

# **Methods Training**

## Scholarship, Posters and Thesis

### (English)

Dr. Karl N. Kirschner

Spring 2018

Day	Date	Session	Topic
1	13-02-2019	Morning (9:00 – 12:00)	Introduction
1	13-02-2019	Morning	Scholarship and research
1	13-02-2019	Morning	Taking notes
1	13-02-2019	Afternoon (13:00 – 15:30)	Posters
1	13-02-2019	Afternoon	Intro to Linux, desktop, command line
1	13-02-2019	Afternoon (15:30 – 18:00)	Personal working time (poster)
2	14-02-2019	Morning	Citations
2	14-02-2019	Morning	Literature searching and bibtex files
2	14-02-2019	Morning	Reference management (Citavi and Jabref)
2	14-02-2019	Afternoon	Inkscape & (Python3 ?)
2	14-02-2019	Afternoon	Personal working time (poster)
3	15-02-2019	Morning	Research questions and hypotheses
3	15-02-2019	Morning	Writing your thesis and personal time line
3	15-02-2019	Morning	FAQ thesis, LATEX
3	15-02-2019	Afternoon	Personal working time (poster)
17-02-2019		Night (21:00)	Final PDF uploaded to LEA
4	18-02-2019	Morning 9:00	Poster PDF must be delivered to printshop
4	18-02-2019	Morning (1 hr)	Git
4	18-02-2019	Morning 10:00	Library seminar
4	18-02-2019	Afternoon	Significant figures and rounding
4	18-02-2019	Afternoon	Personal working time
5	19-02-2019	Morning	Ethics
5	19-02-2019	Morning	Course evaluations
5	19-02-2019	Afternoon	Poster presentation
??-??-2019		08:00-11:00	Poster Session at the Niehl training center

# **Questions or comments from last lecture(s)?**

**German and English Thesis Examples and Template:**

[https://gitlab.com/k.n.kirschner/H-BRS\\_Thesis\\_Template.git](https://gitlab.com/k.n.kirschner/H-BRS_Thesis_Template.git)

## **FAQ About Thesis:**

LEA → EMT-Studieninfos → Prüfungen → FAQ →

Häufige Fragen zu Prüfungsangelegenheiten →

Prüfungsinformationen für alle EMT-Studiengänge: →

Fragen zur Abschulssarbeit und zum Kolloquium

Bib-Cloud – <https://www.h-brs.de/en/bib/cloud-storage-keep-your-files-safe-bibcloud>



Photo by David Iskander on Unsplash

## Why write a thesis?

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- Requirement for your degree
  - It is a conversation with the world (and future students)
  - Write to remember and to archive your thinking, ideas, workflow, etc.
  - Write to understand both your data, other's data/results/conclusions and the state-of-the-art
  - Write to gain a perspective - make your thoughts clearer and more specific
  - Improve your critical reading
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W. Booth, G. Colomb, and J. Williams. *The Craft of Research, Third Edition*.  
Chicago Guides to Writing, Editing, and Publishing. University of Chicago Press, 2009

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## Story telling in a thesis

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"The process of writing a ... [thesis] is analogous to telling a story. Like every well-written story, a ... [thesis] should have a beginning (**Introduction**), middle (**Materials and Methods**), and an end (**Results**). The **Introduction** presents the topic and identifies the purpose of the study, the **Materials and Methods** section tells what the author did to address that purpose, and the **Results** section presents what was observed. The **Discussion** (the moral of the story) puts the study in perspective. The **Abstract** is an opening summary of the story and the **Title** gives the story a name."

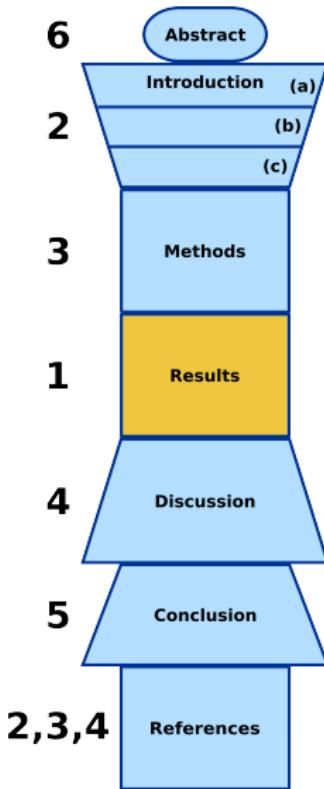
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Adapted from P. R. Manske. [Structure and format of peer-reviewed scientific manuscripts.](#)

*The Journal of Hand Surgery, 31(7):1051 – 1055, 2006*

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# The writing process

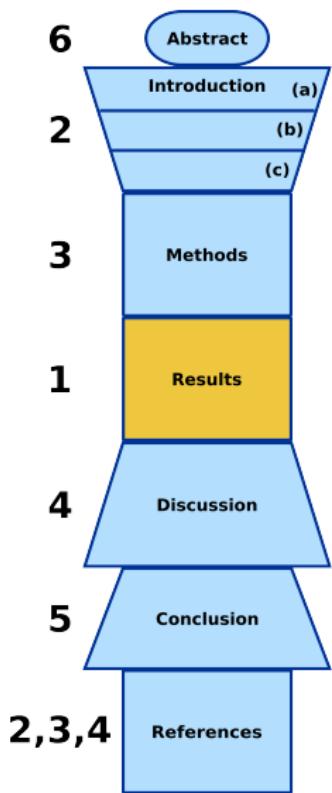


- 1: The whole structure (i.e. EVERYTHING) is governed by the Results
- 2a: Intro begins with a broad focus
- 2c: Intro ends with a focus - purpose, aim, or principle findings
- 2b: In the middle, background info, previous work, what is missing
- 3: In Methods a) one establishes the credibility for the results, and b) it should allow for reproducibility

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M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*  
John Wiley & Sons, 2013

## The writing process



- 4: The Discussion starts off focused on specific results, but could/should end with a broad focus
- 5: Conclusion is similar to the Discussion, but more concisely written without reference to specific raw data – a summary of the take-home points
- 6: The Abstract is a concise summary (again), but is intended to capture the reader
- 2,3,4: References will automatically be done once you have written the Intro, Methods, and Discussion.

## Results: 1<sup>st</sup> thing to do: create figures and tables

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- DATA, Data, data!!!
- Identify, from your results, a clearly connected story that leads to a "take-home-message"
- Your first draft will undergo revisions
- Initially be comprehensive, and then reduce by transferring data to SI material.
- Write one, two or three short summary statements based on your initial analysis/thoughts of the figure and tables (devote lots of time to this).

## Results: When to make tables versus figures

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### Use Tables

- when working with numbers
- when focus is on individual data values
- when accuracy or precision of specific data is important

### Use Figures

- when working with shape/picture
- when focus is on overall pattern
- when accuracy or precision of data is unimportant

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M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*  
John Wiley & Sons, 2013

## Results section

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- Present (nearly) the most important data that is needed for the Discussion section. (Some of the data will go into Supplementary Information.)
  - Introduce and locate the figures and tables.
  - Highlight the important findings (try not to discussing the data)
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W. Zhang. [Ten simple rules for writing research papers.](#)  
*PLOS Computational Biology*, 10(1):1–3, 01 2014

## Results: Example paragraph - introduce and location

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"The corresponding **RMS deviations** (RMSDs) for each fully optimized conformation **with respect to** MP2/aV5Z geometries are given in SI-Table 1, and are **summarized** in Table 2."

"Plots of the **training sites against the first four canonical variates** of the discriminant function **are shown in** Figure 5."

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M. M. Lewis. Numeric classification as an aid to spectral mapping of vegetation communities.  
*Plant Ecology*, 136(2):133–133, Jun 1998

## Results: Example Paragraph - introduce, location & highlight

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"The dendrogram **summarising** the ground cover classification **shows** four broad groupings of the sample sites and nine classes at higher levels of similarity (**Figure 4**)."

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"The final image classification, in which 50 spectral classes have been assigned to their corresponding ground cover classes, is presented in Figure 6. In general the distribution of communities shown reflects that observed in the field. The eastern plains flanking..."

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## Results: Example Paragraph - introduce, location & highlight

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"Figure 3 demonstrates that cylinder deactivation allows an improved turbine outlet temperature vs. BSFC trade-off for exhaust after treatment thermal management. Specifically, cylinder deactivation enables turbine outlet temperatures..."

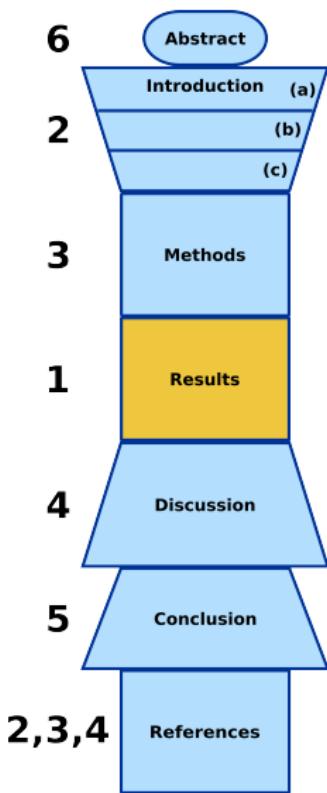
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M. M. Lewis. Numeric classification as an aid to spectral mapping of vegetation communities. *Plant Ecology*, 136(2):133–133, Jun 1998 X. Lu, C. Ding, A. K. Ramesh, G. M. Shaver,

E. Holloway, J. McCarthy, M. Ruth, E. Koeberlein, and D. Nielsen. Impact of cylinder deactivation on active diesel particulate filter regeneration at highway cruise conditions. *Frontiers in Mechanical Engineering*, 1:9, 2015

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## Discussion section



- 4: The Discussion starts off focused on specific results, but could/should end with a broad focus
- 5: Conclusion is similar to the Discussion, but more concisely written without reference to specific raw data – a summary of the take-home points
- 6: The Abstract is a concise summary (again), but is intended to capture the reader
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## Discussion section

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A Discussion section can, but not necessarily, contain:

- 1 Reference the main purpose or hypothesis of the study, or summarize main activity of study
- 2 **How you interpret the figures and tables** (i.e. the data) with respect to the underlying story that you are telling
- 3 **Drawn conclusions and an explanation of your finding**, and supported by references
- 4 **Limitation of the study**
- 5 Implication to the broader field (i.e. the bigger picture)
- 6 Recommended future research (also good for Conclusion)

Items 2–5 can occur multiples times for each grouping of results that you have.

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M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*

John Wiley & Sons, 2013 W. Zhang. *Ten simple rules for writing research papers.*  
*PLOS Computational Biology*, 10(1):1–3, 01 2014

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## Discussion section

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Modulate the strength of your claims by:

- Choosing your verb (e.g. demonstrates versus appears)
- Using modal verbs (e.g. may be, might be)

**Example Paragraph:**

"All of these barriers are lower than those seen in ethanol and propan-2-ol, whose lowest barrier was 3.134 kcal/mol. Adjusting these barriers by their local minimum (i.e. G<sup>+</sup>t, G-t, G<sup>+</sup>g<sup>+</sup>, G-g<sup>+</sup>, Tt and Tg<sup>+</sup>), results in energies that range from 2.597 to 2.769 kcal/mol. Thus, all nine methyl rotor barrier heights occur within a narrow 0.172 kcal/mol window of one another. Consequently, their individual identification might be difficult to achieve spectroscopically."

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M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*  
John Wiley & Sons, 2013

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## Conclusion section

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The Conclusion will ideally contain

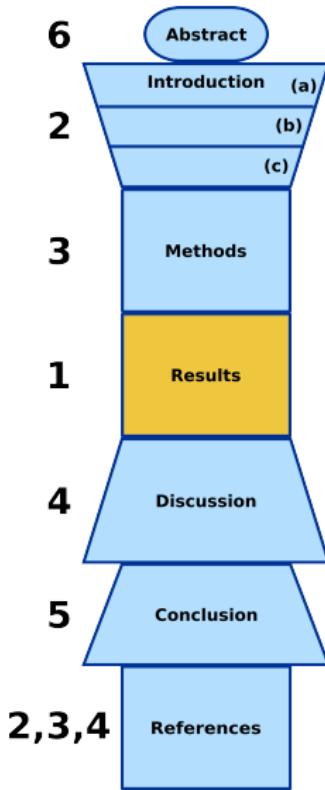
- A short statement of the manuscript's goals
- What was done
- What new knowledge is added to the community
- What are the next steps to be done

### Example:

“In this paper we present an extensive investigation of the minima and first-order saddle points for methanol, ethanol, propan-2-ol and propanol. All geometries were fully optimized at the MP2/aV5Z theory level, while the rPE were computed using CCSD(T). ... As anticipated, methyl rotation is most affected by the conformations that are adopted by adjacent torsion angles. ... It would also be possible to alternatively use Jensen basis sets [24-26] in the calculations, which might reduce the calculation cost.”

## Introduction section

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- 2a: Intro begins with a broad focus
- 2c: Intro ends with a focus - purpose, aim, or principle findings
- 2b: In the middle, background info, previous work, what is missing

## Introduction section

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There are several **possible** stages within an Introduction:

- 1 Setting the context - very broad statements; present tense (express something as "always true") or present perfect (have/has + past participle of the verb)
  - 2 Narrow it down to a smaller domain - what the thesis/article is about.  
Justify the authors' work - use references to support it - this is where you show your knowledge of the area; present perfect is often used - this is the state-of-the-art  
*"Smith has shown..."*
  - 3 Statements about the need for more investigations - what are the gaps or the niche  
*"It is presently unclear how..."*
- 

M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*  
John Wiley & Sons, 2013

## Introduction section

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- 4 State the purpose / main activity of this work - present or past  
"We show here the solution to..."  
"The work reported here were conducted..."
  - 5 Highlight the benefit of the work (can leave out) - present perfect & modal verbs  
"Researcher can use..."
  - 6 Outline the writing sections that are coming (can usually leave out - discipline dependent) - present tense
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M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*  
John Wiley & Sons, 2013

## Introduction section

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### Example:

“Understanding the conformational space of molecules and their underlying rPE surfaces are important goals in scientific disciplines whose experimental observables can be explained at a molecular level. ... Sophisticated quantum mechanics theories have proven to be a powerful tool in providing the structures and relative energies of minima that are as accurate as those provided by experimental spectroscopy [1-8]. ... In this paper we present the minima, first-order and second-order saddle points, and torsion-coupled rPE surfaces of the four smallest alcohol molecules computed at the CCSD(T)/aug-cc-pVTZ theory level. Our motivation for this study is to 1) ...”

## Title

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- Usually the first point that captures a readers attention
  - Make the title catchy
  - Use keywords/buzz words
  - It should reflect the article's essence and novelty to the field
  - It should be clear and concise (less than 12 words) (can increase your citations)
  - Avoid jargon or non-standard abbreviations
  - Reflects purpose of study, rather than its results
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M. van Wesel, S. Wyatt, and J. ten Haaf. [What a difference a colon makes: how superficial factors influence subsequent citation.](#)

*Scientometrics*, 98(3):1601–1615, 2014

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# Title

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- Write it using active verbs
  - "Effects of added calcium on ..."
  - "Calcium addition improves ..."
  
- Avoid a question or complete sentence - use a phrase
  - "Red hens undergo spontaneous chromosome rearrangement when exposed to ultraviolet light" to
  - "Ultraviolet light-induced chromosome rearrangement in red hens"

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M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*

John Wiley & Sons, 2013 M. van Wesel, S. Wyatt, and J. ten Haaf. *What a difference a colon makes: how superficial factors influence subsequent citation.*

*Scientometrics*, 98(3):1601–1615, 2014 G. M. Liumbruno, C. Velati, P. Pasqualetti, and

M. Franchini. *How to write a scientific manuscript for publication.*

*Blood Transfusion*, 11(2):217–226, Dec. 2012 <sup>a</sup>

[www.aje.com/en/arc/choosing-catchy-title-your-scientific-manuscript](http://www.aje.com/en/arc/choosing-catchy-title-your-scientific-manuscript)

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## Examples of article titles

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- Bad: “Critical Essay: Meta-analysis: A critical realist critique and alternative” (Human Relation 70, 2016, 11-39).
- Bad: “Structural insights into type I and type II of nsp4 porcine reproductive and respiratory syndrome virus (nsp4 PRRSV) by molecular dynamics simulations”
- Okay: “Micrometer-sized molecular robot changes its shape in response to signal molecules”

## Examples of article titles

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- Good: “The Effects of Light and Temperature on the Growth of Populations of the Bacterium, *Escherichia coli*”
- Good: “Cassini finds molecular hydrogen in the Enceladus plume: Evidence for hydrothermal processes”
- Good: “Overcoming catastrophic forgetting in neural networks” (top article March 2017)
- Good: “Determining climate effects on US total agricultural productivity”

## Keywords

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- These enable database searching and indexing
- Good selection of keywords
- Try to use controlled vocabulary or well known words
- Shouldn't contain words found in the title

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M. van Wesel, S. Wyatt, and J. ten Haaf. [What a difference a colon makes: how superficial factors influence subsequent citation.](#)

*Scientometrics*, 98(3):1601–1615, 2014

## Abstract section

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- Should be the last thing written for the manuscript
- The writing should be concise, easy to understand and broadly appealing
- Make the abstract attractive - bring the reader into the article
- Write it for non-specialists
- No citations

An Abstract should provide a 1 paragraph summary of the manuscript and its findings.

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M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*

John Wiley & Sons, 2013 M. van Wesel, S. Wyatt, and J. ten Haaf. *What a difference a colon makes: how superficial factors influence subsequent citation.*

*Scientometrics*, 98(3):1601–1615, 2014

## Abstract section

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Can contain:

- Some background information
  - **The purpose of the study and its scope**
  - Some info about the methods used
  - **The most important results**
  - **A statement of conclusion or recommendation**
- 

M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps.*  
John Wiley & Sons, 2013

## **Supplementary Material and how much do you put in SI?**

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- Why include SI material?
  
  
  
  
  
  
  
  
- What type of information do you put there?
  
  
  
  
  
  
  
  
- How much of that information do you include?

## **Best way to learn**

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Find a few articles within your field that have high citations, and that you think are good.

Study them for their content and layout, using what was presented earlier to guide your understanding.



Photo by Kyle Glenn on Unsplash

## Good principles & attitudes

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- 1 Determine a logical information flow - creatively create a set of figures and tables that alone can tell the story.
  - 2 Have clear captions to tables and figure, and clear keys for figures.
  - 3 Make the research goal/purpose self-contained and complete - define things that may not be obvious to target audience.
  - 4 Be concise (!) - "Overly elaborate writing is distracting and boring and places a burden on the readers."
- 

W. Zhang. [Ten simple rules for writing research papers.](#)  
*PLOS Computational Biology*, 10(1):1–3, 01 2014

## Good principles & attitudes

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- 5 Write and design the thesis passionately - this will be conveyed to the reader.
  - Avoid simple, boring, declarative sentences.
  - Pay attention to layout - paragraph indentation, page margins,
  - Again - creative figures and tables that convey much information

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W. Zhang. [Ten simple rules for writing research papers.](#)

*PLOS Computational Biology*, 10(1):1–3, 01 2014

## Good principles & attitudes

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### 6 Referee your own work/writing

- It will take multiple revisions before it is ready to send out.
- Inspect it in context to the state-of-the-art within the field.
- Role play as a professor  
(e.g. is that statement clear enough or am I assuming the reader knows something).
- Step away from the manuscript for a few days and then come back to it with a fresh perspective.

### 7 Collect feedback and critiques from those close to you

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W. Zhang. [Ten simple rules for writing research papers](#).

*PLOS Computational Biology*, 10(1):1–3, 01 2014



Photo by Giammarco Boscaro on Unsplash

## Additional literature and resources

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- Non-native English speakers: T. R. O'Connor and G. P. Holmquist.  
*Algorithm for writing a scientific manuscript.*  
*Biochemistry and Molecular Biology Education*, 37(6):344–348, 2009
- Elements of Style - online version at  
<http://www.bartleby.com/141/index.htm>
- English learning advice at  
<http://web.engr.illinois.edu/~taoxie/advice.htm>
- L. McGrath. Open-access writing: An investigation into the online drafting and revision of a research article in pure mathematics.  
*English for Specific Purposes*, 43:25 – 36, 2016

## Additional resources

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- G. M. Liumbruno, C. Velati, P. Pasqualetti, and M. Franchini. [How to write a scientific manuscript for publication.](#)  
*Blood Transfusion*, 11(2):217–226, Dec. 2012
- G. S. Patience, D. C. Boffito, and P. A. Patience. [How do you write and present research well? answers to the 20 questions.](#)  
*The Canadian Journal of Chemical Engineering*, 95(1):11–20, 2017
- P. E. Bourne. [Ten simple rules for getting published.](#)  
*PLOS Computational Biology*, 1(5):1–2, 10 2005
- W. Zhang. [Ten simple rules for writing research papers.](#)  
*PLOS Computational Biology*, 10(1):1–3, 01 2014
- V. Singh and P. Mayer. [Scientific writing: Strategies and tools for students and advisors.](#)  
*Biochemistry and Molecular Biology Education*, 42(5):405–413, 2014
- M. J. Katz. [From research to manuscript: a guide to scientific writing.](#)  
Springer Science & Business Media, 2009
- M. Davis, K. J. Davis, and M. Dunagan. [Scientific papers and presentations.](#)  
Academic Press, 2012



Photo by Dan Cook on Unsplash

## Humorous article titles

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- "Role of Childhood Aerobic Fitness in Successful Street Crossing."
- "Friends With Benefits: On the Positive Consequences of Pet Ownership."
- "Factitious Diarrhea: A Case of Watery Deception."
- "A Lucky Catch: Fishhook Injury of the Tongue."
- "Carbon Monoxide: To Boldly Go Where NO Has Gone Before."
- "A "Rose Is a Rose Is a Rose Is a Rose," but Exactly What Is a Gastric Adenocarcinoma?"
- "You Probably Think This Paper's About You: Narcissists' Perceptions of Their Personality and Reputation."

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[http://www.slate.com/articles/health\\_and\\_science/science/2015/12/  
the\\_best\\_funny\\_clever\\_or\\_offensive\\_science\\_paper\\_titles.html](http://www.slate.com/articles/health_and_science/science/2015/12/the_best_funny_clever_or_offensive_science_paper_titles.html)

- [1] W. Booth, G. Colomb, and J. Williams. *The Craft of Research, Third Edition*. Chicago Guides to Writing, Editing, and Publishing. University of Chicago Press, 2009.
- [2] P. E. Bourne. Ten simple rules for getting published. *PLOS Computational Biology*, 1(5):1–2, 10 2005.
- [3] M. Cargill and P. O'Connor. *Writing scientific research articles: Strategy and steps*. John Wiley & Sons, 2013.
- [4] M. Davis, K. J. Davis, and M. Dunagan. *Scientific papers and presentations*. Academic Press, 2012.
- [5] M. J. Katz. *From research to manuscript: a guide to scientific writing*. Springer Science & Business Media, 2009.
- [6] M. M. Lewis. Numeric classification as an aid to spectral mapping of vegetation communities. *Plant Ecology*, 136(2):133–133, Jun 1998.
- [7] G. M. Liumbruno, C. Velati, P. Pasqualetti, and M. Franchini. How to write a scientific manuscript for publication. *Blood Transfusion*, 11(2):217–226, Dec. 2012.
- [8] X. Lu, C. Ding, A. K. Ramesh, G. M. Shaver, E. Holloway, J. McCarthy, M. Ruth, E. Koeberlein, and D. Nielsen. Impact of

cylinder deactivation on active diesel particulate filter regeneration at highway cruise conditions. *Frontiers in Mechanical Engineering*, 1:9, 2015.

- [9] P. R. Manske. Structure and format of peer-reviewed scientific manuscripts. *The Journal of Hand Surgery*, 31(7):1051 – 1055, 2006.
- [10] L. McGrath. Open-access writing: An investigation into the online drafting and revision of a research article in pure mathematics. *English for Specific Purposes*, 43:25 – 36, 2016.
- [11] T. R. O'Connor and G. P. Holmquist. Algorithm for writing a scientific manuscript. *Biochemistry and Molecular Biology Education*, 37(6):344–348, 2009.
- [12] G. S. Patience, D. C. Boffito, and P. A. Patience. How do you write and present research well? answers to the 20 questions. *The Canadian Journal of Chemical Engineering*, 95(1):11–20, 2017.
- [13] V. Singh and P. Mayer. Scientific writing: Strategies and tools for students and advisors. *Biochemistry and Molecular Biology Education*, 42(5):405–413, 2014.

- [14] M. van Wesel, S. Wyatt, and J. ten Haaf. What a difference a colon makes: how superficial factors influence subsequent citation.  
*Scientometrics*, 98(3):1601–1615, 2014.
- [15] W. Zhang. Ten simple rules for writing research papers. *PLOS Computational Biology*, 10(1):1–3, 01 2014.