

BIOL3004

Scientific writing and publishing

Prof Boštjan Kobe

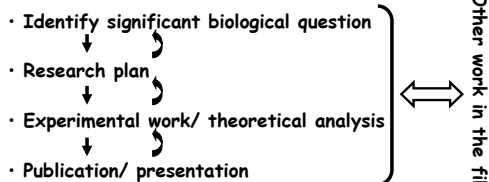
SCMB and IMB

Room 76-452, 3365-2132, b.kobe@uq.edu.au

Lecture outline

- Role of scientific writing in research
- Features of scientific writing
- Scientific paper
 - Why, where, when, how to publish a scientific paper
 - Sitting down to write a scientific paper
- Other types of scientific texts and presentations

Research project



Scientific writing represents a significant part of all stages of a research project

Why publish a scientific paper?

- For other researchers to learn about your work
- Scientific publications are the most important indicator of a scientist's track record
- A research project is unfinished without a publication

Ingredients of good science paper

- Novelty of research
- Comprehensive coverage of relevant literature
- Good analysis (including statistics)
- Thought provoking discussion

Ingredients of good science reporting

- Clarity
- Good organization
- Appropriate use of figures and tables
- Right length (= short)
- Writing to intended audience

Some major features of scientific writing

- Communicate information in concise and logical way
- Make your paper stand out: convey how your results have changed the world
- Audience, format (eg. required by journal), established mechanics (grammar, spelling) and politics impose constraints on the scientific writing
- The secret is to match the mind of the reader
- In scientific writing there is no such thing as "writer's block": when you have done the work, the ideas are there
- Scientific writing is a thankless job: satisfaction must come from the writer for doing a good job; don't expect satisfaction from other people

Scientific writing

Scientific writing is about **clarity**.

Sloppy manuscript = sloppy science

Best writing cannot save a flawed study

The fools collect facts, the wise select them (Powell 1888)

What does a reader expect from a scientific paper?

Questions a reader will ask:

- What is the paper about?
- Is the paper interesting?
- What will I gain from it by reading it?
- How difficult is it to find the interesting information? Will the rewards outstrip the effort?

Be a **reader**: read many papers

- Think about their quality
- Learn how it is done well
- Recognize when it is not done well

What, where and when to publish

- Publish when you have something reasonably complete to say
- Reach the readers you want to reach
- Consider **impact factor** of journal

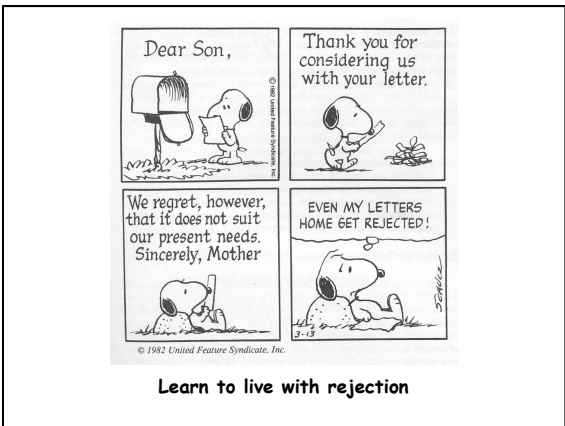
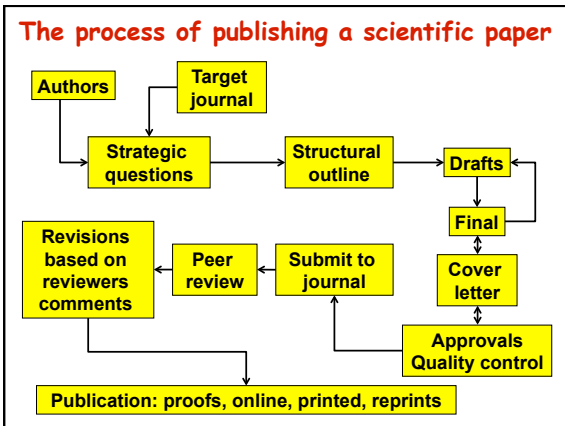
?

What, where and when to publish

- Publish when you have something reasonably complete to say
- Reach the readers you want to reach
- Consider **impact factor** of journal

• Impact factor = average number of citations in a given year of articles published in that journal in the preceding two years

• Nature	30.979
• Science	29.162
• Cell	26.626
• Journal of Biological Chemistry	6.482
• Archives in Biochemistry and Biophysics	2.338
• Bangladesh Journal of Botany	0.035
• Biotechnology Law Report	0.004
• Soap and Cosmetics	0.000



Planning

- **Outline the story as information flowchart**
 - You want to decide where you are going to end and what the steps along the way will be
 - Eliminate extraneous information and dead ends
 - If this is done well, the reader encounters new concepts in a logical order and is led through the story
 - If this is done badly, concepts appear without adequate explanation and the reader is confused
 - Don't be tempted to include everything you know

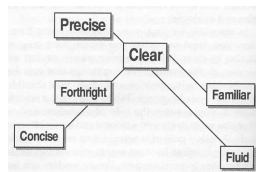
Example of scientific story

- 1) Pigs are large, domesticated quadrupeds
- 2) Flight is generally associated with possession of wings
- 3) This story is about evidence for porcine flight
- 4) How does one define flight?
- 5) What is the evidence for porcine flight?
 - Descent profiles when dropped
 - Evidence for ascent when accelerated
 - Ability to flap artificial wings
 - Unassisted flight when alarmed
 - Variation between breeds (genetic influences)
- 6) The specificity of pig flight (Do cows fly?)
- 7) Conclusion. Pigs fly under some circumstances, but so would any large object

In this story, information about the pig diet and digestive tract, or swine influenza virus, or the percentage bacon yield from different breeds would be irrelevant.

Style

- Writing style is subjective; there is no right or wrong
- Remember the key objectives of scientific writing
 - **Clear**
 - Not complex
 - Not ambiguous
 - **Precise**
 - Gene/protein
 - **Forthright**
 - Sincere, straightforward
 - Not pretentious, arrogant
 - **Familiar**
 - Avoid jargon
 - Define unfamiliar
 - **Concise**
 - Avoid redundancy: Interesting to note, as a matter of fact
 - **Fluid**
 - Eliminate discontinuities
 - Scientific writing does not have to be dull



Being critical

- You need to be critical of the work of others but most importantly **of your own work**
- There is no such thing as scientific fact; science is based on observation, experimentation and interpretation
- It is important to identify what is not known
- Critical assessment presents enough information to recognize the merits of a particular interpretation

Uncritical: Nerck et al. (1915) showed that pigs could fly.

Critical: Nerck et al. (1915) claimed that pigs could fly based on a significant divergence from vertical descent when pigs were dropped off a large cliff. The experiment was flawed by the lack of appropriate controls, such as cows.

Style: some suggestions (1)

- **Sentences**
 - 1 idea/sentence
 - Concise (20-30 words: breath test)
- **Paragraphs**
 - 1 topic/paragraph
 - Start with lead sentence
 - Transitions (flow)
- **Introduction**
 - Funnel method: known, unknown. question



Style: some suggestions (2)

- **Avoid long sentences**
- **Use active verbs: it makes sentences shorter!**
 - 'We found' **not** 'It was found'
- **Avoid writing empty phrases that add nothing**
 - Plays a key role, the fact that, the presence of
- **Avoid redundancy**
 - Already existing, alternative choices, at the present time
- **Avoid cliches**
 - It has long been known that pigs fly under certain circumstances (= I haven't bothered to look up the reference)
- **Don't plagiarize**
 - If precise wording is absolutely crucial, use quotations and provide the reference and acknowledge the author

Style: some suggestions (3)

- **Restrict use of adjectives and adverbs**
 - Especially pseudo-quantitative ('large, remarkable, striking')
 - Adjectives: use 'of' instead
 - Try deleting all adjectives and adverbs and see which made any contribution
- **Avoid repeated sentence constructions**
 - e.g. 'however, furthermore' over and over again
- **Don't use editorial commentary**

Now I am going to tell you about early experiments on flying guinea pigs and we'll come to full sized pigs later.
- **Avoid jargon, conversational and vernacular styles**
 - **Scientific English is an international language**

'It's pretty obvious that pigs would fly if they could shift their bums':
colourful, but incomprehensible to the average literate German
'The problem with pig aviation lies in the uneven distribution of weight towards their posteriors': **may be boring, but brings home the bacon**

Style: some suggestions (4)

- **'Which/that'**
 - Use 'that' for defining clauses (tells us which one)
We will select the option that measures porcine flight accurately
 - Use 'which' for nondefining clauses (adds a fact about known option)
We will select the Option A, which measures porcine flight accurately
- **Don't use no double negatives**
- **Just between you and I, case is important**
 - Not all unfamiliar words start with uppercase
 - Check PubMed if in doubt about the case
- **Remember to never split the infinitive**
- **'And/or': should be left to lawyers**
- **'Since': is a temporal expression (use 'because').**
 - Since pigs do not fly voluntarily, the experiment involved dropping the animal from a large cliff.

The layout of a scientific paper

Suggestion for order of writing

- 3 **Title:** often the only part read
- 4 **Keywords:** help find in online searches
- 1 **Authors:** may indicate if it is worth reading
- 11 **Abstract:** the whole story in condensed form
- 8 **Introduction:** particularly non-experts interested in the topic need to see what has been done in the past in the field and what is the question; the last paragraph then summarizes the main outcomes of paper
- 5 **Methods:** only read by experts in the field or workers trying to use the same approach
- 6 **Results:** the most important content but only for the few very interested
- 9 **Discussion:** what is the authors interpretation of the results
- 7 **Figures/Tables:** gives the main results quickly to an expert. The legends therefore need to be self-explanatory.
- 2 **Acknowledgements**
- 10 **References**
- 12 **Cover letter**

Starting (1)

- **Title**
 - **Often the only thing many people may read**
 - **The paper will not make an impact if it doesn't grab someone browsing the long list of titles in J. Porcine Aviation**
- Studies of the aerodynamics of large living falling bodies:
likely to be consigned to the large body of uncited and unread literature
- Definitive proof that pigs can fly: **will be a citation classic**
- Do pigs fly?: **rhetorical questions in titles are not recommended**

Starting (2)

- **Abstract**
 - **The next most read part of a paper**
 - **Easily accessible (PubMed)**
 - **Summarizes the story in a very condensed form**
 - **Will be read only if the title catches the readers attention**

Starting (3)

- **Opening paragraph**
 - **Provides the reader with indication what is to come**
 - **Watch for "no content" statements, cliches, plagiarising**

'Since time immemorial man has been interested in the aeronautical behaviour of his fellow inhabitants of the earth.'
 - **Don't make claims that imply the writer is going to solve the lack of knowledge**

'Pig flight has been investigated extensively as a model for mammalian aviation in general', or 'Despite intensive study, little is known about pig flight'.
 - **Set the scene and grabs the reader's interest**

'Nobody has ever seen a pig fly, but the phrase "pigs might fly" is part of the vernacular.'

The middle

- Very few people will read the entire paper
- Papers are not read in a linear progression, but readers try to grasp the whole picture as quickly as possible
- The established journal format helps readers find the relevant sections
- Use **signposts** to guide the reader (e.g. subheadings)

How to finish

The end of the paper should provide reader with closure

- **Conclusion treats results as a whole** (Discussion treats them individually)
- **Finishing statement difficult**
 - **Avoid motherhood statements**
'Porcine aviation is bound to be an exciting and fruitful area of future research.'
 - **Better to sum up and echo the opening**
'Clearly the old cliché that pigs might fly has some basis in fact.'
 - **Can finish with future directions, but be specific and avoid generalized clichés** (eg. observe that more research is needed.
'The one key experiment that has yet to be performed is to drop a pig from an aeroplane. Survival of such a fall would provide definitive proof that pigs really can fly.'

References

- Scholarship in references is very important
 - Remember other workers in the field will review the paper
- Use a **reference manager program** ?

References

- Scholarship in references is very important
 - Remember other workers in the field will review the paper
- Use a **reference manager program (Endnote)**
 - Can download references from the web directly in a database: no typos
 - Can easily switch between different reference formats
 - Can easily insert references while writing
- **Usual reference formats**
 - Name and year
 - By number in order of citation
 - By number in alphabetical list

Authorship

- **Who should be an author? In what order?**

Authorship

- **Who should be an author?**
 - Researcher who made a significant **technical contribution** to the paper (responsible for ≥ 1 Figure or Table); and/or significant **intellectual contribution**)
- **Order of authors** (biomedical science convention)
 - First author: did most of the work
 - Senior author: directed the project

The University of Queensland: Handbook of University Policies and Procedures (HUPP)

4.20.2 Procedures for the Conduct of Research

3. Statement of Authorship

3.1 The minimum criterion for authorship is participation in the conceptualisation, execution or interpretation of part of the research. participation must be sufficient for her/him to take public responsibility for the publication.

An example of journal instructions to authors: PNAS

PNAS Information for Authors
 R0802 February 2009

PURPOSE AND SCOPE
 The Proceedings of the National Academy of Sciences (PNAS) publishes research reports, original research articles, and short communications. The journal is published weekly, except for two issues that are published biweekly during the summer months.

Research Reports
 Research reports describe the results of original research of broad interest to the scientific community. They are published in the journal and are available to the public through the PNAS website.

Original Research Articles
 Original research articles report original research results. They are published in the journal and are available to the public through the PNAS website.

Short Communications
 Short communications are brief reports of original research results. They are published in the journal and are available to the public through the PNAS website.

Editorial Policies
 The journal's editorial policies are designed to ensure the highest quality of research. All articles are subject to peer review by members of the PNAS community.

Manuscript Preparation
 Manuscripts should be prepared according to the following guidelines:

- Title Page:** The title page should include the title, authors, and affiliations.
- Abstract:** The abstract should be concise and to the point, summarizing the main findings of the study.
- Introduction:** The introduction should provide background information and state the objectives of the study.
- Methods:** The methods section should describe the procedures used in the study in detail.
- Results:** The results section should present the data and findings of the study.
- Discussion:** The discussion should interpret the results and discuss their implications.
- References:** References should be cited in the text and listed in a separate section at the end of the article.
- Tables and Figures:** Tables and figures should be prepared according to the journal's guidelines.
- Supplementary Materials:** Supplementary materials can be included to provide additional information.

Other types of scientific writing

Similar principles apply to any type of scientific writing, but the purpose and constraints may be different

- **Review article:** adjust to the readers, use subtitles
- **Thesis**
 - Break down into chapters to reduce the size of task
 - Introduction ~ review article, individual chapters ~ scientific papers
- At UQ you can use published papers as substitute for chapters
- **Book:** ~ thesis
- **Report:** ~ scientific paper
- **Instructions:** main constraints audience and format
- **Correspondence:** main constraints audience and mechanics
- **Grant proposal:** focus on aims and expected outcomes; main constraints format, politics, audience
- **Presentations:** oral, poster: more opportunities to make exciting

Science writer: Fast growing profession

The screenshot shows the Council of Science Editors (CSE) Job Bank website. The page lists several job openings with details such as position name, location, and date posted. The jobs include:

- Senior Science Writer:** Position Location: Memphis, Tennessee, USA; Company name: St. Jude Children's Research Hospital; Date Posted: 08/23/2008
- Assistant Managing Editor:** Position Location: Boston, Massachusetts, USA; Company name: Circulation; Date Posted: 08/20/2008
- PLoS Medicine Associate/Senior Editor:** Position Location: San Francisco or Cambridge, California or Cambridge, UK or UK; Company name: Public Library of Science; Date Posted: 08/11/2008
- Copy Editor:** Position Location: Alexandria, Virginia, USA; Company name: The American Society of Clinical Oncology; Date Posted: 06/06/2008
- Open Production Coordinator:** Position Location: New York, New York, USA; Company name: The Rockefeller University; Date Posted: 08/01/2008
- Journal Production Manager:** Date Posted: 07/24/2008

Further reading

Bourne PE. Ten simple rules for getting published. *PLoS Comput Biol.* 2005 Oct;1(5):e57.

Author: Zeiger, Mimi
 Title: Essentials of writing biomedical research papers
 Publisher: McGraw Hill, 1999

Author: Day, Robert A
 Title: How to write & publish a scientific paper
 Publisher: Cambridge, England : Cambridge University Press, 1998

Author: Alley, Michael
 Title: The craft of scientific writing
 Publisher: New York : Springer, 1996

Authors: Janice R. Matthews, John M. Bowen, Robert W. Matthews
 Title: Successful Scientific Writing: A Step-By-step Guide for Biomedical Scientists
 Publisher: Cambridge University Press, 2001