On Scientific Writing

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Writing

Goal of PhD studies:

writing a PhD dissertation.

The bottom-up approach

Writing and publishing scientific papers.

The rest of this talk

Only two things:

- “What is well understood is expressed clearly.” (Nicolas Boileau, 1636-1711)
- Your paper will elicit only so much attention from its reader / reviewer.

The good news

The full quote from Boileau is actually:

"What one is well understood is expressed clearly,
and the words to say it come easily."

A paper:
the prime medium for reporting scientific results.

In computer science: the conjunction of

- something conceptual (and preferably new),
- something sound, and
- something practical.

Plan

1. The variety of papers.
2. Reading a paper.
3. Refereeing a paper.
4. Writing a paper.
5. Proof-reading a paper.
6. Targeting a submission.
7. Receiving a review.

The variety of papers

- Unpublished draft.
- Tech report.
- Workshop paper.
- Conference/symposium paper.
- Journal paper.
- And also: submitted / revised / final / extended.

The draft

Definition: the first shape assumed by a paper.

Use: for the author and for his immediate collaborators.

Quality control: the author(s).

The tech report

Definition: a draft readable by others.

Use: either as a time stamp (new draft with a new result),
or for the record (old draft with lots of detail).

Quality control: maybe a few colleagues & students.

The workshop paper

Definition: a record to document a talk.

Use: communication among specialists.

Quality control: the program committee (if any).

The conference/symposium paper

Definition: a record documenting a talk.

Use: communication in a larger community.

Quality control: the program committee.

The journal paper

Definition: the author's last word on a particular topic.

Use: archival purposes.

Quality control: the journal reviewers.

The tech report (revisited)

Definition: extended version of a conference / journal paper.

Use: typically includes all the proofs (and bypasses the copyright restrictions...).

Quality control: the reviewers.

The draft (revisited)

Definition: an unpublished paper.

Use: like wine, a draft may improve with age.

Quality control: unspecified.

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Reading a paper

- Information acquisition and retrieval.
- Critical reading.

Information acquisition

In principle, a paper provides enough information for its reader to reproduce its contents:

- proof,
- experiment.

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Exercise: Think of the corresponding criterion for an overview / survey paper.

Trust in the paper

Directly proportional to its advanced state:
journal versions are more trustworthy
than conference versions.

Information retrieval

It is a good idea to keep reading notes
(minimally as annotations in one's bibfile).

Critical reading

The three stages of reading (as one grows up):

1. the books say blah and thus it is true;
2. this book says blah;
3. the author wrote blah.

Examples

1. “Introduction to Data Bases”
2. “Advances in Data Bases”
3. “A new technique for query processing in object-oriented data bases”

More examples...

- “The λ-calculus with applications”
- “A λ-calculus for nameless dummies” (foreword by N. de Bruijn)
- etc.

Back on track

Here: paper, not book.

But one's critical sense should still apply.

On reading critically

Don't swallow the author's propaganda,

accepting the paper as the author constructed it.

Instead:

- disassemble it to identify its real thrust;
- appreciate;
- probe / question / stress;
- (if needed) reassemble: minimize / expand.

Scientific reading (ended)

In principle, a paper provides enough information for its reader to reproduce its contents:

- proof,
- experiment.

But does it?

What if

- What if you don’t understand something in a paper?
- What if you think you found a bug in a paper?

Recommendation:

1. Consult people locally.
2. Send a very polite e-mail to the author
   (keeping in mind that you may well be wrong yourself).

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Refereeing a paper

What: the cornerstone of quality control.

How: peer review.

Reference: Parberry's guide for new referees.

Critical sense

One should not be impressed or unimpressed by the name and affiliation of the authors.

Examples:
- D. Knuth, Stanford University.
- S. Snape, Hogwarts School.

—

Advice to JFP referees:

It is a mistake to see depth where there is merely obscurity.

A few tips

- Reviews should be as comprehensive as possible.
- Reviews should be as courteous as possible.
- Reviews should be as selfless as possible.

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Writing a paper

A paper is written for others to read:

- other researchers,
- reviewers,
- yourself in the future, and
- people you don't know yet.

It should thus reflect all the concerns already mentioned: readability, clarity, etc.

Organization

- Title / list of authors / abstract.
- Introduction / compelling example / related work / overview.
- Development.
- Conclusion (if any).
- Acknowledgments / references.

The title

- It should be informative.
- It should be concise.
- It should be catchy / memorable.
- It needs to be original.
- It does not need to be funny.

On the temptation of being funny

The messenger can hide the message.

Circus analogy:

Do you want to be remembered as the clown (form) or as the trapeze artist (contents / achievement).

Besides, most funny titles do not convey concrete messages: they tend to be puns or insiders's jokes.

On the temptation of being sophisticated – or not

- "The eductive interpreter."
- "Fuzzy maths"
- "Trust in the λ-calculus"
- "Concurrency rules"

The list of authors

- Alphabetically ordered;
- ordered by “degrees of contribution”;
- student first, adviser second;
- etc.

Key: the message should be more important than [the order of] the messenger[s].

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- It should be brief.
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Fact:

Many more people will read your abstract than your paper
(e.g., in a bibliographic data base).

Titles, abstracts, data bases, and search engines

Abstracts are the key to locate papers on the web.

Abstracts are stored textually,
so they should NOT contain formulae, special symbols,
or bibrefs.
(Ditto for titles.)

A reminder

An abstract is not an ad:

there is no need to repeat the name of your product.

The introduction

- It should start with a bang.
- It should stop with an overview of the rest of the paper.
- It should mention which prerequisites are expected from the reader.
- It should say clearly what is the achievement of the paper.
- A compelling example is always good, especially in a submission.

Starting with a bang

- “Real programs have effects.” (Mason and Talcott, JFP)
- “He awoke – and wanted Mars.” (Dick)
- “Little Peggy was very careful with the eggs.” (Card)
- “It was a dark and stormy night.” (Bulwer-Lytton)

See also Mogens’s dissertation-opening sentences.

Eye catchers

- First words.
- Last words (of paragraph / section / chapter / thesis).
- Capitalization (in an abstract).

Pitfalls

- Exaggerating.
- Seeking effect for seeking effect:
  “This paper bridges a much needed gap.”
  (quoted by Neil Jones)
- Practicing Cooper’s prose style (cf. Mark Twain).
- Misspelling (always use a spell checker!).

Standing on the shoulders of giants

Disparaging earlier work invites the reader to disparage your own work.

Positivise – for example:

- the goal is blah, and it would be great to reach it;
- what has been done so far is remarkable,
  but it does not quite reach the goal;
- in this paper, we take one step further towards the goal.

Development

- Organized in sections.
- Should be progressive.
- Should be as complete as possible.
- Should be as concise and precise as possible.

Related work

- Mandatory.
- Situates the novelty and significance of your work.
- Where: either part of introduction, or part of conclusion, or stand-alone section (second or second to last).

Pitfalls: forgetting or mispresenting someone else’s work.

Bibliographical references

Bibrefs should be used parenthetically, so that they do not interrupt one's reading.

Example: "...as seen in [2]." is awful, and so is

"[KAZAM97] shows that..."

Better: "...as introduced by Church in his monograph on the λ-calculus [2]."

The conclusion

None in the mathematical tradition.

Minimally:

- recapitulates the problem and the contribution;
- assesses the significance of the contribution;
- suggests / outlines future work.

The pitfalls of one's future work

- Often presumptuous:

  "Writing a "future work" section of a paper is like a dog pissing on the trees at the boundary of its territory." (John McCarthy, 1991)

- Often shows the limits of the author's understanding.

The acknowledgments

- Minimally, there should be thanks to the anonymous reviewers.
- Rota's 8th lesson: your proof-readers will appreciate being mentioned.

The references

They must be impeccable:

- accurate (correct year, etc.);
- complete (page numbers, etc.).

Standard pitfall: misspellings in titles.

Tips for writing a research paper

- In general, the contents should precede the paper. (But often, spelling things out in the paper tends to clarify its contents.)
- Top-down approach: goal and significance first.
- Bottom-up approach: results first.

A rule of thumb:
put in your paper what you (would) like to find in other's papers.

As time goes by

It sounds silly, but...

- remember to date your manuscripts, and
- remember to update your bibrefs (“This paper is superseded by ...”).

To summarize: the α and the ω

- The Danish mother.
- The sushi Master.

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Proof-reading a paper

Form vs. content.

- Form: what the reader sees.
- Content: what the writer sees.

A subjective perception of one's writing style

- One tends to like one's writing style.
- One is blind to one's flaws.

Proof-reading each other

- What: an investment.
- How: with consideration.

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A key resource

“How to have your abstract rejected”

Mary-Claire van Leunen and Richard Lipton

Conferences

Watch out for the theme of the conference.

Watch out for the program committee.

Watch out for what needs to be submitted:

- an extended abstract;
- a full version.

Extended abstracts (usually in the US)

The reviewers want to be convinced quickly.

The first impression is crucial:
abstract and introduction often determine the fate of the submission.

An extended abstract is closer to a workshop submission.

Full versions (usually in Europe)

The reviewers want the whole truth.

The simplest is to give it to them.

A full version is closer to a journal submission.

Classification (Parberry)

- Breakthrough.
- Ground breaking.
- Progress.
- Tinkering.
- Debugging.
- Survey.

Help the reviewer to make up his mind.

Methodological pitfall

Avoid core dumps.

- The paper should be focused on what it achieves.
- Tangents should be eliminated.

Motivational pitfalls

Ambitious: “Let’s write a paper for LICS.”

Opportunistic: “I’ve got to beef up my CV.”

Jealous: “I want more papers than X.”

Competitive: “I want to show that X’s papers are insignificant.”

Meteorological (esp. in Denmark): “Hmmm... Hawaii...”

etc.

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Better (if obvious): “I want to make science progress.”

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Receiving a review

- Rod Burstall's take: a review is an offering.
- The Dilbert syndrome.

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Challenges of this talk

- It's all trivial (in the mathematical sense).
- It's just more stuff to learn.
  (Analogy: the driving exam.)
- Two concrete examples:
  - The unsolvable exercise.
  - The great paper.

Summary and conclusion

A paper is part of the trade at BRICS
and is likely to be part of your PhD dissertation.

It is the means for reporting scientific results.

This talk:
how to write a paper and put it where it belongs,
ranging from the trashbin to a library bookshelf.