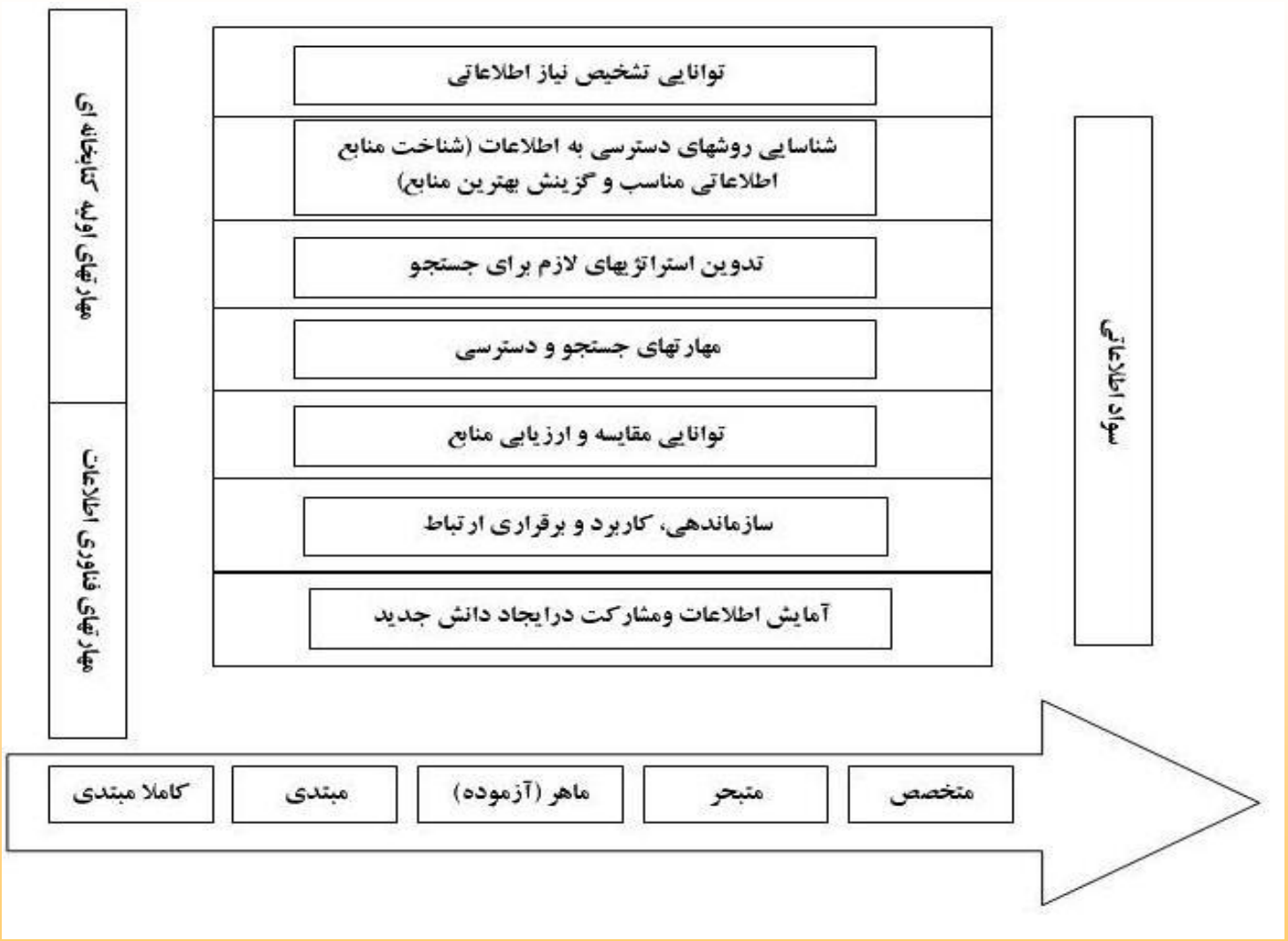
اصول مقاله نویسی علمی

واحد توسعه تحقیقات بالینی شهداء

دکتر بهمن یوسفی

مهر و آبان ماه ۱۴۰۰



هفت اصل سواد اطلاعاتي بر گرفته از

Information skills in higher education: a SCONUL Position Paper (1999)

Introduction

Research Purpose

Pushing back the frontiers of science

Spreading abroad

Introduction

First Journals published in *1665* :

Journal des sçavans

Philosophical Transactions of the Royal Society

1665

Presentation Agenda

- Principles of writing
- Types of Articles
- General Structure of a Research Paper
- Writing for a Journal in Biomedical Engineering
- Submission

Principles of Writing

Principles of Writing

- Unity
- Coherence
- Support
- Effective Paragraphs
- Word choice

Unity

If you advance a single point and stick to that point,

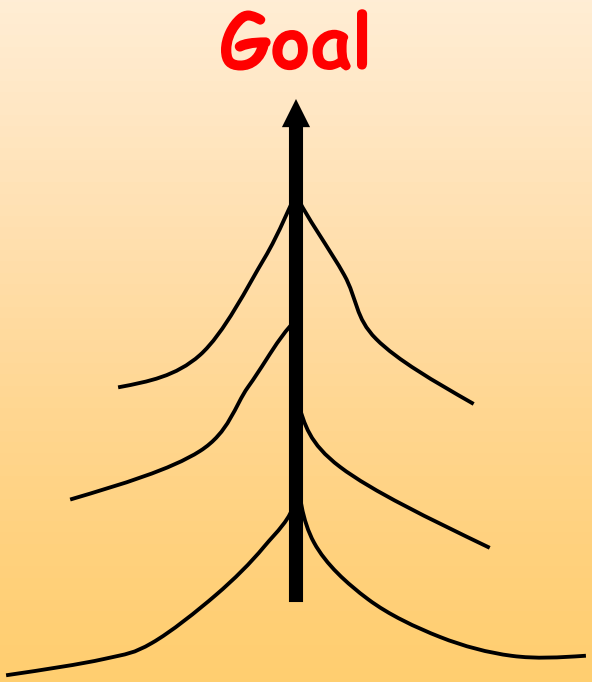
You will have ***unity*** in your paper.

Unity

To achieve unity is to have all the details in your paper related to your thesis.

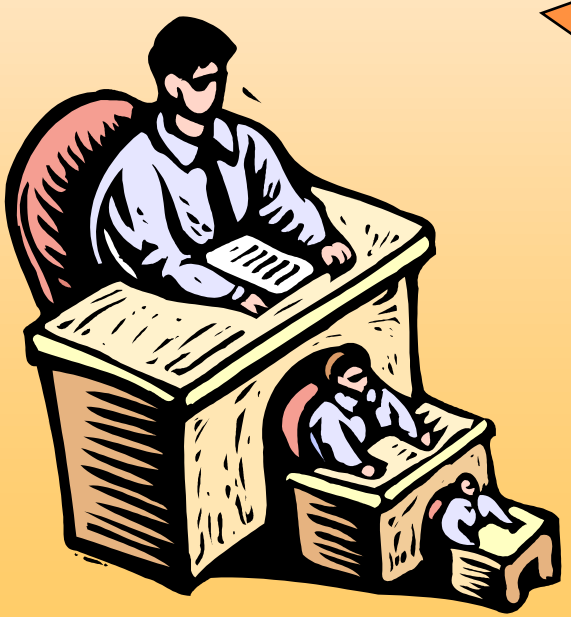
Unity

To achieve unity is to have all the details in your paper related to your thesis.



Unity

Unity is important in:



paragraph level

A paragraph is unified when all of its sentences work towards the same end.

paper level

An essay is unified when all of the paragraphs illustrate, clarify, explain, support and/or address the idea expressed in the essay's thesis statement.

Coherence

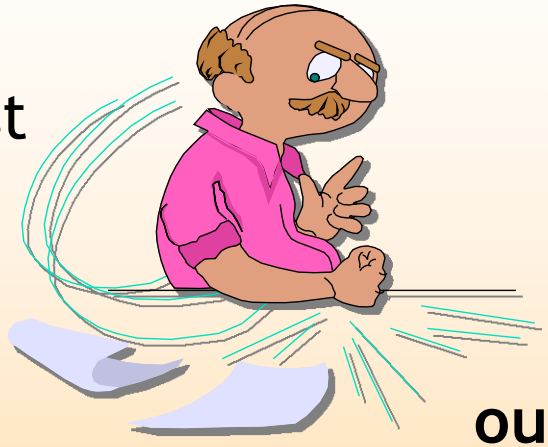
Isaac Watts:

"It was a saying of the ancients, 'Truth lies in a well;' and to carry on this metaphor, we may justly say that logic does supply us with steps, whereby we may go down to reach the water."

Coherence

If we are writing to entertain

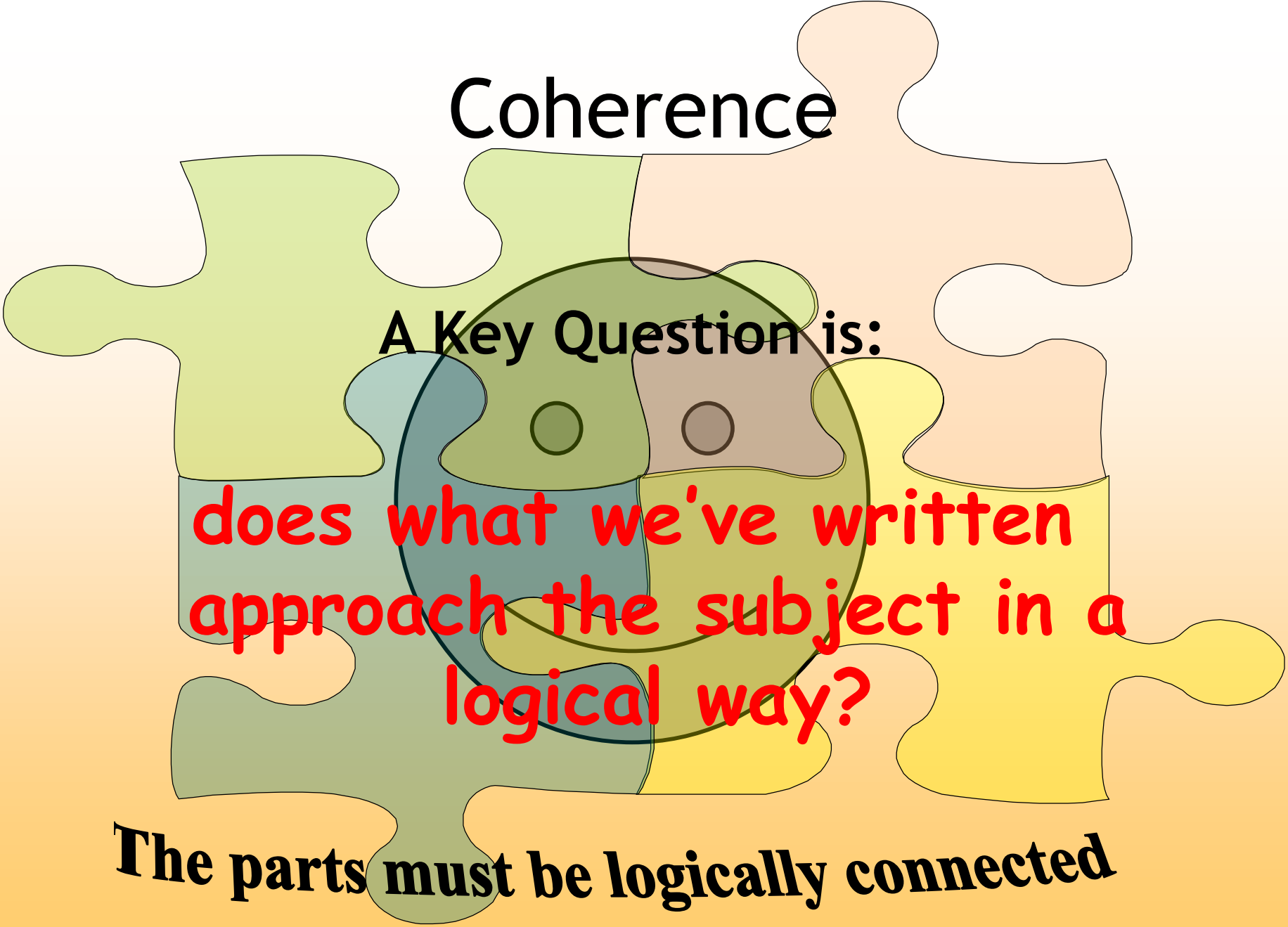
readers may just give up if they find our writing hard to follow



our message may be lost

they may have no choice but to struggle for comprehension

Coherence



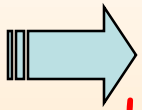
A Key Question is:

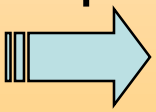
does what we've written approach the subject in a logical way?

The parts must be logically connected

Coherence

Common mistakes:

- trying to force pieces together  ***confusion***
  e.g: "The women loved to cook, and there were three of them."

- no relationship exists between two parts of a sentence  ***confusion***
  e.g: "The women loved to cook, and the sky was very dark that day."

Coherence

methods can be used to organize our writing

- chronological order
- problem and solution
- cause and effect
- topical arrangement

Support

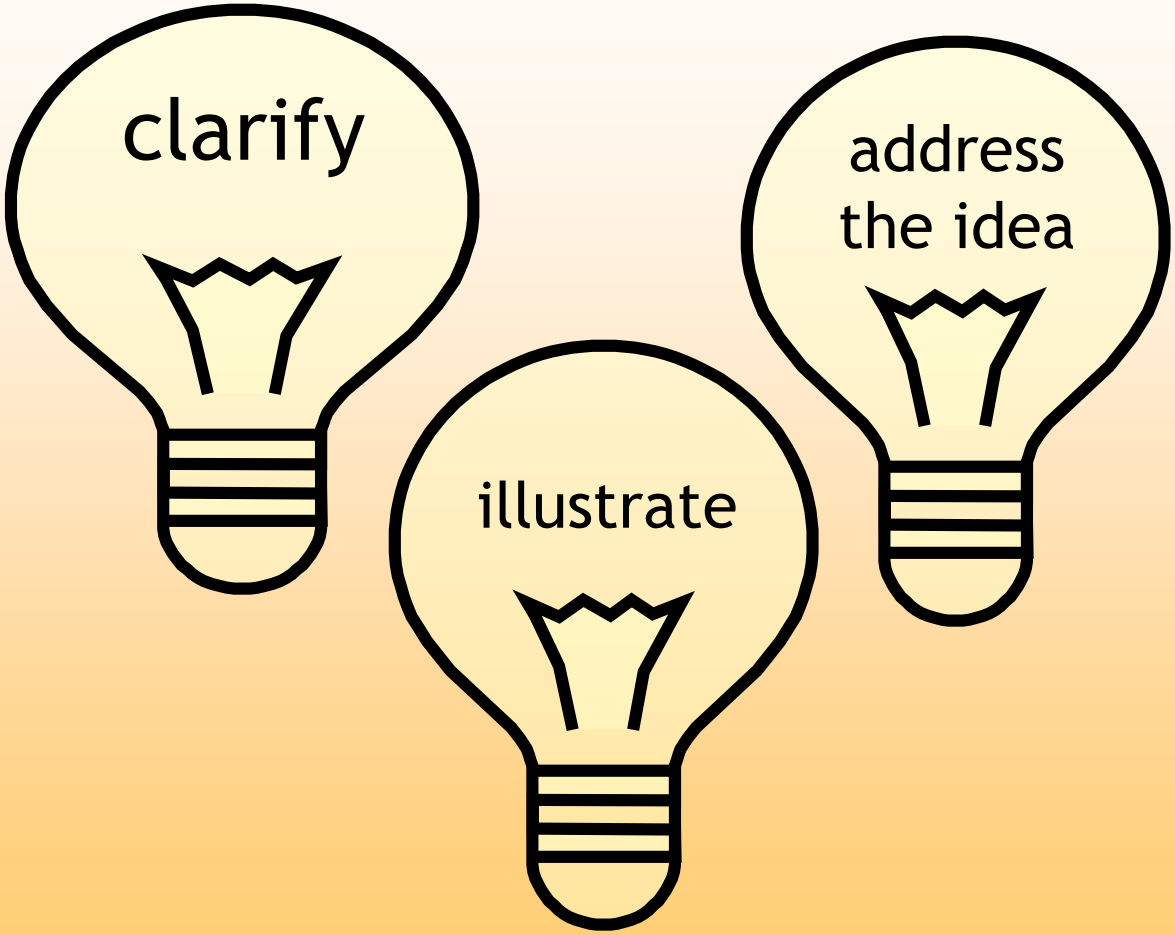
If you support the point with specific evidence,

You will have support in your paper.

Support

Support

Support



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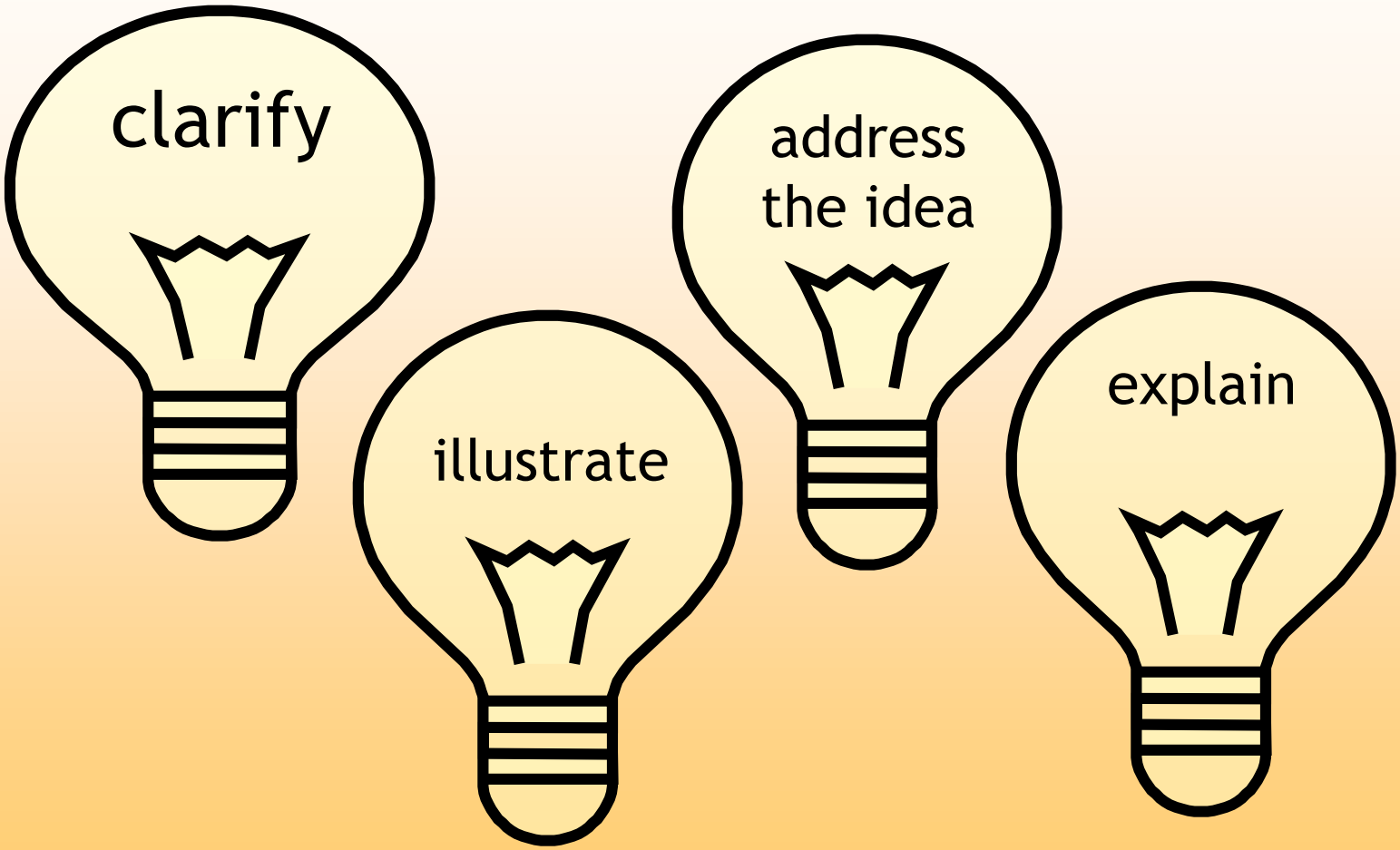

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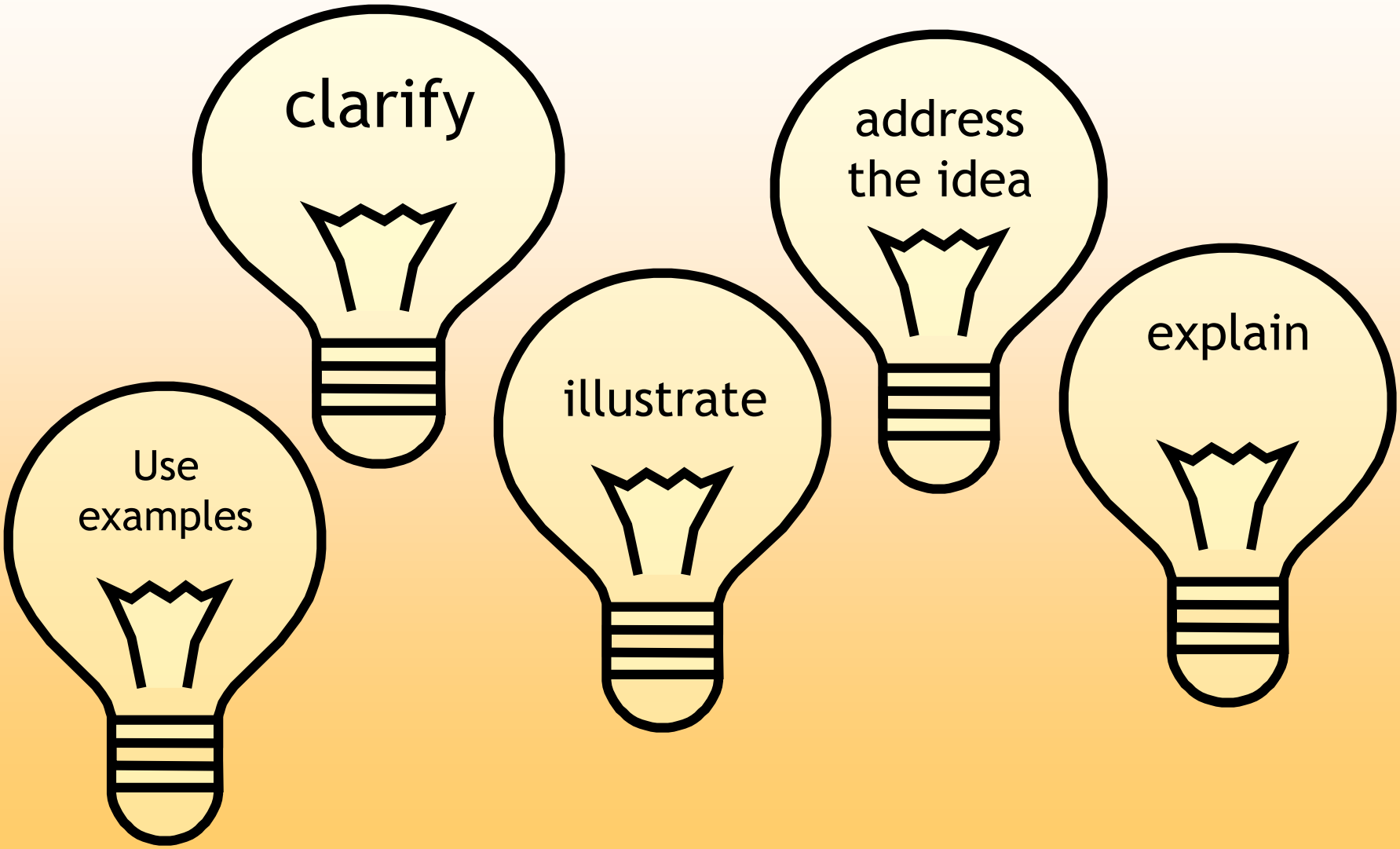
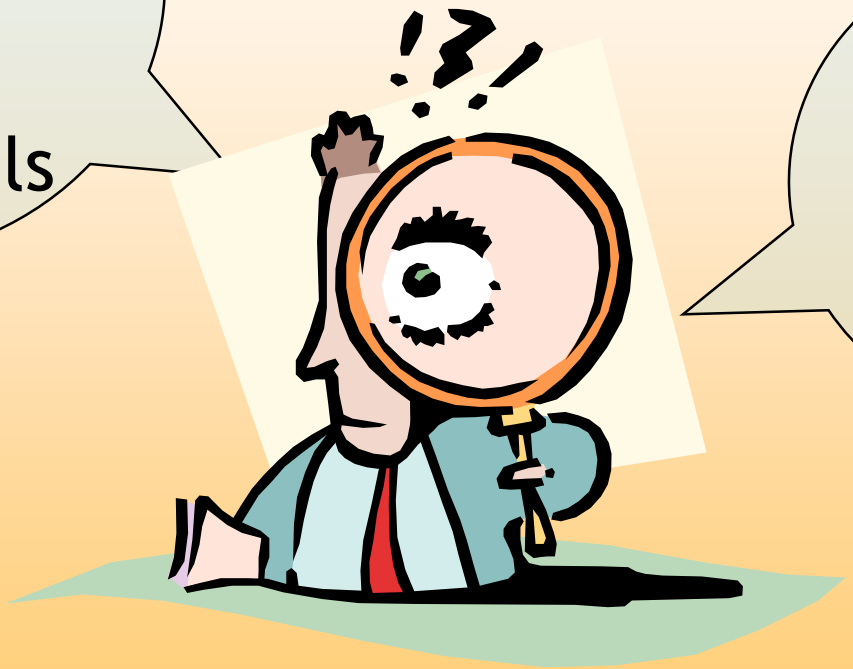


Support

Your paper should

include

vivid details



Consider your audience

Effective Paragraphs

1. A topic sentence

   A main idea is expressed, often as a generalisation

2. An explanatory sentence

   The meaning of the generalisation is elaborated on and explained

3. An illustration

   The application of the generalisation is shown by example

4. A conclusion

   This rounds off the points made in the paragraph and lead into the following paragraph

Word choice

Rudyard Kipling:

"Words are, of course, the most powerful drug used by mankind."

Joseph Joubert:

"Words, like glass, obscure when they do not aid vision."

Word choice

Word choice involves several considerations:

1. Grammar
2. Simplicity & Variety
3. expressions with double meanings
4. sentence length

Types of Articles

Types of Articles

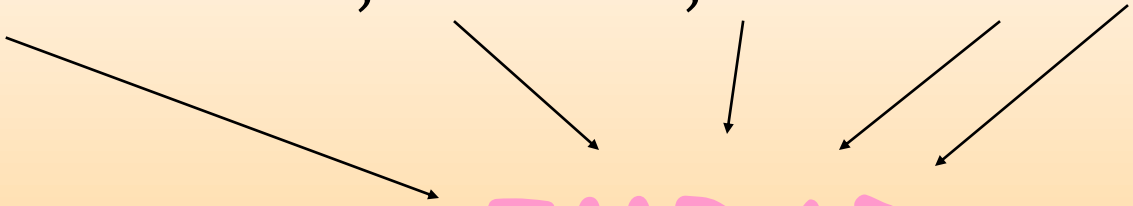
1- general **IMRAD** scheme

2- Types of Articles

3- Research Poster

general **IMRAD** scheme

Introduction, Methods, Results And Discussion



IMRAD

recommended by the *International Committee of Medical Journal Editors*

(ICMJE)

1978

general **IMRAD** scheme

Abstract: a one-to-four-paragraph summary of the paper.

Introduction: describes the background for the research

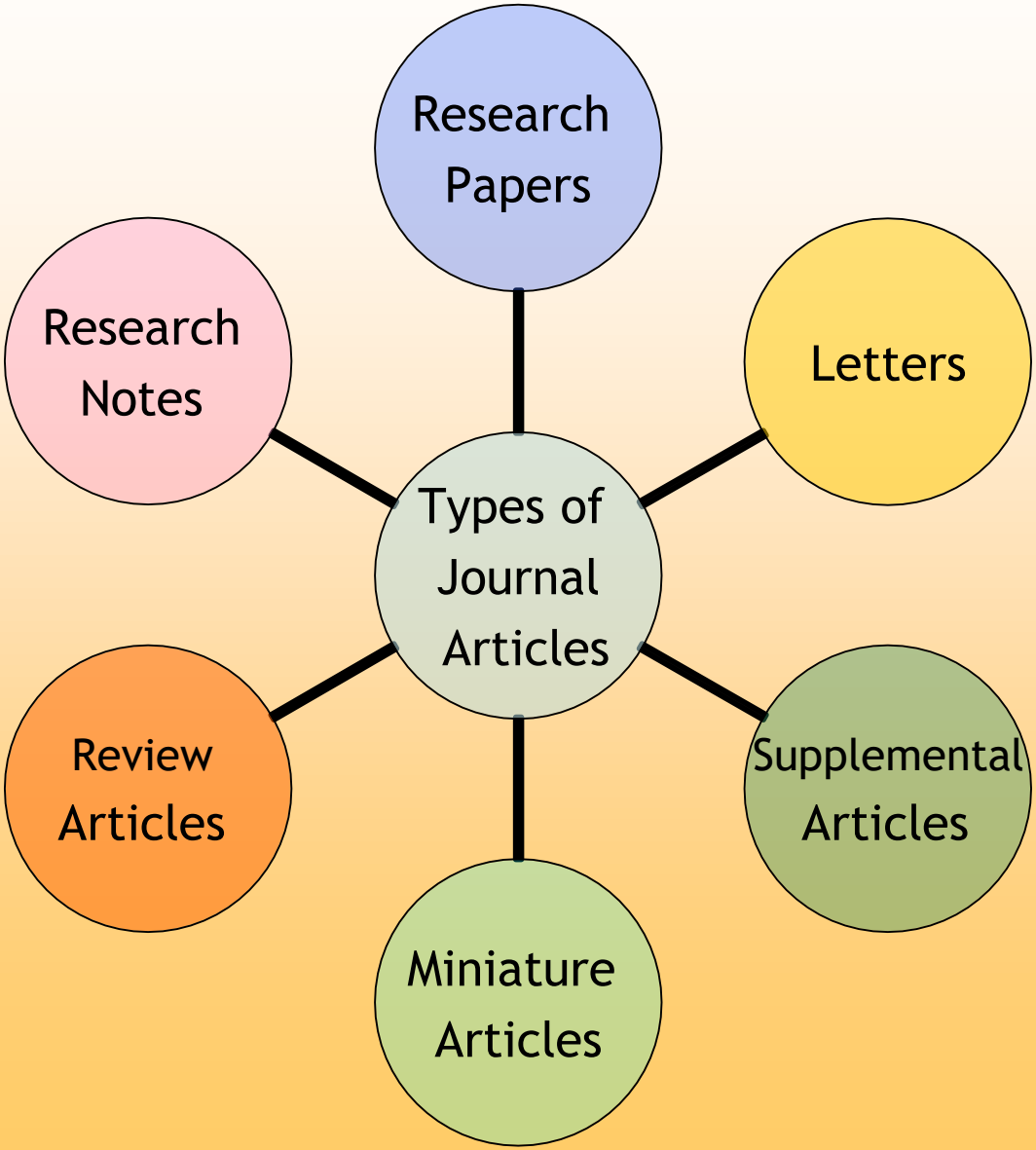
Materials and methods: provides specific details

Results: describes the outcome

Discussion: describes implications of the research

Conclusion: places the research in context and describes avenues for further exploration.

Types of Articles



Letters

- **Letters** (also called *communications*, and
- not to be confused with *letters to the*
- *editor*) are **short descriptions** of
- important current research findings
- which are usually fast-tracked for
- immediate publication because they are
- considered urgent.

Letters

communications include:

Abstract,
Introduction
Main body,
Conclusion,
References.

Acrobat Document

Supplemental Articles

Supplemental articles contain a large

- volume of **tabular data** that is the result
- of current research and may be dozens or
- hundreds of pages with mostly **numerical data**.
- Some journals now only publish this
- data electronically on the internet.

Acrobat Document

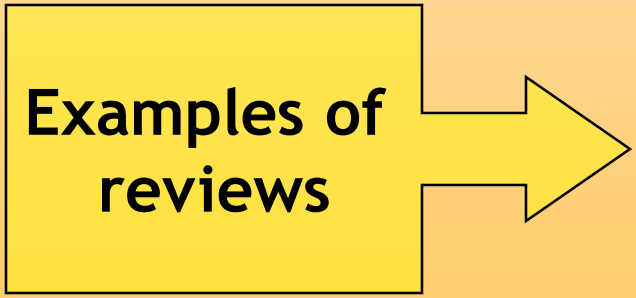
Miniature Articles

The concise article format (limited to four journal pages including references and figures) permits the editorial board to process papers rapidly and enables the reader to learn about new results and developments efficiently.

Acrobat Document

Review Articles

- **Review articles** do not cover original
- research but rather **accumulate** the
- results of many different *articles* on a
- particular topic into a coherent narrative
- about the state of the art in that field.



'Nature Reviews'

'Critical Review in Biomedical Engineering'

Review Articles

Review articles include:

Abstract
Introduction,
Main body,
references.

Acrobat Document

Research notes

- **Research notes** are short descriptions of
- current research findings which are
- considered **less urgent or important** than
- *Letters*.

Acrobat Document

Research Papers

Articles are usually between five and

- twenty pages and are a complete
- descriptions of **current original research**
- finding, but there are considerable
- variations between scientific fields and
- journals

Acrobat Document

Research Poster

Research Poster

- Posters are typically shown during conferences, either as a complement to a talk or scientific paper, or as a publication.
- They can be a good introduction to a new piece of research before the paper is published.
- Poster presentations are often not peer-reviewed, but can instead be submitted, meaning that as many as can fit will be accepted.

Acrobat Document

Writing the manuscript

The hardest part is getting started

You don't have to be great
to start,
but you have to start
to be great.

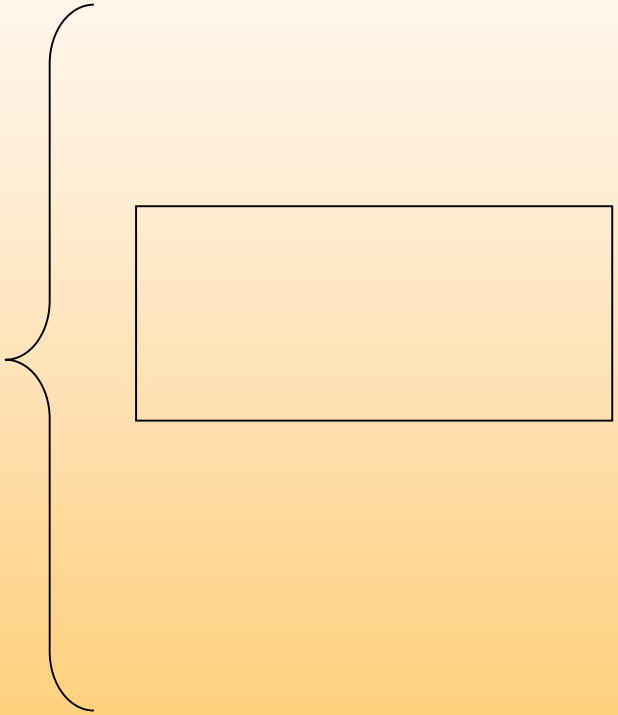
Get going!

General Structure

Title
Abstract
Introduction
Methods
Results
Discussion
Acknowledgements
References

Write in what order?

Title
Abstract
Introduction
Methods
Results
Discussion
Acknowledgements
References



Methods and materials

- Demonstrates the reliability of results.
- Best to begin writing when experiments still in progress.
- Should be detailed enough so results can be repeated by others.
- Include animal/human use approval information.
- Make adequate reference to accepted methods and identify differences.
- If any of your methods is fully described in a previous publication cite that.
- Mathematical equations and statistical tests are considered mathematical methods . (last paragraph)

Methods and materials

- Do not mention unnecessary details.

it is unnecessary to write:

"We poured N-free fertilizer solution into a graduated cylinder until the bottom of the meniscus was at the 30 ml line. We poured the fertilizer onto the top of the soil in a pot and then repeated this procedure 24 times."

Rather, you would assume that the scientist knows how to measure and add liquids to pots and write:

"We added 30 ml of N-free fertilizer to each of 24 pots."

Methods and materials

- Explain why each procedure was done

Difficult to understand:

First, I removed the frog muscle and then I poured ringer's solution on it. Next, I attached it to the kymograph.

Improved:

I removed the frog muscle and poured Ringer's solution on it to prevent it from drying out. I then attached the muscle to the kymograph in order to determine the minimum voltage required for contraction.

Methods and materials

Subsections:

1. participants
2. apparatus (or materials)
3. procedure

Participants

- Should be adequately described and should be representative.

- The importance:
  - assessing the results
  - generalizing the findings
  - making comparisons in replications
  - literature reviews
  - secondary data analysis.

Participants

- Major demographic characteristics should be reported:
  - sex and age
  - racial and ethnic designation
  - national origin
  - level of education
  - health status
  - language use

Apparatus

- The function of the apparatus or materials used in the experiment
- equipment obtained from a commercial supplier:
  - The model number of the equipment
  - The supplier's name and location
- Complex or custom-made equipment:
  - Drawing
  - Photograph

Procedure

- Summarize:
  - Instructions to the participants
  - Formation of the groups
  - Specific experimental manipulations
- Describe:
  - control features in the design

Methods and materials

Some examples of the titles of methods section:

"2. Model Development; 2.1 Draft Model for Emergent Vegetation, 2.2 Turbulence Intensity within Emergent Vegetation, 2.3 Diffusion within Emergent Vegetation. 3. Methods; 3.1 Laboratory Experiments, 3.2 Field Experiments." (Nepf 1999).

"Gravitational Convection; The main assumptions." (Morton et al. 1956).

"2. Classification of 2-D coherent structures in shallow flows. 3. Methods of investigation." (Jirka 2001).

"2. Theory of Vortex Ring Formation" (Linden & Turner 2004).

"2. Theory; 2.1. Conservation laws and variational principle, 2.2. Flat topography or circular seamount, 2.3. Irregular seamount, 2.4. Comparison with the theory of Carnevale & Frederiksen." (Nycander & Lacasce 2004).

Methods and materials (a good example)

To collect data on the treatments, we measured the growth and color of each plant weekly during the five-week experimental period. Measurements were be taken at the middle to end of each week. After the growing period, the plants were harvested. Each pot was harvested separately, the plants carefully removed as a group and the root ball washed to remove all vermiculite particles. The plants were then dried to eliminate excess water, and a wet weight of shoot and root were taken for each pot. The data were averaged by pot, treatment and week and the weekly treatment means were analyzed using a t-test comparison in Excel Spreadsheet to determine if any significant data was collected. Data significance would be determined by demonstrating a difference in the effect of varying *Rhizobium* concentration on plant growth and mass.

Results

- Briefly repeating protocols can be effective
- Present the results of the experiment but not interpret their meaning.
- Do not over discuss results.
- It is not necessary to describe every step of your statistical analyses.

e.g.: Just say something like:

"Honeybees did not use the flowers in proportion to their availability ($X2 = 7.9$, $p<0.05$, d.f.= 4, chi-square test)."

Results

- Present main findings referring to tables/figures.

Example:

- Incorrect: The results are given in Figure 1.
- Correct: Temperature was directly proportional to metabolic rate (Fig. 1).

Results

"Nitrogen fertilizer significantly increased soy bean total biomass (p=0.05) regardless of the presence or absence of *Rhizobium* (Table 1).“

The sentence above is well written because:

- The result of adding nitrogen is stated concisely
- The word *significantly* is accompanied by the statistical probability level (p=0.05)
- The scientific name *Rhizobium* is italicized
- The reader is referred to a table where the data to support the statement can be found.

Tables and Figures

- Straight forward and concise
- Do not include the same data in both a table and a figure
- Present the data in a table unless there is visual information that can be gained by using a figure.
- A figure is useful for reporting:
  - a regression analysis (line graph),
  - comparing the several treatment levels (bar graph with error bars).
- Avoid using figures that show too many variables or trends at once.

Tables and Figures

- A table's legend appears above it.
- A figure's legend appears below it.
- Describe how the data were manipulated in a legend not in the text.
- Each figure or table included in the paper should be referred.

Tables and Figures

Table 3.Mean number of nodules produced for each treatment with their standard of deviation. And results of t-tests comparing Number

Treatments	Avg. # of nodules± Std. Dev.	Significant
4 drops	24.858±11.47	no
8 drops	88.8±45.9	yes
16 drops	73.36±19.5	no
24 drops	69.16±33.9	yes

at what level of significance ?

same font.

same # of decimals

Tables and Figures

The good features of Table 1 are:

(i) The legend explains key details.

(ii) It is clear.

(iii) It explains the meaning of unusual abbreviations.

Table 1. Gas exchange characteristics of an *Orontium aquaticum* plant before and after 17 d inside a flow-through cuvette. Values are means± standard deviations. PPFD=photosynthetically-active photon flux density.

	Experimental Treatment	
	Before	After
Photosynthesis (μmol $^{-2}$ s^{-1})	14.7 ± 0.7	11.8 ± 2.4
PPFD (μmol m^{-2} s^{-1})	641 ± 57	531 ± 24
Ambient [CO_2] (Pa)	38.2 ± 1.5	34.1 ± 1.6
Relative Humidity (%)	46 ± 15	67 ± 5
Number of Leaves Measured	3	5

Tables and Figures

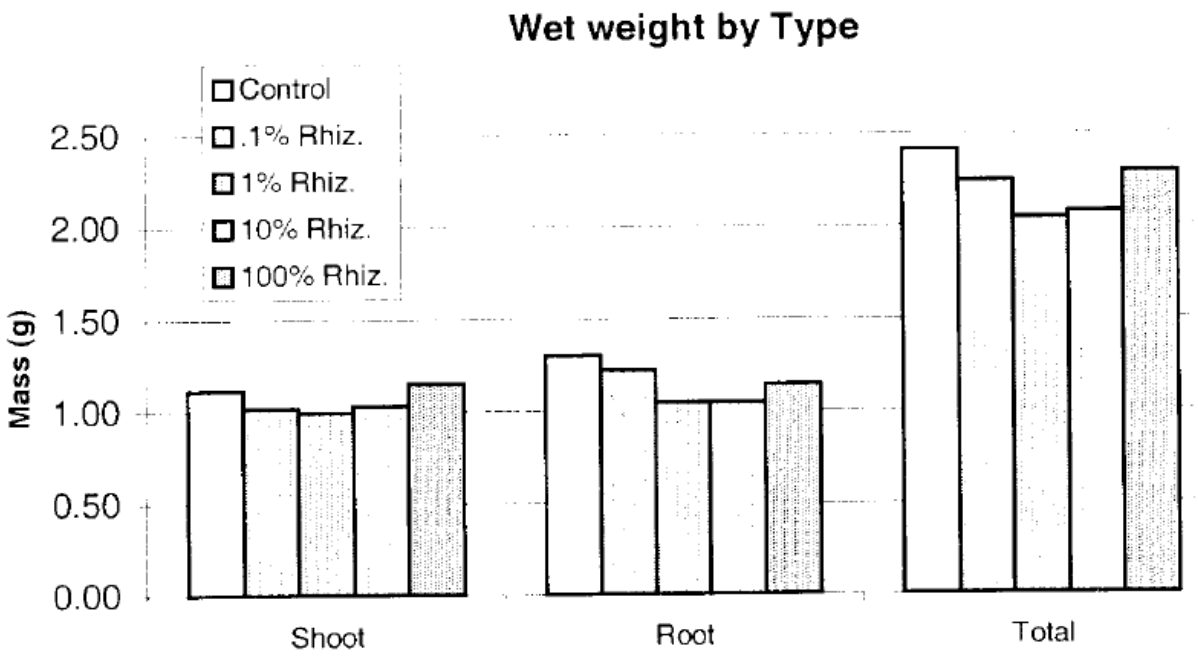


Figure 2. Graph of mass data by type of wet weight. There is no observable trend or relation between the weights of the shoots, roots, or total plants and the treatments.

Introduction

- Importance/necessity of study
- Write this section in the past or present tense, never in the future.
  - Avoid expressions like "This study will examine
- this section should contain:
  1. Current state of knowledge or understanding at the beginning of the investigation (background);
  2. A statement of the purpose;
  3. hypothesis/hypotheses and predictions.

Back ground

- Introduce the reader to your research, **not** summarize and evaluate all past literature on the subject.
- Save other studies you may be tempted to discuss for the Discussion, where they become a powerful tool for comparing and interpreting your results.

Statement of purpose

- Expresses the central question you are asking and thus presents the variable you are investigating.
- e.g.:
  - This study investigates the relationship between tree density and fruit size.
  - The purpose of this study is to determine the effect of enzyme concentration on the reaction rate of ....

Hypothesis

- The explanation you are proposing for certain observations.
- It should be accompanied by a prediction of results.
- e.g.:
  - If competition lowers reproductive output, then fruit size should be smaller when tree density increases.

Introduction

- Some editors think that: The principal results and conclusions should be summarized in the Introduction.
- Most biologists disagree, arguing that such a summary appears in the abstract and should not be repeated in the Introduction.
  - Don’t repeat abstract in introduction
  - Don’t repeat introduction in discussion

Introduction

- Rules for citation in text:
  - Use authors last names
    - "Smith (1983) found that N-fixing plants could be infected by several different species of *Rhizobium*."
  - If there are more than two authors, the last name of the 1st author is given followed by the abbreviation **et al** .
    - "Walnut trees are known to be allelopathic (Smith 1949, Bond et al. 1955, Jones and Green 1963)."
  - sources are ordered by publication date.

An example for the 1st paragraph:

"There is a long-standing interest in flow over isolated topography, such as seamounts, with regard to both theoretical and practical issues. Trapped flows are often observed over seamounts, and these flows evidently affect the distribution and concentration of subsurface fauna, filter feeders and the like (e.g. Genin, Noble & Lonsdale 1989 and references therein). *These flows are often so intense that they alter the ambient vorticity and, as such, can modify the allowable frequencies of internal waves.* This in turn may affect wave breaking (Kunze & Toole 1997 and references therein)." (Nycander & Lacasce 2004), emphasis added.

An example for the final paragraph:

"In addition to the theory, we present results from numerical simulations. These are done in order to examine whether the predicted stable flows can arise naturally as a result of the time-dependent evolution. As the initial condition, we use various non-stationary vortices near or on top of a seamount. We also revisit two-dimensional turbulence over a bump. The simulations are broadly supportive of the theoretical predictions, although time-dependence can produce exotic and interesting final states." (Nycander & Lacasce 2004).

Discussion

- analyze the data and relate them to other studies.
- The Discussion should contain at least:
  1. The relationship between the results and the original hypothesis.
  2. An integration of your results with those of previous studies .
  3. Possible explanations for unexpected results and observations.

Discussion

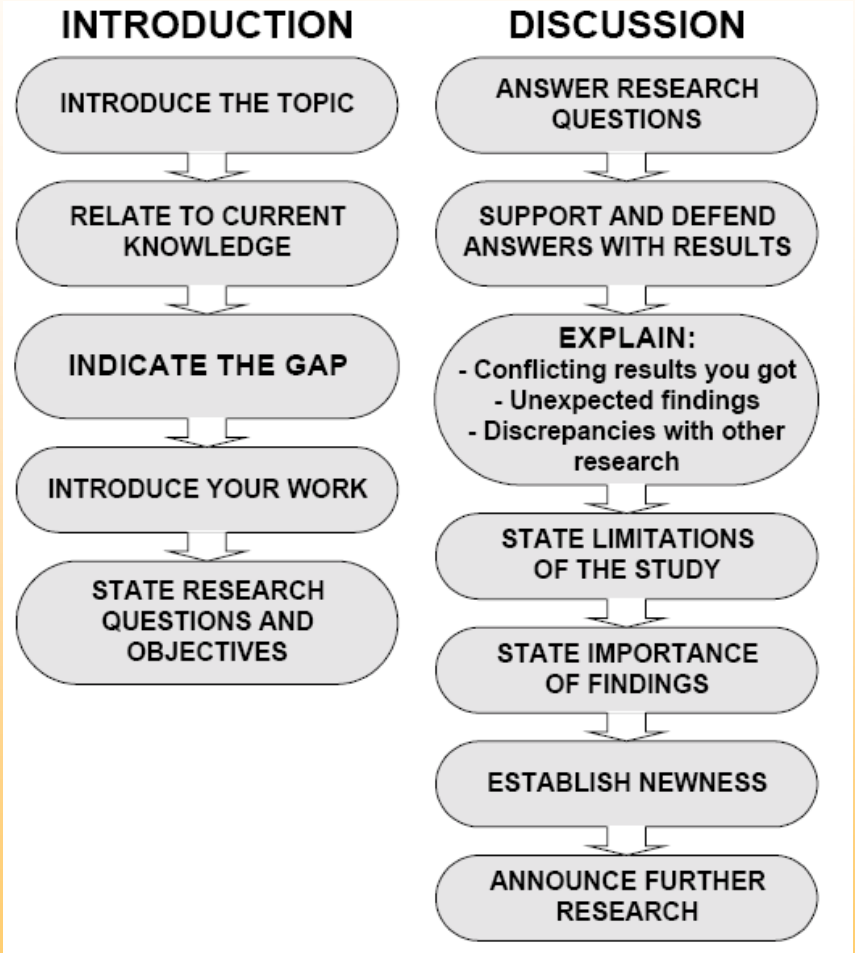
- Trends that are not statistically significant can still be discussed.
- Avoid redundancy between the Results and the Discussion section.
- End the Discussion with a summary of the principal points you want the reader to remember.
- Do not end with:

  - the tired cliche' that

    "this problem needs more study."

  - What you wish you had done..

Introduction & Discussion



References

- Relevant and recent
- Be highly selective
- Read the references
- Do not misquote
- Use correct style for journal

Abstract

- Critical part of paper
- State main objective
- Summarize most important results
- Avoid acronyms and mathematical symbols

Write and rewrite until flawless!!

Abstract

Two examples of well-written abstracts

"Fishes swim by flapping their tail and other fins. Other sea creatures, such as squid and salps, eject fluid intermittently as a jet. We discuss the fluid mechanics behind these propulsion mechanisms and show that these animals produce optimal vortex rings, which give the maximum thrust for a given energy input. We show that fishes optimize both their steady swimming efficiency and their ability to accelerate and turn by producing an individual optimal ring with each flap of the tail or fin. Salps produce vortex rings directly by ejecting a volume of fluid through a rear orifice, and these are also optimal. An important implication of this paper is that the repetition of vortex production is not necessary for an individual vortex to have the 'optimal characteristics." (Linden & Turner 2004).

Abstract

"Aquatic plants convert mean kinetic energy into turbulent kinetic energy at the scale of the plant stems and branches. This energy transfer, linked to wake generation, affects vegetative drag and turbulence intensity. Drawing on this physical link, a model is developed to describe the drag, turbulence and diffusion for flow through emergent vegetation which for the first time captures the relevant underlying physics, and covers the natural range of vegetation density and stem Reynolds numbers. The model is supported by laboratory and field observations. In addition, this work extends the cylinder-based model for vegetative resistance by including the dependence of the drag coefficient, C_D, on the stem population density, and introduces the importance of mechanical diffusion in vegetated flows." (Nepf 1999).

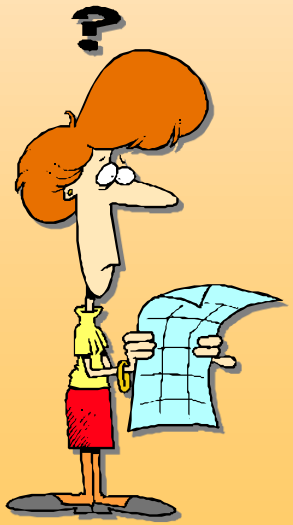
Abstract

Both abstracts:

- ✓Tell the reader what to expect
- ✓Summarize important contribution
- ✓Entice the reader to look further
- ✓Have no detailed quantitative results

Title

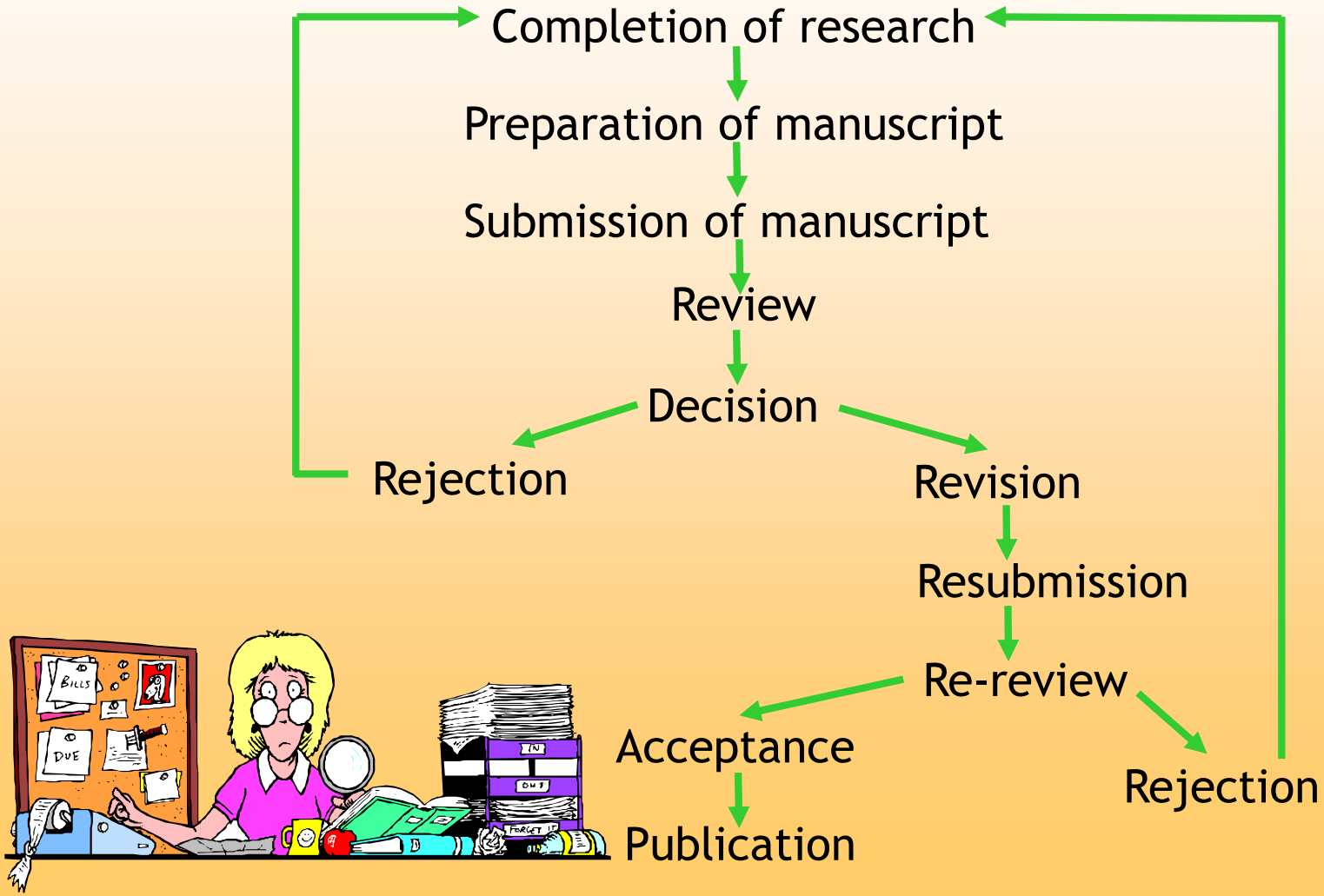
- Determines whether paper gets read
- Uses keywords that researchers in a particular field will recognize
- Avoid long title (see journal rules) and abbreviations



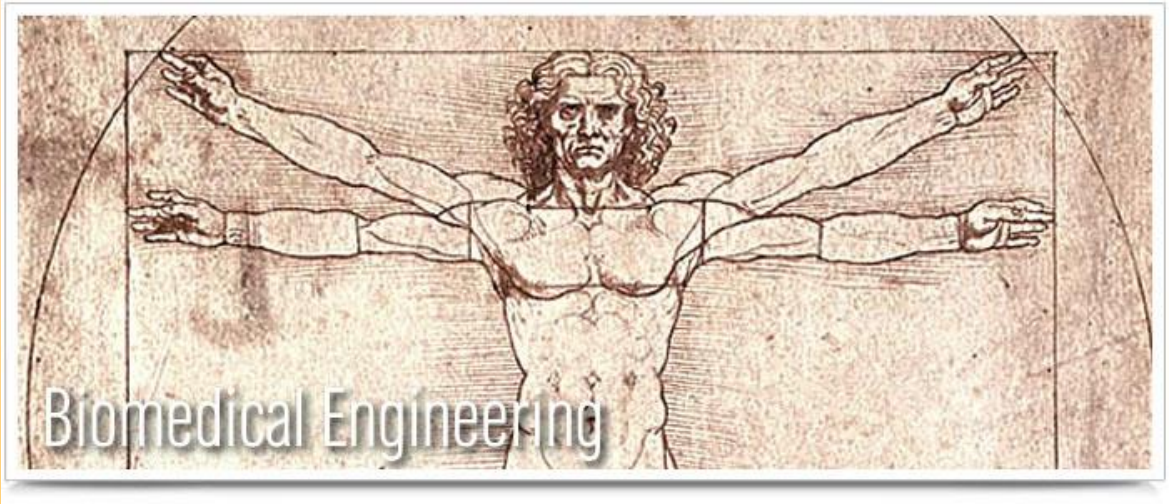
Title

Not designed to catch the reader's fancy!

Process of Research



Writing for Journals in Biomedical Engineering

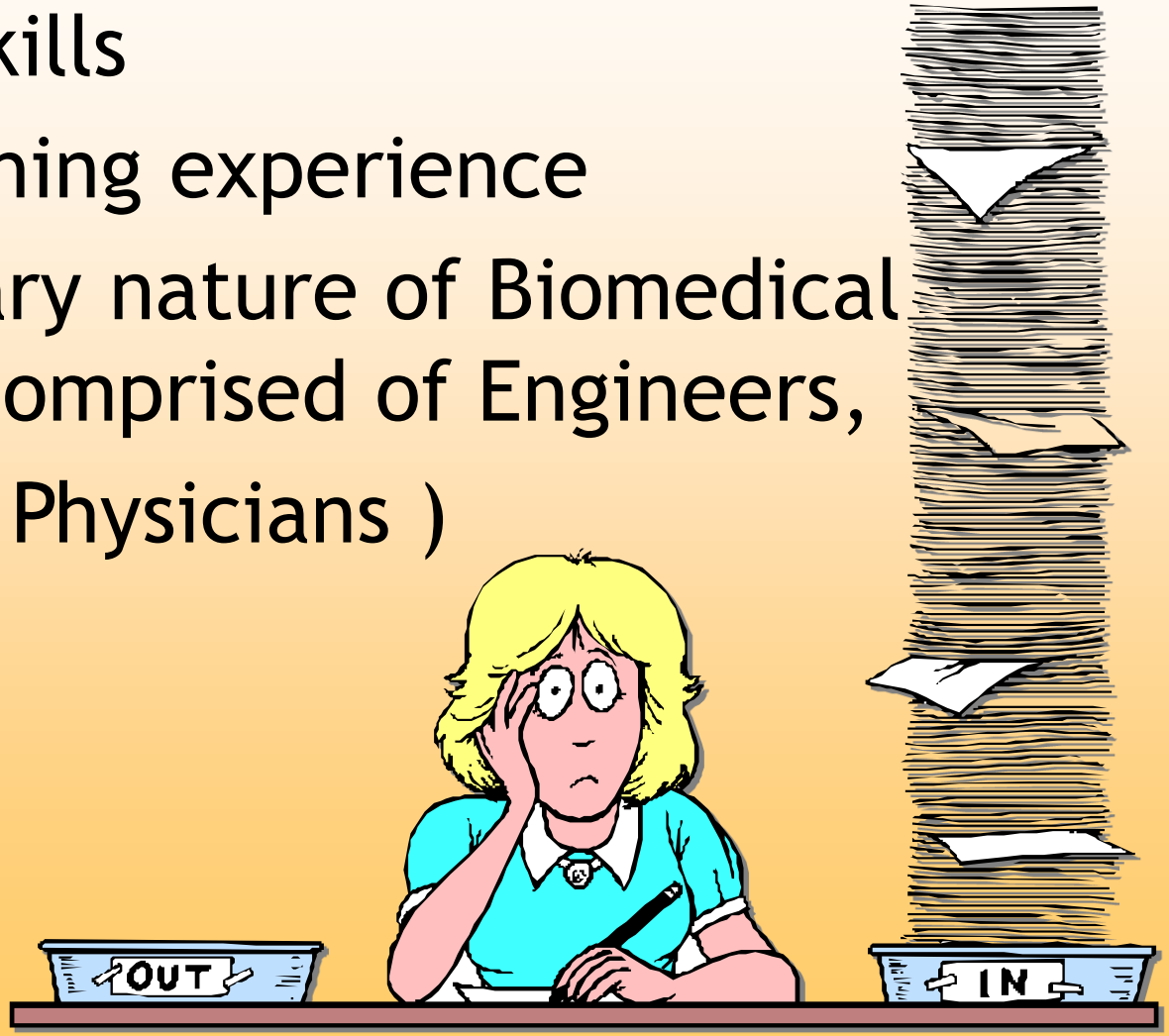


Biomedical Engineering is an example of a field where new technology and rapid application of new ideas creates a competitive, fast-paced environment.

It is important to publish often to be regarded as *a source of good science* and *creative ideas*

Common Difficulties

- Poor English skills
- Lack of publishing experience
- Multidisciplinary nature of Biomedical Engineering (comprised of Engineers, Scientist, and Physicians)



Style and jargon used in *Biomedical Engineering* is markedly different from what is found in *Electrical Engineering*, *Physics*, or *Biotechnology* journals.

Academic Writing Interview

Dr. Richard Komistek (Director of Rocky Mountain Musculoskeletal Research Laboratory, Denver Colorado) and Dr. Reed Ayers (Professor at Colorado School of Mines, Golden Colorado) answer:

How to construct a well-written article for publication in the Biomedical Engineering discipline…

Academic Writing Interview

Is there a difference between publishing in other disciplines of engineering than in Biomedical Engineering? If so, what are they?

Your audience selection is very important !

Academic Writing Interview

What problems do students you have advised typically have when constructing papers?

Don’t become overwhelmed!

Academic Writing Interview

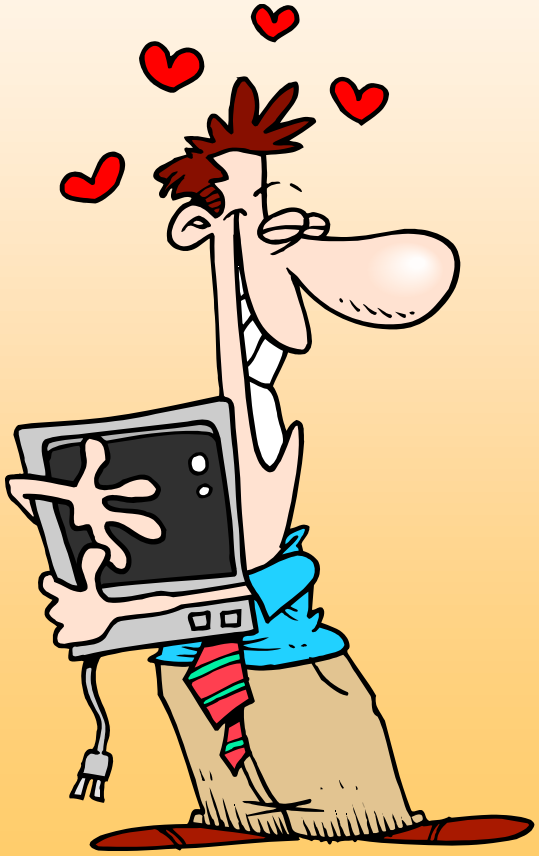
How can an article be made more interesting without making the science less important?

Write a very strong abstract !

Academic Writing Interview

Are there any style tips you give your students when it comes time to publish?

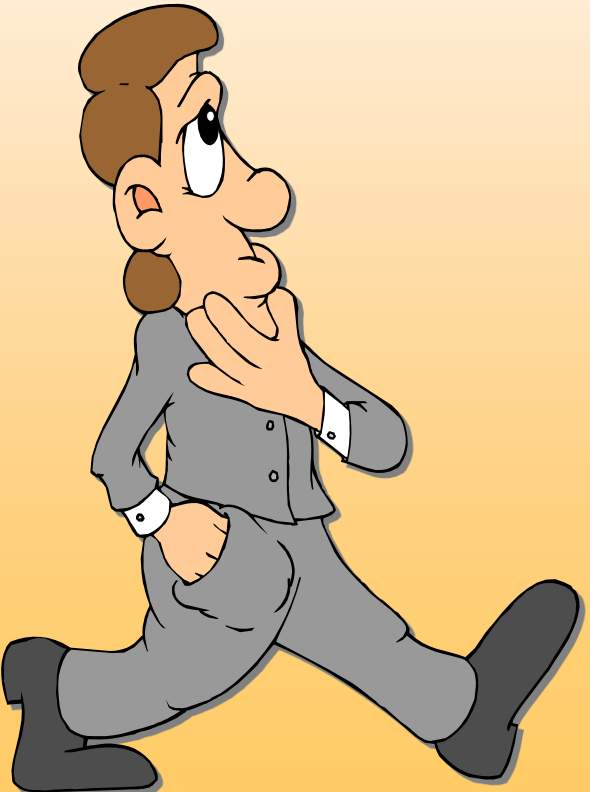
LOVE YOUR DATA !!



Journals

Choosing the right journal

- ✓ Aims and scope
- ✓ Types of articles
- ✓ Current hot topics
- ✓ Readership



Impact Factor

Immediacy Index

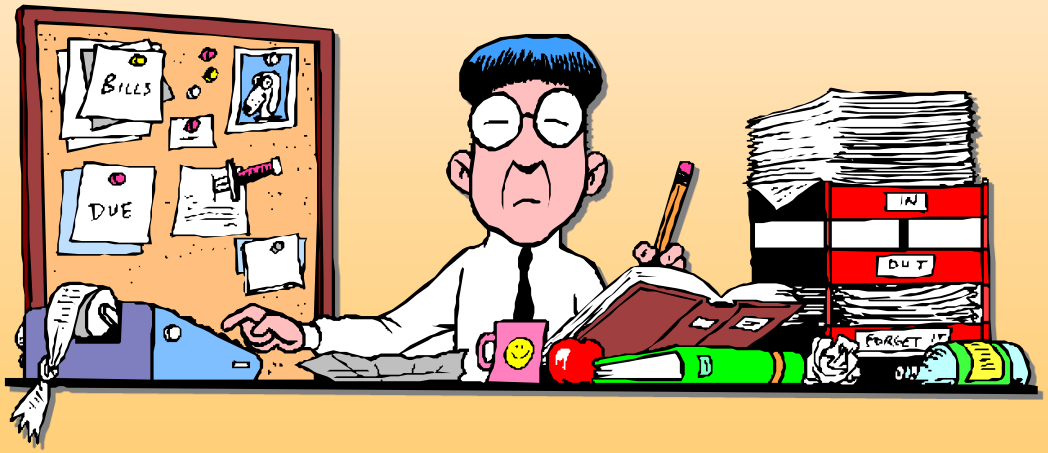
Some Useful Journals..

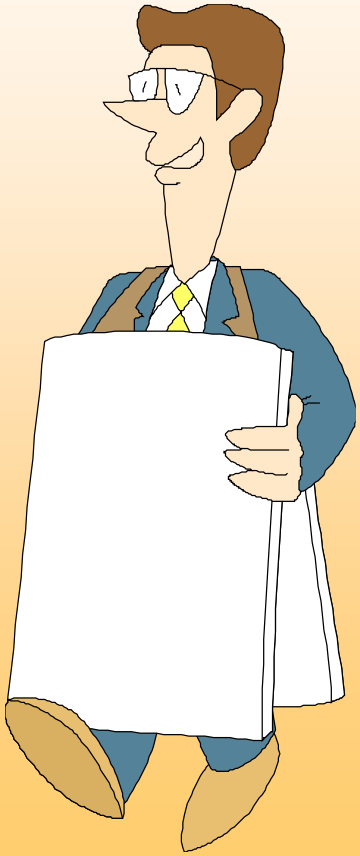
IEEE transaction on biomedical engineering
IEEE transaction on medical imaging
IEEE transaction on signal processing
IEEE transaction on image processing
Journal of neuroscience methods
Neuroscience
Cybernetics and systems
Biomedical signal processing and control
Chaos, Solitons & Fractals
Magnetic resonance imaging
Neural networks
Neurocomputing
Fuzzy sets and systems
Brain research
Journal of bioengineering and biomembranes

Revision before Submission

Why revision is important?

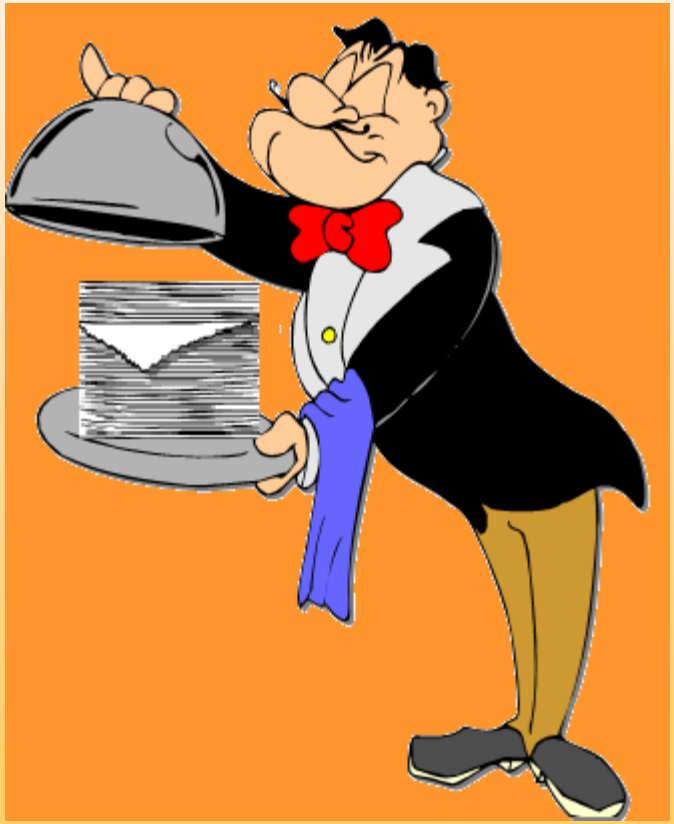
Is your paper worth other's time?





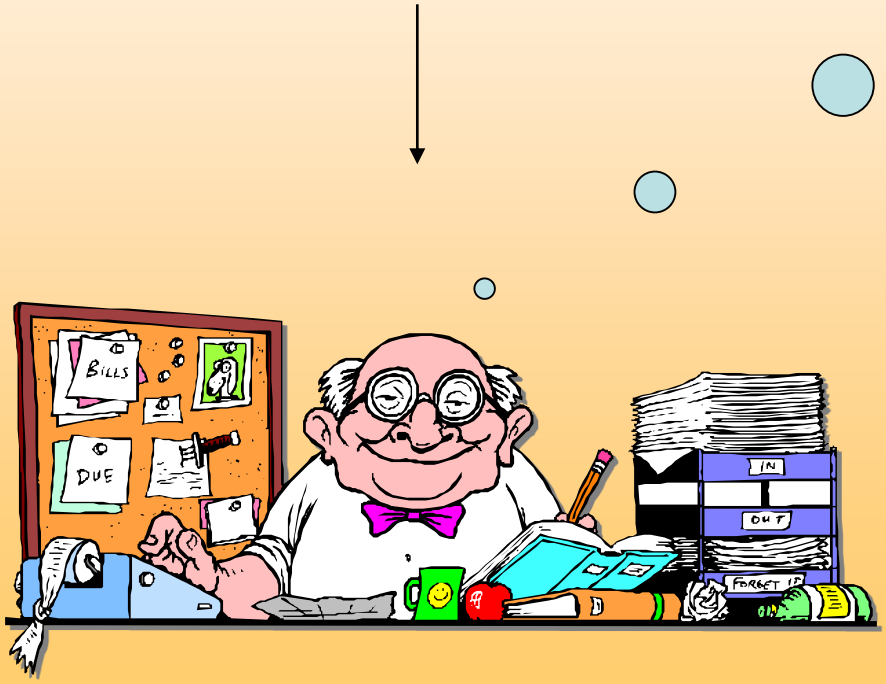
Cover letter

- Your name
- Editor name(s)
- Desired Reviewers
- Originality of submission



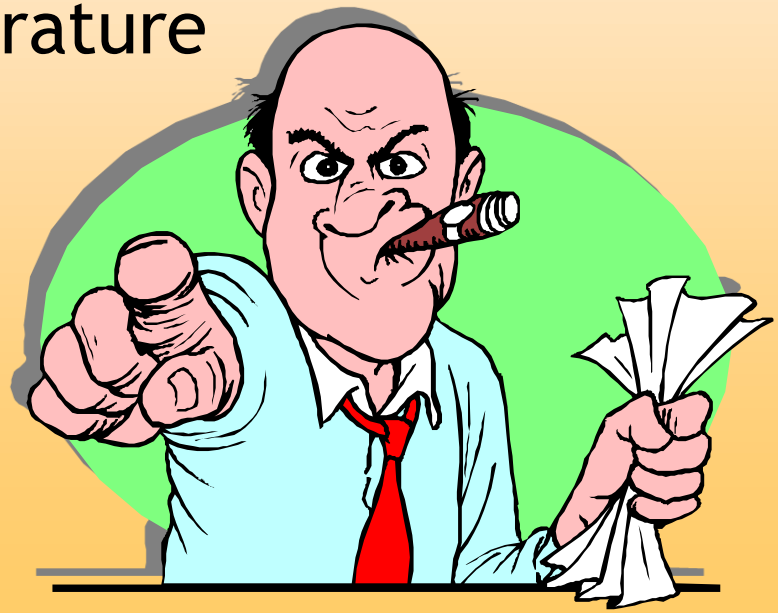
Typical reviewer

Read the guide for authors for God's sake!!!

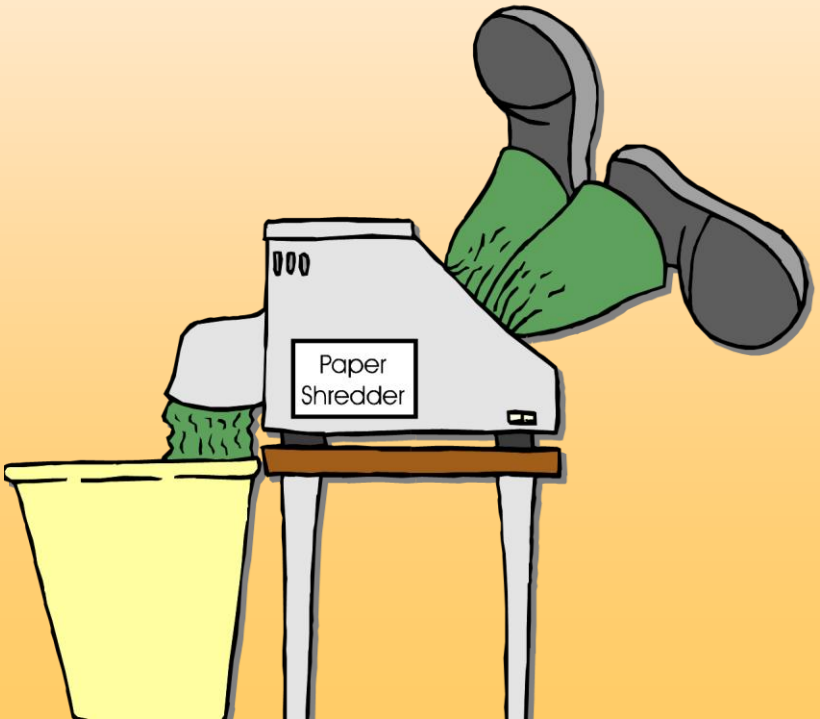


Reasons for early rejection

- Limited interest of paper
- Routine application of a well-known method
- No novelty
- Failure to meet submission requirements
- Incomplete coverage of literature
- Unacceptably poor English



Rejection : not the end of the world

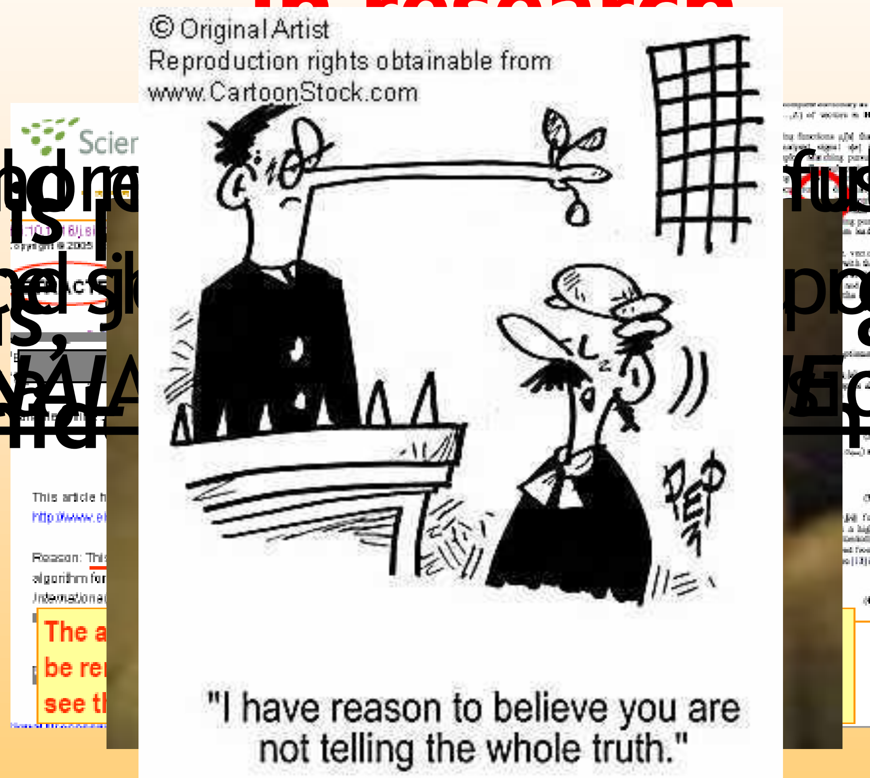


Ethical issues

Multiple submission

in research

If there is ... ethical problems, ... author cannot ... innocent.



What gets you accepted?

- **A**ttention to details
- **C**heck and double check your work
- **C**onsider the reviews
- **E**nglish must be as good as possible
- **P**resentation is important
- **T**ake your time with revision
- **A**cknowledge those who have helped you
- **N**ew, original and previously unpublished
- **C**ritically evaluate your own manuscript
- **E**thical rules must be obeyed

ACCEPTANCE

Acknowledgement

Special Thanks to Dr.Towhidkhah

&

Many Thanks to Ms.Babaee

Good luck!!

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