How to write a scientific paper

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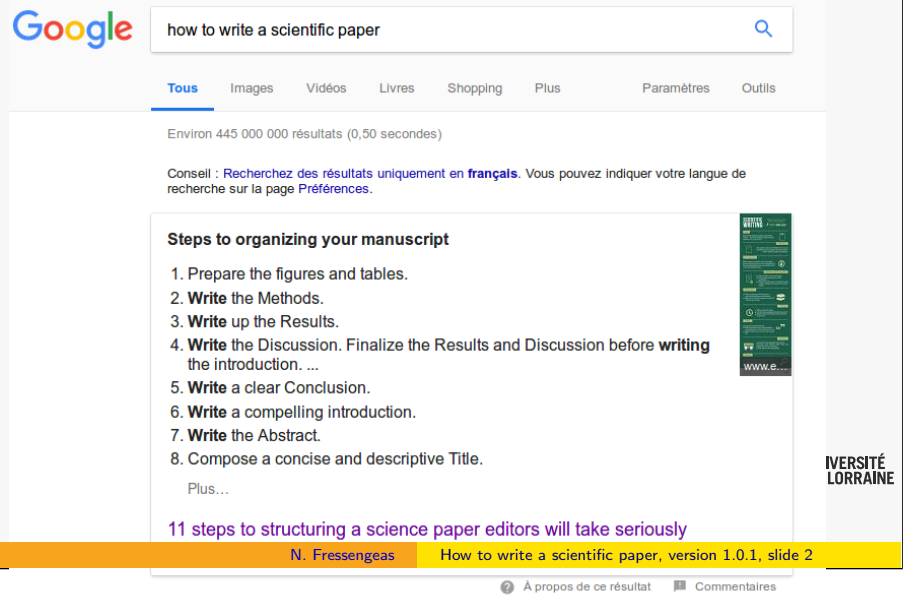
Notes

How to write a scientific paper

Google can tell you !



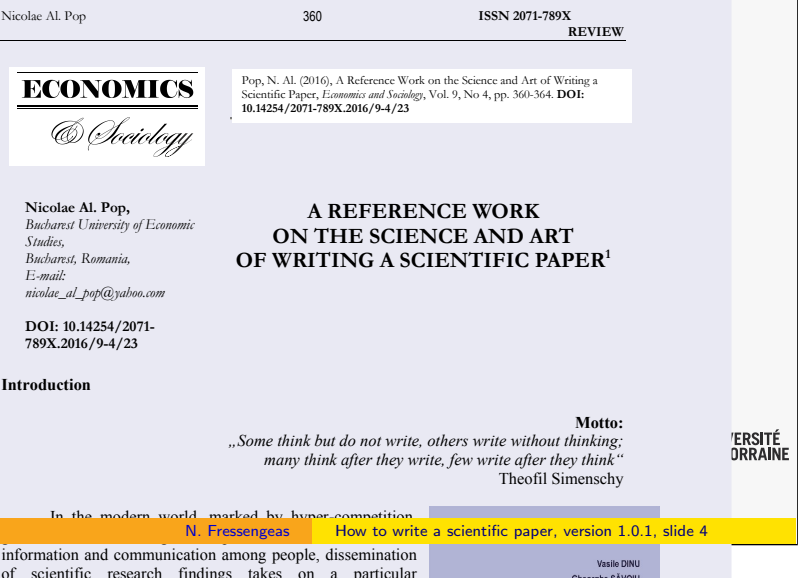
Notes

Even YouTube provides tutorials

- Learn how to write scientific papers in under 4 minutes
- How to Write a Paper in a Weekend (By Prof. Pete Carr)
- Judy Swan, Scientific Writing: Beyond Tips and Tricks

Notes

A reference work



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A REFERENCE WORK ON THE SCIENCE AND ART OF WRITING A SCIENTIFIC PAPER[1]

Introduction

Motto:
„Some think but do not write, others write without thinking; many think after they write, few write after they think"
Theofil Simenschy

In the modern world, marked by hyper-competition, information and communication among people, dissemination of scientific research findings takes on a particular

Vasile DINU

Notes

Part I

Tools for scientific writing

Notes

I Tools for scientific writing

Notes

The process of publishing a scientific paper

Choose the right journal

- Get inspired by your university policy
- Choose a journal that is read by your targeted audience
- If you can, choose Open Access journals
- Read the editorial guidelines

Write and publish

- Write your paper — this class
- Send it to journal
- Wait for reviewing
- Make corrections if necessary
- Publication occurs if reviewers agree

Notes

The first page of a scientific paper

- Informative short title
- Ordered author list
- Affiliations
- Keywords
- Article history
- Abstract
- Contact information
- Article reference

European Geriatric Medicine 6 (2015) 573–579

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com/en

Research paper

Writing a scientific article: A step-by-step guide for beginners

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ABSTRACT

Many young researchers find it extremely difficult to write scientific articles, and few receive specific training in the art of presenting their research work in written format. Yet, publication is often vital for career advancement, to obtain funding, to obtain academic qualifications, or for all these reasons. We describe here the basic steps to follow in writing a scientific article. We outline the main sections that an average article should contain; the elements that should appear in these sections, and some pointers for making the overall result attractive and acceptable for publication.

1. Background

Every researcher has been face to face with a blank page at some stage of their career, wondering where to start and what to write first. Describing one's research work in a format that is comprehensible to others, and acceptable for publication is no easy task. When you invest a lot of time, energy and often money in your research, you become intimately and emotionally involved. Naturally, you are convinced of the value of your research, and of its importance for the scientific community. However, the subjectivity that goes hand in hand with deep involvement can make it difficult to take a step back, and think clearly about how best to present the research in a clear and understandable fashion, so that others – likely, non experts in your field – can also appreciate the interest of your findings.

Even today, the old adage "publish or perish" remains valid. Many young researchers find themselves under pressure to produce scientific publications, in order to enhance their career prospects, or to substantiate requests for funding, or to justify previous funding allocations, or as a requirement for university qualifications such as a Masters degree or doctoral thesis. Yet, often, young doctors do not have much training, if any, in the art of writing a scientific article. For clinicians, in particular, the clinical workload can be such that research and scientific writing are seen to be secondary activities that are not an immediate priority, and to which only small amounts of time can be devoted on an irregular basis. However, the competition is already quite fierce amongst all the good quality papers that are submitted to journals, and it is therefore of paramount importance to get the basics right, in order for your paper to have a chance of succeeding. Don't you think that your work deserves to be judged on its scientific merit, rather than be rejected for poor quality writing and messy and confusing presentation of the data?

With this in mind, we present here a step-by-step guide to writing a scientific article, which is not specific to the discipline of geriatrics/gerontology, but rather, may be applied to the vast majority of medical disciplines. We will start by outlining the main sections of the article, and will then describe in greater detail the main elements that should feature in each section. Finally, we will also give a few pointers for the abstract and the title of the article. This guide aims to help young researchers with little experience of writing to create a good quality first draft of their work, which can then be circulated to their co-authors and senior mentors for further refinement, with the ultimate aim of achieving publication in a scientific journal. It is undoubtedly not exhaustive, and many excellent resources can be found in the existing literature [1–7] and online [8].

2. Getting started: things to do before you write a word

A certain amount of preparatory work needs to be done before you ever write a word of your article. This background work should generally already have been accomplished by the time you are at the writing stage, because it also serves as background to the research project you are writing about. All the time you invest in preparing the protocol for your project is an advance on the writing

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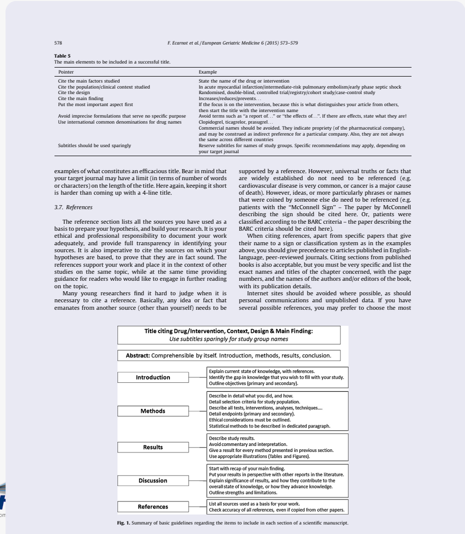
http://dx.doi.org/10.1016/j.eurger.2015.08.005
1878-7649/

Notes

The paper body

Sections, subsections, figures & tables

- Introductory section
- Sections and subsections
- Self-consistent figures
- Self-consistent tables



Notes

The paper end

Conclusion, acknowledgments and references

- Conclusion
- Acknowledgments
- Other mandatory sections
- References

Notes

The need for refences

Standing on the shoulders of giants

A scientific issue

In a scientific paper, *all sayings* must be

- either demonstrated,
- or taken from an identified referenced source.

A network issue

The way papers are linked through proper referencing

- shows the links between scientific domains,
- shows how people work together,
- provides a world-wide basis for scientific knowledge[a].

[a] See wikicite, crossref & the initiative for open citations

Notes

Do not forget the references

Researchers and advisors are touchy about references

An acknowledgment issue

Using other people work without citing it properly is BAD.
A good citation allows to find the way to the original work.

An evaluation issue for researchers

The quality of a researcher's work is often evaluated on the number of times her/his papers are cited.
Career and salary may depend on it.

A reputation issue for institutions

International ranking is often based on papers citations rather than on papers themselves.
Institutions issue affiliation rules to ensure proper automatic attribution.

Notes

Reference management

Real time tracking of the papers you read to ease proper referencing upon writing

Zotero — UL favorite

- Keeps tracks of web searches as you read
- Keep references in collections
- Allow participative work on a reference collection
- Easy export for one click proper citations
- Allow to match most journals citation habits
- Full training courses available here

Many other reference managers exist — *e.g.* JabRef

`https://en.wikipedia.org/wiki/Comparison_of_reference_management_software`

Notes

Focus on content, not on presentation

All journals have different guidelines for presentation, though all articles share the same structure

Jourrnal articles share the same structure

- All journal articles have title, authors, affiliations, abstract, references. . .
- which are typeset differently, depending on the journal.

Scientific writing is focusing on content

- OK for writing a short descriptive title, a meaningful abstract and properly referencing others work
- But who cares about character font or size and paper layout ?
- Not the scientist job ! Leave it to a software that knows better.

Notes

Markup languages: a universal solution

XML, HTML, WikiML, SVG, PDF... and LaTeX

Specify what things are, not *how*

This is a title

```
\title{My really neat short and descriptive title}
```

Abstract example

```
\begin{abstract}
A good research paper can be hampered by a poor abstract.
    The students following this class should thus focus on
    paper content rather than on its layout, so that they
    can summarize it properly in an attractive abstract.
\end{abstract}
```

Notes

OK, I specify what things are

Who will specify how things are ?

The rendering job is done by a software, upon your directives

- The web browser renders the HTML language
- LaTeXrenders this presentation as directed:

```
\documentclass{beamer}
\mode<presentation> {
  \usetheme{Warsaw}
  \usecolortheme{wolverine}
  \setbeamercovered{dynamic}
}
\usepackage[frenchb,english]{babel}
\usepackage[utf8]{inputenc}
\usepackage{xcolor}
\usepackage{listings}
\title{How to write a scientific paper}
\author{N.~Fressengeas}
...
```


Notes

Portability: another advantage of Markup languages

In the HTML world

Think of responsive websites which can be rendered differently on computers and smartphones using the same source code

In the LaTeXworld

- The same LaTeXcode can render articles for different journals
- LaTeXcode is plain text, available on all platforms
- LaTeXcode is stable through time
- LaTeXcan, in some conditions, be converted to HTML

Notes

LaTeX, a typesetting system

Read more: The not so short introduction to LaTeX or Une courte (?) introduction à LaTeX

Origins

- Written originally in 1983 by Leslie Lamport
- Uses TeX for typesetting
- Free open source sofware
- Current LaTeX engine: `pdflatex`

LaTeX step by step

- Use your favorite text editor to produce LaTeX code
- Run the `pdflatex` engine on the source code to get the PDF
- View the result with your favorite viewer

Notes

LaTeX all-in-one writing environment

TexStudio, Kile, TeXShop, TeXMaker, WinEdt, TeXnicCenter...

All-in-one environments simplify the use of LaTeX

- Integrated code writing, LaTeX-compiling and PDF viewing
- In-line help on code writing
- Multiple file management
- Spell-checking
- ...

Collaborative online environment

- Overleaf for collaborative LaTeX
- CoCalc for a collaborative environment including LaTeX and various scientific softwares, allowing interactions between them[a]

[a] For example: embed `R`, `sage` ou `python` calculations in LaTeX

Notes

LaTeX, dedicated to scientists

A few features

Focus on content, forget about presentation

A state-of-the-art typesetting system will do the presentation for you

Neat equation rendering

```
\[\sum_{n=1}^{+\infty}\frac{1}{n^2}=\frac{\pi^2}{6}\]
```

$$\sum_{n=1}^{+\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

Journal specific class files

Specifying the journal as your document class will set lay-out up for you

Notes

My first article

```
\documentclass[12pt]{article}
\title{My very first article in \LaTeX}
\author{Nicolas Fressengeas}
\begin{document}
\maketitle
\begin{abstract}
This is my very first article in \LaTeX. I
     will thus try to keep this abstract
     short
\end{abstract}
An introductory material can come before
     the first section
\section{\LaTeX\  is so great}
I love using \LaTeX. That is the reason why
      this section is named this way.
\section{Make the students understand it}
There is simply no other way to write, or
     beam, science. May my students
     understand this after this class !
\section{Conclusion}
This is nearing to the end of the first
     part of this class dedicated to tools
     . Now is the time to practice, before
      going into more scientific details.
\end{document}
```

My very first article in LaTeX

Nicolas Fressengeas

September 25, 2018

Abstract

This is my very first article in LaTeX. I will thus try to keep this abstract short

An introductory material can come before the first section

1 LaTeX is so great

I love using LaTeX. That is the reason why this section is named this way.

2 Make the students understand it

There is simply no other way to write, or beam, science. May my students understand this after this class !

3 Conclusion

This is nearing to the end of the first part of this class dedicated to tools. Now is the time to practice, before going into more scientific details.

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Notes

Learn LaTeX How–To through practice

Typeset a Wikipedia article of your choice using LaTeX.
Leave out and figures and references, for the moment.
Try to target a specific journal using its LaTeX class.

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Notes

Part II

The process of writing an article

Notes

II The process of writing an article

Notes

Read before you write

Be sure to stand on the shoulders of the giant

Literature review — Scientific & technological intelligence

- Scientific writing is always about a first-time-ever
- Read related work
- Record related work
- Get your scientific intelligence organized
- Get help from a community reference manager

Reference managers — My favorites

- `https://en.wikipedia.org/wiki/Comparison_of_reference_management_software`
- For yourself: JabRef
- Community work: Zotero
  - Domptez la Doc

Notes

Efficiently recording relevant literature for further reference

BibTeX: a reference management software and a raw text file format

BibTeX: manage your reference and get them cited in LaTeX

- Store your references in one, or several, `.bib` files
- Cite a reference as you write `\cite(ref-key)`
- Get the references automatically filled in with the layout of your choice

Notes

The BibTeX file format

A raw text file for all your bibliographic data

A sample BibTeX item

```
@article{ECARNOT2015573,
title = "Writing a scientific article: A step-by-step guide for beginners",
journal = "European Geriatric Medicine",
volume = "6",
number = "6",
pages = "573 - 579",
year = "2015",
issn = "1878-7649",
doi = "https://doi.org/10.1016/j.eurger.2015.08.005",
url = "http://www.sciencedirect.com/science/article/pii/S1878764915001606",
author = "F. Ecarnot and M.-F. Seronde and R. Chopard and F. Schiele and N.
     Meneveau",
keywords = "Scientific publications, Writing, Research, Article"
}
```

Tune the elements you need

- `@article`, `@book`, `@inproceedings`, `@phdthesis`...
- ECARNOT2015573: an arbitrary key
- Self-explanatory fields, some required, others optional

Notes

Build a `.bib` database of your own

`.bib` hand editing or using JabRef or Zotero

`.bib` hand editing

- Use your favorite raw text editor to manually fill in your `.bib` file.
- Use references of your own or from a Wikipedia article
- A LaTeX designed raw text editor[a] can help fill `.bib` file

[a] TexStudio, Kile, TeXShop, TeXMaker, WinEdt,TeXnicCenter...

`.bib` assisted editing

- Use JabRef and/or Zotero and/or a reference manager of your choice to build a bibliographic database[a]
- Export a `.bib` BibTeX file

[a] Use references of your own or from a Wikipedia article

Notes

Actual paper writing

OK... Research background read and recorded... Research itself ready for writing...

DO NOT start by the beginning

It is REALLY difficult to start writing an article without knowing the end

DO NOT start by the end

It is REALLY difficult to imagine the end of an article without having written the beginning

Imagine a way to write all the article as a whole

Successive approximation writing

Notes

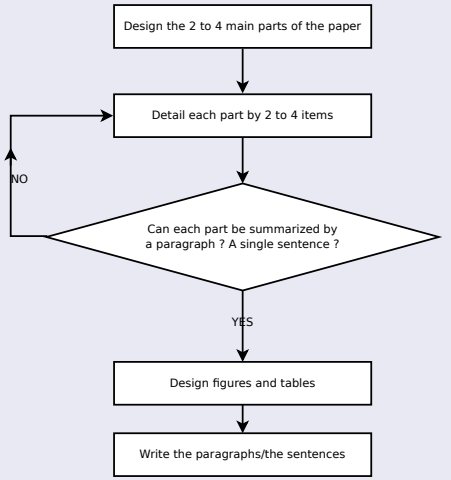
Successive approximations writing

Writing the paper as a whole to keep constistency throughout the writing process

A paper being written

- Introduction
- Part I
  - part
  - part
  - part
- Part II
  - part
  - part
  - part
- Part III
  - part
  - part
  - part
- end matter

A simple algorithm



Notes

Figures and tables are really important

The hasty reader reads: title, abstract, author list, figures, references, conclusion... and sometimes the paper

Successful production of good figures requires substantial effort

- Use vector graphics[a] for infinite resolution and small file size
- Insure good resolution for pictures
- Keep it clear and simple
- Insure black & white readability
- My favorites to create figures: `Python` & `matplotlib`, `SageMath` and `inkscape`

[a] Vector graphics: PDF, EPS, SVG...

Self-consistent figures, tables and captions

A paper should be understandable through the figures, tables, and their captions

Notes

LaTeX how-to for figures and tables

Be sure to use PDFLaTeX, otherwise, only EPS file format is allowed

Include the graphics package

```
\documentclass{article}
%
\usepackage{graphicx} % graphicx is the modern version of graphics
%
\begin{document}
```

Create a figure file

- Preferably a vector PDF graphics file
- PNG for bitmap graphics, JPG for pictures

Declare the figure at the right place

```
\begin{figure}
\centering
\includegraphics{Tux.png}
\caption{Tux, le pingouin}
\label{Tux}
\end{figure}
```


Notes

Inserting figure at the right place

Let LaTeXplace the figures nicely, it knows what its doing

Editing rules for figures and tables

- Figure as close as possible to its declaration
- Figure never before its declaration
- Figure does not break text
- Figure preferably on page top, bottom if possible, on page if necessary
- If text is present on page a minimum fraction of the page is required

Let LaTeXplace the figure

Declare the figure just before the paragraph where it is referred first

Notes

Figure and table reference

Automated numbering of figures and tables for an atomatic referencing

The `\label` command

- `\label{AnyKeyYouWant}`
- For figures, table, equations, sections...
- Allows automated referencing to the object it is in

The `\ref` command

- The `\ref{AnyKeyYouWant}` command is replaced by the referenced object number

The `varioref` package

- Numerous figures can be rejected far from their reference
- In a long document, figures can lie many pages before `\ref`
- `varioref` is the solution: it includes the page number along with the figure number

Notes

As you write and cite, the reference list builds up

BibTeX and LaTeX magic

Place at the end of your paper

```
\bibliographystyle{unsrt} % or any other relevant style
\bibliography{bibfile1,bibfile2,bibfile3...}
```

Notes

Build the skeleton of your first scientific paper

Ultra detailed outline, figures and automatic citations

Get ready for writing

- Design your paper skeleton using successive approximation writing
- Carefully design self consistent figures and tables
- Declare them in your paper skeleton[a]
- Link your bibliography database

[a] Don't worry, LaTeXwill stack them et the end of the paper, but this will change as text is added

Notes

Introduction

Decribes the time and space context of the work to make the paper readable as a whole

Introduction probably includes

- The paper specific domain
- A description of the problem tackled
- A review of the past attempts to tackle the same problem
  - Lots of references here
- A description of the novelties your work proposes
- A review of the article organization and strategy to present the work done
  - Materials, methods, experiments. . .
  - Results
  - Discussion

Notes

Materials, methods, experiments. . .

Describes the methods used so that the work can be *reproducible*

First goal: convince that your methods are scientifically sound

- Be sure to give all the details
- Include experimental framework and detailed conditions
- Include data collection and analysis
- Justify all, either directly of through references

Second goal: make your work *reproducible*

- Be sure to give all the details
- Open the methods as much as you can:
  - Measurement apparatus model, reference, *and inner details*
  - Open source software, or precisely referenced software
  - Detailed experimental sketches
  - . . .

Notes

Results

Results, only results: give the reader a chance interpret them on his/her own

Give raw results in a human understandable manner

- Small tables
  - Avoid huge tables
- 2D curves
  - Think twice before going 3D
  - If approximations or interpolations are done, tell why and how

Consider publishing your data in data warehouses

- Allows the reader to get the numbers
- Insure a long life to your data
- Allow others to browse your data
- Certify your data is sound and honest
- Allow Google and other to index your data
- Produce a DOI for your CV

Notes

Discussion

The only section which can go away from raw facts

Finally, you can write about what you are thinking

Potential advices:

- summarize your problem,
- clarify your hypotheses...
- and finally write about what you refrained to say from the very beginning.

Notes

Scientific writing style
Be clear and concise

Be clear
- Define everything: math variables, acronyms...
- One word has one specific meaning: chose carefully
- Avoid *and so on*, *etc.*...

Be concise
- Do not say anything twice,
  - unless you have a good reason.
- Avoid literature style effects,
  - except if it allows even more conciseness.

Avoid
- trying to impress the reader,
- using abbreviations ("does not" instead of "doesn't").

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Notes

Final note on plagiarism and referencing
About using the work of authors, or the shoulders of giants

Using the work of authors is good, and necessary
- Be sure to completely understand the cited work
- Properly reference the previous writings
- Even properly referenced figures can be reused, if their license[a] allows so
- If absolutely necessary, the words of others can also be used, between quotes and properly attributed

[a] Present licenses tend to go towards the CC-BY Creative Commons Attributions licence

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Notes

Advanced team working

Writing a paper is usually a team work. `git` is the ultimate solution

Using git for collaborative LaTeX

- Use `gitlab` on `https://framagit.org`
- `https://youtu.be/YprjPIMtFnk`
- `https://www.google.com/search?q=git+latex`
- `https://twitter.com/Blogozoic/status/954089174461755392`

Notes

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