

SUMMARY should be a brief, accessible summary of ~100 words. It should explain the goals, results and chief conclusions of the work, and must not include any references.

RESULTS should include short cross-headings to define the main aspects of the study and guide the reader through the text. Manuscripts describing new structures should generally contain a clear C-alpha backbone diagram (in divergent, wall-eyed view) with error bars and appropriate labels (see figure). Crystallographic papers should contain a table summarizing structural and refinement statistics (see example) as well as a stereo image of a portion of the electron density map. NMR papers should contain a similar table summarizing the structural statistics (number of restraints, etc.; see example) as well as a stereo image of the 2D NMR energy structures (see figure). Stereo diagrams should be presented for divergent, wall-eyed viewing.

Some tips on how to succeed at graduate work and in writing papers for publication

METHODS (for Articles, Letters and Insight articles) will be in a separate section placed at the end of the text, before the references.

STRUCTURAL AND BIOLOGICAL Papers: Atomic coordinate and structure factor files (or comparable NMR data) have been deposited in the Protein Data Bank (or the Nucleic Acids Database or BioMagResBank, as appropriate) and must list the accession code(s). For papers received before May 1, 2001, we allow a maximum six month hold on files deposited into the Protein Data Bank. For papers received on or after May 1, 2001, we require immediate release upon publication.

Sept 20, 2010

Some tips on how to succeed in graduate school

- Develop a strong work ethic and realize that self-motivation and independence are key traits – graduate work is quite different from undergrad!
- Ask for regular 1:1 meetings with your supervisor; set goals for each meeting; know your labs work well
- Start writing short “one pagers” on ideas for feedback and complete a 10-15 page review on your thesis topic in the 1st year
- Go to seminars, lab meetings, journal clubs and ask questions!
- Talk with other faculty & students about your research; get comfortable explaining your question and why its important – take ownership of your thesis problem
- Develop concrete short & long term goals and stick to them; if you think you might want an academic job start publishing early!

The Science of Scientific Writing

If the reader is to grasp what the writer means, the writer must understand what the reader needs.

Science is often hard to read. Most people assume that its difficulties are born out of necessity, out of extreme complexity of scientific concepts, data and analysis. We argue ...that complexity of thought need not lead to impenetrability of expression

American Scientist (1990) 78: 550-558

General Recommendations

- Choose the target journal carefully, aim high but be realistic
- Look at recent issues of the journal and follow style & submission guidelines very carefully
- Write a 1-2 page summary of the paper with appropriate headings & sub-headings before you start
- In the summary decide on the specific objectives, usually two or three
- Have several colleagues read your paper before submission
- Don't feel you have to tidy up your office before you begin; if you have writer's block write a paragraph a day!

Writing Style

- Keep paragraphs short, 2-3 per page
- Begin each paragraph with a topic sentence and end with a concluding sentence that relates to the topic sentence
- Try not to end a paragraph with a reference
- Try not to cite the same reference more than twice in a paragraph
- Keep sentences short with appropriate punctuation
- Keep scientific jargon to a minimum
- Use the active not the passive voice, especially in Methods

Recommended Sequence

Complete all data collection & analysis before writing

- 1) Prepare figures & tables**
- 2) Material & Methods**
- 3) Results**
- 4) Abstract**
- 5) Introduction**
- 6) Discussion**
- 7) References**
- 8) Title & Keywords**

Abstract

Most important section as is often the only thing read.

- 1) Read carefully word limit
- 2) General introduction with questions (1-3 sentences), study system & methods (1-2 sentences), main results (2 sentences), interpretation & general significance (2 sentences)
- 3) Keep jargon to a minimum and emphasize the main results and why they may be interesting to somebody outside your field

Abstract

Commonest problems

- significance of study not clear
- main results not clearly stated
- weak concluding sentence

Introduction

A very important section of the paper. An excellent introduction puts the reader in a good mood!

- 1) Usually no more than 5-6 paragraphs
- 2) Decide on topics for each before you start writing
- 3) First paragraph or two should be conceptual, introduce study system after review of history of general problem & previous work on the topic
- 4) Conclude with a paragraph outlining the specific objectives or questions, often as point form 1)....2)....3)
- 5) In most cases, do not motivate a paper by saying “little is known about...”

Structure of Introduction

General concepts & questions surrounding the topic



Review of previous work what is known & not known



Model system/organism and its virtues



The 2-4 specific questions addressed

Introduction

Commonest problems

- general significance of study unclear
- specific objective of study not clearly stated or motivated
- introduction too long with some text that should be in Discussion
- Key previously published work not mentioned (but buried in Discussion)

Methods

Be brief but with sufficient detail that the reader can understand what was done and repeat the study. Always use subheadings e.g.

- **The Study System:** e.g. 'The Study System' or 'Natural History of *Sagittaria latifolia*'
- **Sampling:** how many populations? locality details? when sampled? sample sizes?
- **Experimental methods:** briefly describe the experiments conducted. If more than one experiment may need sub-headings for each
- **Statistical analysis:** provide details of statistical programs used, what types of ANOVA. This section can be incorporated into Experimental methods if several sub-headings are used

Methods

Commonest problems

- no sub-headings & insufficient detail
- statistical analysis not clearly outlined
- disconnect with specific objectives
- Impossible to repeat

Results

Unless a very short paper always use sub-headings with titles that reflect the different questions or experiments

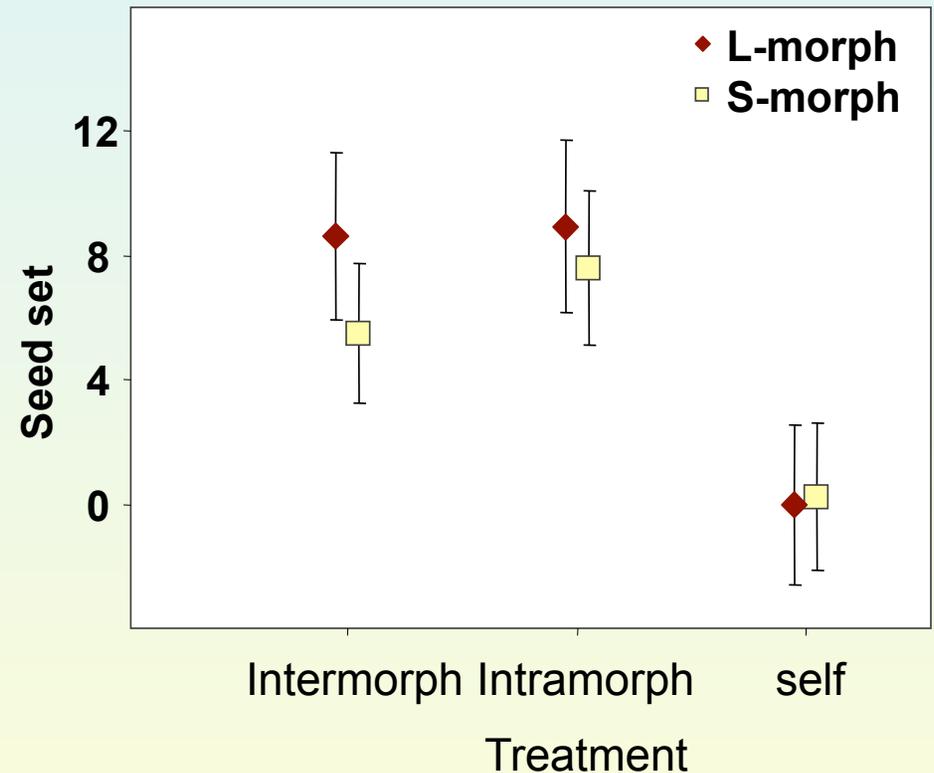
- 1) Each paragraph should begin with a topic sentence that introduces the main results
- 2) Lead with the most important results and follow the sequence of questions outlined in the *Introduction*
- 3) Use figures as much as possible. Tables are boring!
- 4) Scale figures appropriately and don't try to put too much information in a single figure
- 5) The average paper should contain a maximum of 8-10 figures and tables, often less
- 6) To reduce number of tables incorporate simple statistics into text and use supplementary materials
- 7) Figure and Table legends should be informative and "stand alone"

A figure is easier to interpret than a table

Table 1 Mean & 95% CI for seed set following controlled pollinations on style morphs of *Narcissus papyraceus*

		Treatment		
		Intermorph	Intramorph	self
Mean	L	8.639	8.941	0.000
Mean	S	5.490	7.605	0.208
95% CI	L	2.697	2.776	2.625
95% CI	S	2.266	2.468	2.336

Figure 1 Mean & 95% CI for seed set following controlled pollinations on style morphs of *Narcissus papyraceus*



Presentation style and scaling are important for effective data presentation

Fig 1. Mean plant height for treatments A and B

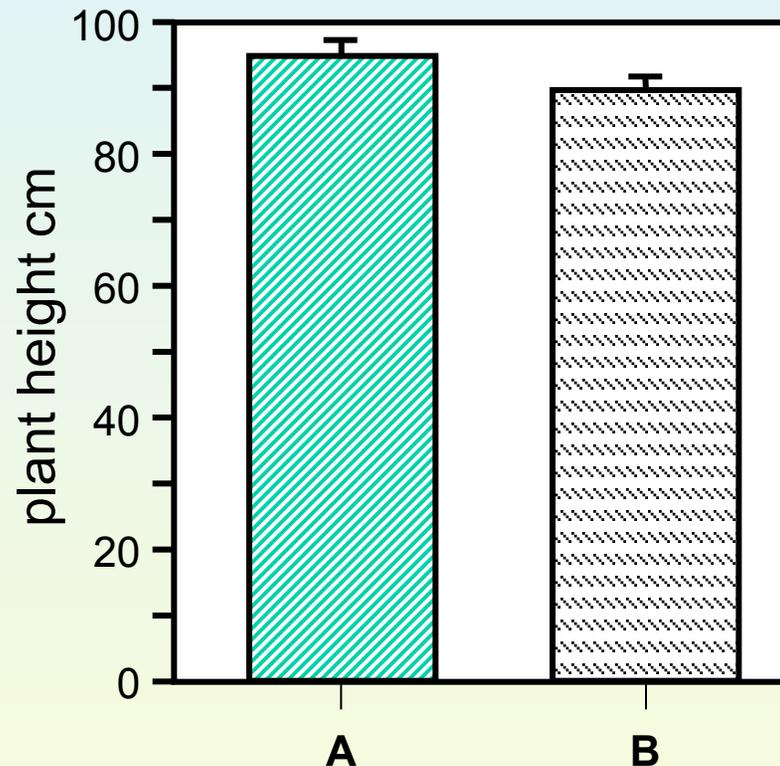
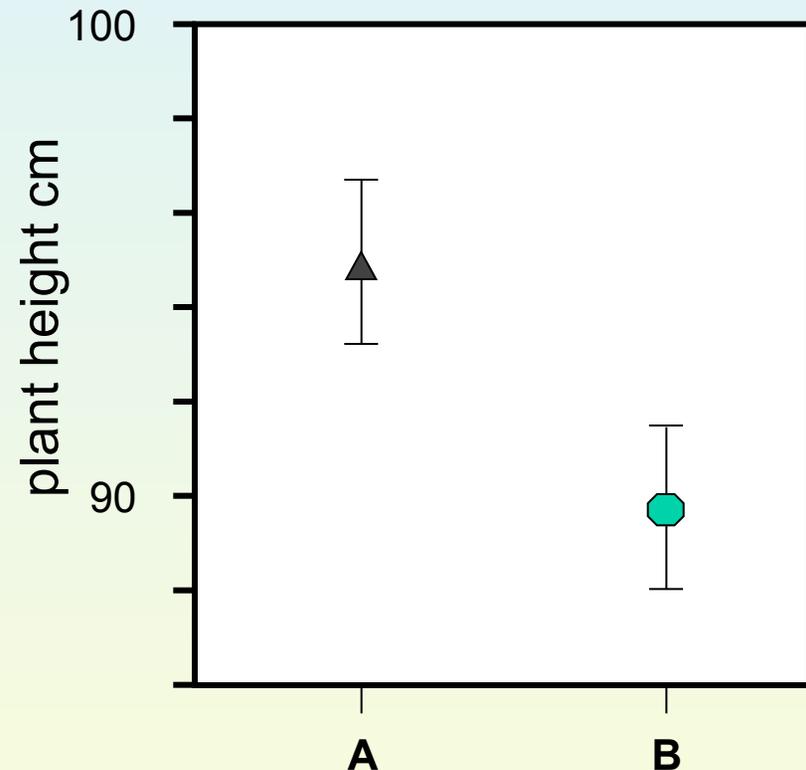


Fig 2 Mean plant height for treatments A and B



- histogram bars are inappropriate for means & variances
- scaling from zero makes differences difficult to judge
- standard errors don't allow easy interpretation of results, use confidence intervals

Results

Commonest problems

- no sub-headings
- order of results does not follow objectives
- not obvious how results relate to objectives
- too much discussion & interpretation of results

Discussion

The most difficult section of the paper to write

- 1) No longer than 10-15 paragraphs at most
- 2) Use 3-4 sub-headings that reflect the main topics
- 3) Begin with a paragraph (no sub-heading) that summarizes the main findings & what will be covered in the discussion
- 4) Discuss & interpret the main results, referring to key figures & tables
- 5) Don't be afraid to introduce new ideas or to speculate
- 6) Strong concluding paragraph, ending on a general theme

Discussion

Commonest problems

- too long for the amount of novel data
- simply a re-statement of results without interpretation
- general implications of results not well developed & few new ideas
- Comparison of results to previous work omitted

References

The choice of references is a key aspect of the paper. They are often used by reviewers as a quick guide to the author's competence or naivety

- 1) Check & recheck the accuracy of citations. Many typographical errors are repeated in the literature
- 2) Assess the average number of citations for the target journal; 30-60 is normal for an average 10-15 page paper
- 3) Follow the style guideline for the journal

References

Commonest problems

- inappropriate citations
- large numbers of mistakes in style & many typographical errors
- book chapters incorrectly cited

Acknowledgements

- 1) Keep brief – not an opportunity for you to show how many famous people you know or friends you have
- 2) So only acknowledge people who provided substantial help in the form of ideas, concrete assistance or manuscript review
- 3) Make sure you acknowledge funding sources

Title & Keywords

The Title is critical because it influences whether the paper is likely to be read. Keywords aid researchers in locating your paper, especially using electronic searches.

- 1) A bad title will dissuade people from reading further
- 2) Keep the title short but informative
- 3) If the scientific name is used in the title, consider adding a family name or a common name to enable non-specialists to identify the organism(s) studied
- 4) Try to pick keywords that cover both the overall topic and those more specific to your paper e.g. plant mating systems, early abortion, self-pollination

Title & Keywords

Commonest Problems

- Title too long, with many technical terms & not enough generality
- Keywords too specific

Titles: an example

Pick the best one!

- “The influence of large floral displays on the intensity of geitonogamous pollen discounting in the aquatic plant *Eichhornia paniculata* (Pontederiaceae)”
- “Sexual interference in plants”
- “Mating cost of large floral displays in hermaphrodite plants”
- “Genetic markers reveal a negative relation between outcrossed siring success and the selfing rate in *Eichhornia*”

Titles: an example

- “The influence of large floral displays on the intensity of geitonogamous pollen discounting in the aquatic plant *Eichhornia paniculata* (Pontederiaceae)” **Too long**
- “Sexual interference in plants” **Too general**
- **“Mating cost of large floral displays in hermaphrodite plants” Harder, L.D. & Barrett, S.C.H. (1995). *Nature* 373: 512-515**
- “Genetic markers reveal a negative relation between outcrossed siring success and selfing rate in *Eichhornia*” **Unclear what type of organism *Eichhornia* is**

Concluding Remarks

- Become familiar and emulate papers in the very best journals in your field
- Do not try and write a paper in a few days. Set realistic writing goals e.g. several paragraphs a day; my rule is a paper a month
- Do not submit poorly prepared papers to international journals
- Keep cover letters short and precise, except for *Nature* and *Science*
- Get advice from experienced colleagues before submission
- Do not pester members of the editorial board concerning delays in manuscript decisions
- Accept editorial decisions and only appeal rejections in exceptional cases