

Writing and Publishing Your First (or 2nd or 3rd...) Academic Paper

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CFD Group Presentation

May 24, 2016

Motivation

- Many of you are either in the midst of writing your results up as a paper, or else are considering doing so.
- Writing a scientific (mathematical) journal paper is very different from almost any other kind of writing you will ever do.
- Lots of “insider information” is usually only learned through by trial/error or (preferably) from someone with experience.
- Supervisors sometimes aren't great at communicating things they feel are “obvious” . . .

Objectives

- To stimulate you to think critically about your research and your writing before you begin.
- To provide some tips on writing well.
- But mostly . . . to point you to some good books or articles on the subject of scientific writing.

Note: If you notice something in these slides that I'm missing, or that you don't agree with, then please speak up!

Outline

- 1 Why publish?
- 2 Tips on writing
- 3 Structure of a paper
- 4 Submission and review process
- 5 Closing remarks

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Why publish?

- 1 To contribute to the body of scientific knowledge.
- 2 To become part of a scientific community and/or establish your reputation as an expert in something.
- 3 To stake your claim on a field and protect your intellectual property.
- 4 To focus your thinking, since you typically don't fully understand a problem until you write it up in all its detail.
- 5 To show your employer that you've actually done something (when applying for a job, or going up promotion/tenure).
- 6 To prove to a funding agency that their money was well spent.
- 7 For simple personal satisfaction.

Items 5-6 relate to the aphorism ... "Publish or perish"

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When to publish?

Start early!! Don't wait until your results are 100% complete to begin writing.

For Postdocs: If you are aiming for an academic position, then it's essential to complete several publications within a short time window.

For PhD students: It's an advantage to get a paper or two out before you defend your thesis.

For MSc students: In applied math, it's difficult to squeeze out a publication within a 2-year window. But if you work hard at it, you can still publish your MSc thesis results.

The psychology of writing

“My work isn’t good enough to publish.”

Yes, it is!

“I don’t know what’s publishable.”

Read! and get informed

“I can’t afford the time.”

Make the time!

“I don’t know where to start.”

Start at the beginning!

If you only take home one message from today’s discussion . . .

My advice:

- Time spent writing up your results is never wasted, since it organizes your thoughts.
- On the practical side . . . whatever you write is likely to end up in your thesis anyways.

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Publishing in applied mathematics

Norms for publishing and doing research differ between applied math and the other “natural/physical sciences”:

- **Different modes of publishing:** Mathematicians tend not to publish in conference proceedings.
- **Different journals:** Applied mathematicians publish in a relatively wide range of journals (analysis \rightarrow applications). There is no math equivalent of the “big three” (Nature, Science, PNAS).
- **Different standards/emphasis:** Most science progresses in small increments, interspersed with rare “breakthroughs”. Math papers tend to be longer, and aim to solve a problem “completely”.
- **Different time scales:** Studies combining modelling/analysis/ simulation tend to take longer (?).
- **Different collaboration styles:** Math papers tend to involve many fewer authors.
- **Different review process:** Average review time in mathematics is much longer (≥ 6 months). Reviews are more lengthy and in-depth.
- **Different typesetting:** Journals in math and physics require \LaTeX , so use it to do **all** of your writing.

More on (applied) mathematics

Things mathematicians don't have to worry so much about:

- Ethics reviews for experimental studies.
- Politics around collaborating and publishing with large groups of co-authors . . . sometimes 100's!
- Meticulously documenting experimental methods and sources of error.
- Papers in the “big three” as a precondition for tenure, funding, . . .

Things we do have to worry about:

- Mathematical rigor and precision.
- Choosing a good notation that doesn't obscure or confuse.
- Meticulously documenting numerical methods and sources of error.

Outline

- 1 Why publish?
- 2 **Tips on writing**
- 3 Structure of a paper
- 4 Submission and review process
- 5 Closing remarks

Tips on writing

This section is largely based on

“How to write a research journal article in engineering and science”
by Scott A. Socolofsky (Texas A&M, 2004)

Other good references:

- Higham, “Handbook of Writing for the Math Sciences” (SIAM, 1993)
A **MUST!** (student price: US\$26.10)
- Alley, “The Craft of Scientific Writing” (Springer, 1996)
- Booth, “Communicating in Science” (CUP, 1993)
- Gerver, “Writing Math Research Papers” (Key Curriculum Press, 2004)
- Cytrynbaum, “How to write a good (math biology) paper” [slides]
- My previous CFD group talks

General comments/advice

- Writing a paper can take anywhere from weeks to years, so break the job down into manageable tasks.
- Read widely and pay attention to what impresses you in other people's written work.
- High quality graphics are important!

“A [good] picture is worth a thousand words”
(see my slides on “What makes a great plot?”)

- It's much easier to publish incremental work, so always focus on **quality** instead of **quantity**.

First: What's your point?

Before starting to write, ask yourself:

- What is the message/scope of the paper?
- What new results or contributions do you want to describe?
- What do you want to convince people of?

Second: Write an outline

- Summarize your initial ideas into short bullet points that will over time evolve into paragraphs or sections.
- Organize bullets into a logical structure. Don't be afraid to re-organize until the logical arguments are just right!
- Whenever you're ready, expand bullets into key sentences.
- A weak outline cannot be saved by any good writing skills.

Third: Literature review

- Perform a comprehensive literature review.
- It's easy to get overwhelmed! Don't overdo it, since you can always come back and do some more searching.
- **Tip:** See my slides on “How to do a literature search”.

Discuss authorship with your collaborators

- Authorship is an issue to address very early on, optimally near the beginning of a collaboration.
- Someone should be included as an author if they contributed in a “significant” way to the intellectual content to the work: problem formulation, mathematical analysis, interpretation of results, writing the paper, . . .
- Ordering of authors is another issue to be dealt with at the time the paper is being written:
 - By default, author order in pure math is alphabetical.
 - In other sciences, the rules are complex with first author being the major contributor.
 - In applied math, ordering depends on the people or journal.
 - My students: regardless of journal, I prefer that your name go first.

Next: The hard part . . .

Write the content.

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Structure

Socolofsky suggests a generic outline for a **scientific** article:

- 1 Abstract
- 2 Introduction
- 3 Methods
- 4 Results
- 5 Discussion
- 6 Summary and conclusions
- 7 Acknowledgements
- 8 References

Applied math papers tend to be slightly different:

- 1 Abstract
- 2 Introduction
- 3 Mathematical model
- 4 Analytical/approximate solution
- 5 Numerical simulations
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Abstract

- A single paragraph that summarizes the content.
- It is published by itself and can be searched/indexed on the journal web site, with Google, etc. **This is critical!**
- Contains: general introduction, major results, conclusions.
- Don't cite, avoid use of symbols.
- Minimize details, don't give any numbers, write at a high level.

Introduction

Opening paragraph:

- Use “inverted triangle principle”:
 - Start with an attention-getting broad statement that establishes the general topic.
 - Successively narrow the topic in sentences that outline the state-of-the-art and knowledge gaps.
- End with a general problem statement.

Introduction

Middle paragraphs:

- Function as a literature review.
- Focus on state-of-the-art knowledge and significant differences between what has already been published and the new contribution that you will make.
- Focus on refereed journal articles, and use non-refereed sources only when absolutely necessary.
- Read every source you cite. Don't rely on someone else's assessment!
- If in doubt, cite.
- **BUT** . . . Focus on more seminal contributions, don't just cite for the sake of padding your reference list.
- Self-citations are fine, but don't overdo it.

Introduction

Final paragraph:

- Outline the specific contribution of the article and give a “road map” for the paper.
- Some authors step through what they're doing section-by-section. Others don't like this approach.

Methods / Results / Discussion

References:

- Higham
- Socolofsky
- Cytrynbaum

Summary and conclusions

- Don't introduce any new information or insights.
- Suggested format is two paragraphs:
 - Summarize various sections of the article (different from introduction!)
 - Draw important conclusions.
- An optional third paragraph may identify future research directions that flow naturally from your research.
- Keep it short!

Acknowledgements

- Identify sources of research funding.
- Recognize people who contributed to the article with ideas, data, code, proof-reading, . . . but don't qualify as authors.
- **Don't** thank reviewers except for someone who suggested a significant new line of inquiry that led to major changes in the paper or its impact.

Acknowledgments

We wish to thank Stephen Bond (UIUC) for discussion on granular models. We also thank the anonymous reviewers for their valuable comments. This work was partially supported by a grant from UIUC Research Board.

Yuck!

References

- All cited references must appear in the list at the end of the paper **and vice versa!** These two \LaTeX packages are very helpful:

```
\usepackage{showkeys}
```

```
\usepackage[pagebackref=true]{hyperref}
```

- Ensure all references are complete, correct and consistent – Use Bib \TeX and grab citations from the web (e.g., Google Scholar)

The screenshot shows a Google Scholar search for "stockie immersed boundary". The search results are displayed in a list format. The first result is titled "Analysis of stiffness in the immersed boundary method and implications for time-stepping schemes" by JM Stockie and BR Wetton, published in the Journal of Computational Physics in 1999. The abstract mentions numerical stiffness and the interaction of immersed elastic fibres. The "Import into BibTeX" link is circled in red. The second result is titled "Simulating the motion of flexible pulp fibres using the immersed boundary method" by JM Stockie and SI Green, published in the Journal of Computational Physics in 1998. The abstract discusses the motion of flexible fibres in an incompressible fluid. Both results include links to PDFs on researchgate.net and "Where Can I Get This?" links.

What about grammar?

Reality: Most top journals are English-only.

- Some reviewers (like me) get really irritated by badly written English. Fine-tune the language so that your logic and results are clear. Then reviewers can focus on math/scientific content.
- Sloppy use of language is a symptom of sloppy thinking.
- I'm not suggesting that authors who are non-native English speakers are sloppy writers! But they can be at a disadvantage.
- You can sometimes get away with spelling/grammar errors, and your sloppy paper may even get into print (in a lower-quality journal).
- Don't harm your scientific reputation by submitting anything that isn't the best you can possibly make it.

Literary style

- Use sentences with varied length and structure.
- Don't write huge run-on paragraphs.
- Each paragraph should have a purpose and a well-organized flow.
- Use active voice

he said, we derive, they found

instead of passive voice

was communicated by, is derived as follows, was found by

Choosing a title

Day's (1983) definition of a good title:

"The fewest possible words that adequately describe the contents of the paper."

- Besides the abstract, the title is the other component of a paper that is publicly available and indexed.
- Choose your title very carefully, considering that it should be brief, informative, serious and (if possible) catchy.
- Don't use any abbreviations or acronyms.
- **Tip:** See my slides on "What's in a title?"

Other issues related to header information:

- Your name: Use full name and initials, and don't change it! (ever)
- Keywords: Pick informative choices (they're also indexed)
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Finishing touches

- Use a spell-checker.
- Proofread multiple times, focusing on different aspects:
 - Grammar and sentence structure.
 - Citations, figure/table references and graphics quality.
 - “Big picture” and overall organization.
- Ask colleagues (not involved in the project) to read it for English and for content.
- Sleep on it for days or weeks, and then proofread again.

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Choosing a journal

- Read journal aims and scope.
- Look through editor list.
- Read articles from a couple of issues.
- Check your references and look for journals that appear often.
- Try to determine reviewing and editorial standards.
- Ask someone you know and trust for their suggestions.
- Understand journal rankings (ARC, Scimago SJR, ...).
- Check “[Backlog of Mathematics Research Journals](#)” in *AMS Notices*.

My advice: Aim for the highest quality journal with the most appropriate readership.

Tip: See my slides on “Academic Journals and Open Access”.

Research Journals Backlog

Journal (Print and Electronic)	Number Issues per Year	Approximate Number Pages per Year	2014 Median Time (in Months) from:			Current Estimate of Waiting Time between Submission and Publication (in Months)	
			Submission to Final Acceptance	Acceptance to Print	Acceptance to Electronic Posting	Print	Electronic
Michigan Math. J.	4	896	8	6	5	6	5
Monatsh. Math.	12	1920	3	2	1	4.5	3.5
Multiscale Model. Simul.	4	1500	6.7	5	3	11.7	9.7
Nonlinear Anal.	18	3816	5	2	1	7	5
Nonlinear Anal. Hybrid Syst.	4	560	10	3	1	13	10
Nonlinear Anal. Real World Appl.	6	1701	7	3	1.1	9	7
Notre Dame J. Form. Log.	4	600	7.5	20	20	23	23
Numer. Math.	12	2400	11	4	3	12	12
Pacific J. Math.	12	3072	7.9	9.3	9.3	15	15
Probab. Theory Related Fields	12	2580	7.9	9.1	1.1	17.4	8.8
Proc. Amer. Math. Soc.	12	5240	5.3	21.8	19.1	27.1	14.3
Proc. Lond. Math. Soc. (3)	12	2970	10.2	8.2	2.8	14.9	12.6
Publ. Math. de l'IHES	2	770	10.5	3.5	1.1	13.9	11.8
Quart. Appl. Math.	4	800	1.5	22.5	19.1	24	17.4
Rocky Mountain J. Math.	6	2100	10	27	24	28	25
Semigroup Forum	6	1400	9	9	1	19	10
SIAM J. Appl. Math.	6	2500	7.5	5	3	11.6	9.6
SIAM J. Comput.	6	1600	15.3	5.3	3.3	20.6	18.6
SIAM J. Control Optim.	6	3200	13.1	4.9	2.9	17.8	15.8
SIAM J. Discrete Math.	4	2250	10.1	5	3	14.7	12.7
SIAM J. Math. Anal.	6	4700	8.3	3.8	2.8	12.1	11.1
SIAM J. Matrix Anal. Appl.	4	1500	9.3	4.9	2.9	14.2	12.2
SIAM J. Numer. Anal.	6	3200	10.2	3.9	2.9	14.1	13.1
SIAM J. Optim.	4	2200	10	5.1	3.1	17.1	15.1

Choosing a journal

Some top journals in various sub-fields of applied math:

- **General:** SIREV, SIAP
- **Analysis:** Commun Pure Appl Math
- **Scientific Computing:** J Comput Phys, SISC, SINUM, Comput Meth Appl Mech Eng
- **Math Biology:** Bull Math Biol, J Theor Biol
- **Fluid Mechanics:** J Fluid Mech, Phys Fluids, Phys Rev E
- **Multidisciplinary:** PNAS, J Roy Soc Interface
- **Open Access:** Research in Math Sci NEW!

Article submission and review process

- 1 Submit your paper to a preprint server like arXiv, and make it available to the world.
- 2 Carefully read the journal “Guide for Authors”.
- 3 Write a cover letter and submit it along with the completed manuscript to your journal of choice.
- 4 Wait, anywhere from 2-12 months.
- 5 Deal with concerns from your referee reports, and resubmit.
- 6 Or if rejected, revise and send to another journal.

These are each pretty interesting topics in their own right, so I'll leave them for another day.

Tip: See my slides on “The Peer Review Process”.

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Why does an article get accepted?

Elsevier based this list on feedback from experienced editors:

- 1 It provides insight into an important issue.
- 2 The insight is useful to people who make decisions.
- 3 The insight is used to develop a framework or theory.
- 4 The insight stimulates new, important questions.
- 5 The methods used to explore the issue are appropriate.
- 6 The methods used are applied rigorously and explain why and how the data support the conclusions.
- 7 Connections to prior work in the field or from other fields are made and serve to make the article's arguments clear.
- 8 The article tells a good story.

Source: <http://www.elsevier.com/connect/8-reasons-i-accepted-your-article>

Why does an article get rejected?

Elsevier based this list on feedback from experienced editors:

- 1 It fails the technical screening: plagiarism, ethics, missing key elements, poor English, unclear, references incomplete.
- 2 It does not fall within the Aims and Scope.
- 3 It's incomplete: not a full study, ignores other important work.
- 4 The procedures and/or analysis of the data is seen to be defective.
- 5 The conclusions cannot be justified on the basis of the rest of the paper: illogical arguments, insufficient data, missing literature.
- 6 It's simply a small extension of a different paper, often from the same authors: incremental or cookie-cutter results.
- 7 It's incomprehensible.
- 8 It's boring.

Source: <http://www.elsevier.com/connect/8-reasons-i-rejected-your-article>

Last words

- Write often, every day if possible.
- Give oral/poster presentations at every opportunity. This provides even more chances for writing and organizing your work.
- Think critically about your research and constantly try to improve it.
- Read widely and learn from others' writing.
- When you hear about an award for “best paper”, read it!
- Get involved in reviewing articles as soon as you can, such as [Mathematical Reviews](#)
- Be persistent. Don't get discouraged.

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