings are incremental and do not advance the field.

  The work is clearly part of a larger study, chopped up to make as many articles as possible.

- **It's incomprehensible.**

  The language,

  structure,

  figures

Steps in writing a paper

- Assess your work what, when and where to publish.
- Read the Instructions to Authors of the journal chosen.
- Decide who the authors will be.
- Decide on the basic form of the paper.
- Draft a working title.
- Collect the material under the major headings chosen.

Steps in writing a paper

- Design tables, illustrations and write titles and legends for them.
- Write for permission to reproduce any previously published tables, illustrations or other material that will be used
- Write, type or dictate a preliminary draft of the text quickly.
- Check completeness of the references.
- Ask for criticism from co-authors and friends.
- Compose a now title and abstract suitable for information retrieval.

Steps in writing a paper

- Compile the reference list, cross-check references against the text, and ensure that all bibliographical details are correct.
- Write a covering letter to the editor.
- Check that all parts of the paper are present.
- If the editor returns the paper, revise it as necessary, send it elsewhere, or abandon it.
- Correct the proofs.

Any question?