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How To Write and Perhaps Publish a Scientific Paper?

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Warning: The task of writing a research paper can be daunting.

How To Write a Paper that Readers Cite?

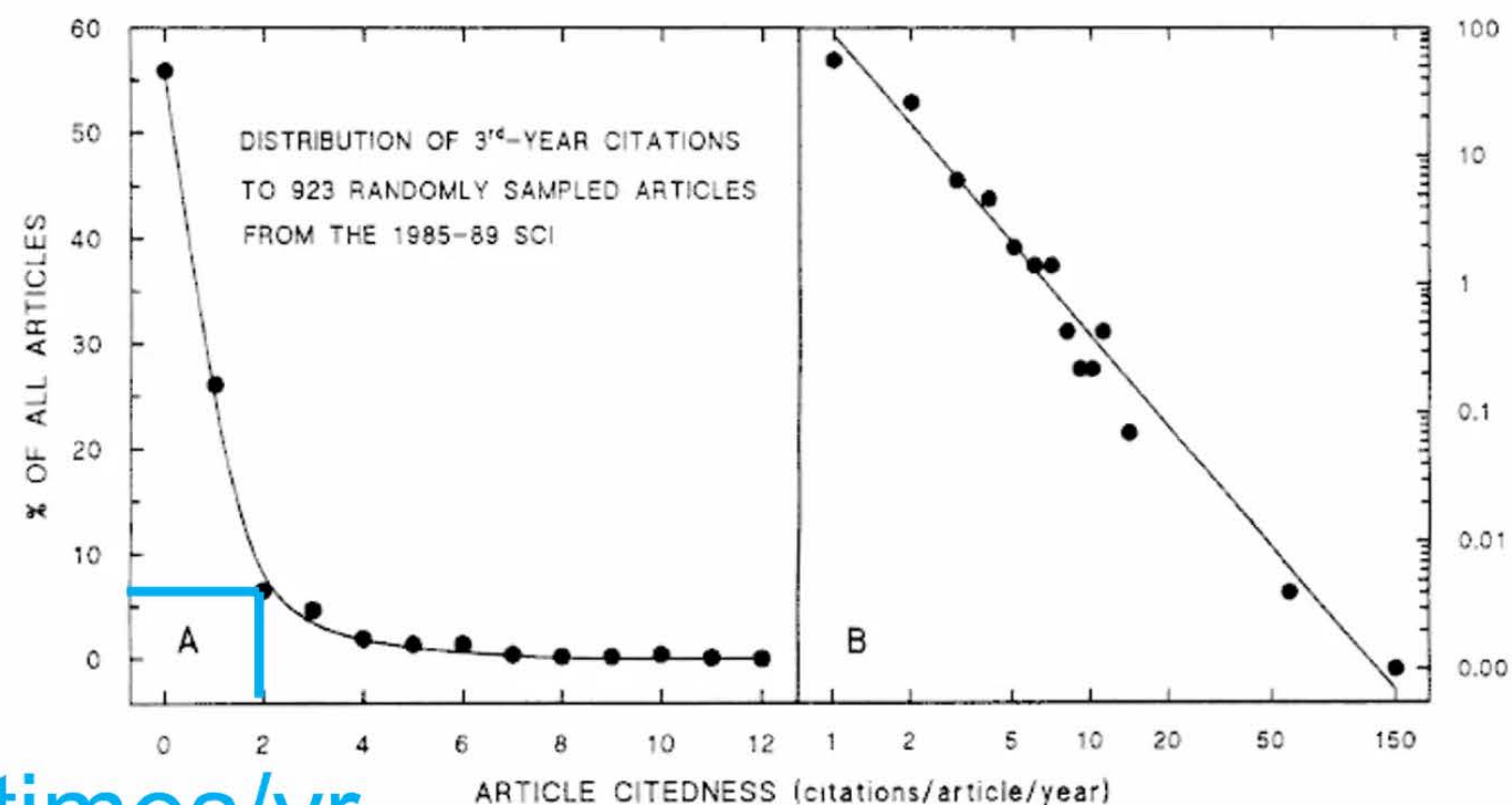
The Skewness of Science

Per O. Seglen

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Scientific publications are cited to a variable extent. Distributions of article citedness are therefore found to be very skewed even for articles written by the same author, approaching linearity in a semilog plot. It is suggested that this pattern reflects a basic probability distribution with some similarity to the upper part of a normal (Gaussian) distribution. Such a distribution would be expected for various kinds of highly specialized human activity, parallels being found in the distribution of performance by top athletes and in the publication activity of university scientists. A similar skewness in the distribution of mean citedness of different authors may combine with the variability in citedness of each author's articles to form a two-levelled citational hierarchy. Such a model would be capable of accounting for the extremely skewed distribution of citedness observed for all articles within a scientific field, which approaches linearity in a double-log rather than in a semilog plot.

The skewness implies that there will always be a large fraction of uncited publications, the size of the fraction depending on the citation practices (such as the number of references per publication) within the field in question. However, as part of a continuous probability distribution even uncited articles have a definite probability of contributing to scientific progress. Since it is furthermore impossible to eliminate uncited articles for statistical reasons, they should be the cause of neither worry nor remedy.



<6% of all papers are cited > 2 times/yr

Presentation Sources

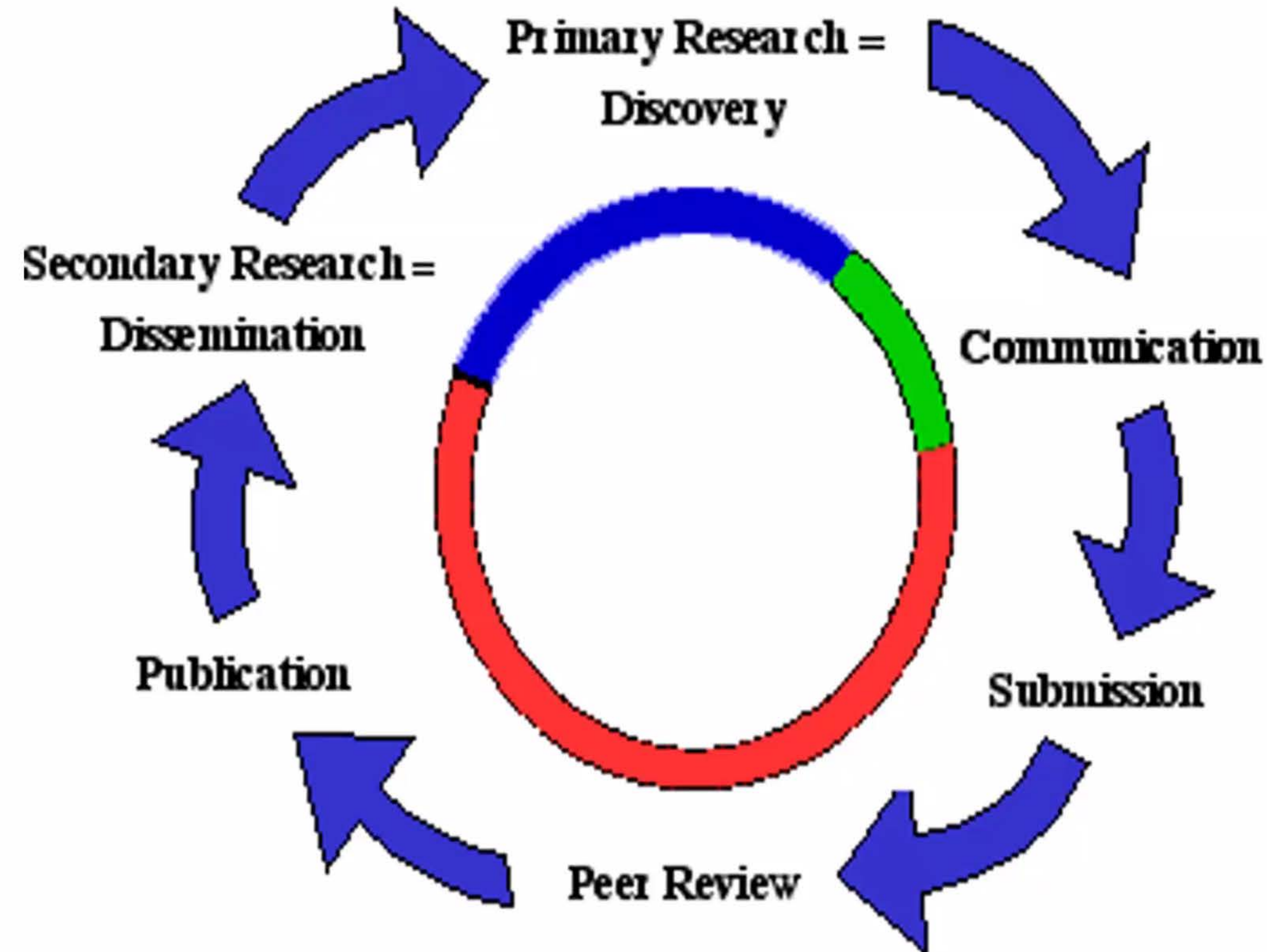
- Considered Content from Presentations by Elsevier and WHO
- Gopen, G.D., Swan, J.A., 1990. The science of scientific writing. American Scientist, 550-558.



Warning: Even with ground breaking research, unless the paper is **well written**:

- at best, publication will be delayed
- at worse, never published

Information Life Cycle



Why Publish: To **communicate** and **preserve** knowledge.

Why Publish: The **Publish or Perish** paradigm. Key indicator of academic success. Promotion and tenure committees value peer-reviewed publications above all.

Motivation to publish: Author's Perspective

- Dissemination (54% 1st choice)
- Career prospects (20% 1st choice)
- Improved funding (11% 1st choice)
- Ego (8% 1st choice)
- Patent protection (4% 1st choice)
- Other (3% 1st choice)

Bryan Coles (ed.) The STM Information System in the UK, BL
Report 6123, Royal Society, BL, ALPSP, 1993

Outline

- When to write a scientific paper

You have discovered something worth sharing.

- How to write a scientific paper

You will need a **structure** for your paper.

Always begin by reading the journal's **author guide**.

- Common mistakes
- How to get better at it

Structure of a Paper

Scientific writing follows a rigid structure –
a format developed over hundreds of years

Consequently, a paper can be read at several levels:

- Some people just refer to the **title**
- Some may read only the title and **abstract**
- Some may read the **figures and tables**
-
- Some read the paper **multiple times** for a deeper understanding

Footnote: The 'structured abstract' format is also invaluable for submitting papers to workshops or conferences.

Components of a Paper

Section	Purpose
Title	Clearly describes contents
Authors	Ensures recognition for the writer(s)
Abstract	Describes what was done – 150 words
Key Words (some journals)	Ensures the article is correctly identified in abstracting and indexing services
Introduction	Explains the problem
Methods	Explains how the data were collected
Results	Describes what was discovered
Discussion	Discusses the implications of the findings
Acknowledgements	Ensures those who helped in the research are recognised
References	Ensures previously published work is recognised
Appendices (some journals)	Provides supplemental data for the expert reader

Common Mistakes by All Authors



Authors Listing

- ONLY include those who have made an *intellectual contribution* to the research
- OR those who will publicly defend the data and conclusions, and who have *approved the final version*
- Order of the names of the authors can vary from discipline to discipline

Mistakes:

- Neglect to consult your advisors and/or colleagues to reach an understanding.
- List everyone in the lab or team as a co-author.

Title

- Describes the paper's content clearly and precisely including ***keywords***
- Is the ***advertisement*** for the article
- Do not use abbreviations and jargon
- Search engines/indexing databases depend on the accuracy of the title - since they use the keywords to identify relevant articles

Mistake: Long title loaded with jargons and abbreviations

Abstract

- **Briefly** summarize (approximately **150 words**) - the problem, the method, the results, and the conclusions so that
 - The reader can decide whether or not to read the whole article
- Together, the title and the abstract should stand on their own
- Many authors write the abstract last so that it accurately reflects the content of the paper

See: The Structured Abstract: An Essential Tool for Research
research.mlanet.org/structured_abstract.html

Mistake:

- Abstract reads like conclusion or mini-introduction.
- Abstract cannot stand alone.

For a critique of an article, see:
Authorship_Skills_Module_2_Annotated_Journal_Article
_Michele_Yeoman_Appendix_2013_10_pdf

OPEN ACCESS Freely available online

PLOS ONE

Crop Pollination Exposes Honey Bees to Pesticides Which Alters Their Susceptibility to the Gut Pathogen *Nosema ceranae*

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Abstract

Recent declines in honey bee populations and increasing demand for insect-pollinated crops raise concerns about pollinator shortages. Pesticide exposure and pathogens may interact to have strong negative effects on managed honey bee colonies. Such findings are of great concern given the large numbers and high levels of pesticides found in honey bee colonies. Thus it is crucial to determine how field-relevant combinations and loads of pesticides affect bee health. We collected pollen from bee hives in seven major crops to determine (1) what types of pesticides bees are exposed to when foraging for pollination of various crops and (2) how field-relevant pesticide blends affect bees' susceptibility to the gut pathogen *Nosema ceranae*. Our samples represent pollen collected by foragers for use by the colony, and do not necessarily represent foragers' roles as pollinators. In blueberry, cranberry, cucumber, pumpkin and watermelon bees collected pollen exclusively from weeds and wildflowers during our sampling. Thus more attention must be paid to how honey bees are exposed to pesticides outside of the field in which they are placed. We detected 35 different pesticides in the sample pollen, and found high fungicide loads. The insecticides esfenvalerate and phosmet were at a concentration higher than their median lethal dose in at least one pollen sample. While fungicides are typically seen as fairly safe for honey bees, we found a increased probability of *Nosema* infection in bees that consumed pollen with a higher fungicide load. Our results indicate a need for research on sub-lethal effects of fungicides and other chemicals that bees placed in an agricultural setting are exposed to.

Citation: Pettis JS, Lichtenberg EM, Andree M, Stitzinger J, Rose R, et al. Crop Pollination Exposes Honey Bees to Pesticides Which Alters Their Susceptibility to the Gut Pathogen *Nosema ceranae*. PLoS ONE 8(7): e70182. doi:10.1371/journal.pone.0070182

Editor: Fabio S. Nascimento, Universidade de São Paulo, Faculdade de Filosofia Ciências e Letras de Ribeirão Preto, Brazil

Informative, descriptive title in sentence form with a verb. Please note that not all publications accept sentence titles.

Overall, abstract is informative and concise

Use of "We" with active voice

Introductory sentences provide background and context.

Principal objectives are clearly identified with numbers.

Results concisely summarized.

Principal conclusion places paper in appropriate context with other studies and highlights areas for future research

Introduction

- **Clearly** state the:
 - Problem being investigated
 - Background that explains the problem
 - Reasons for conducting the research
- Summarize relevant research to provide context
- State how your work differs from published work
- **Identify the questions** you are answering
- Explain what other findings, if any, you are challenging or extending
- Briefly describe the experiment, hypothesis(es), research question(s); general experimental design or method (**The road map**)

Mistake: Fails to identify scientific question

Methods

- Provide the reader *just enough details* so they can understand and replicate your research
- Explain how you studied the problem, identify the procedures you followed, and order these chronologically where possible
- Explain new methodology in detail; otherwise name the method and cite the previously published work
- Include the frequency of observations, what types of data were recorded, etc.
- Be precise in describing measurements and include errors of measurement or research design limits

Mistake: Missing important details, or presenting too much details



Search ID: gri0050

Mistake:
methodology accounting for more than 1/3 of the paper.

Results

- Objectively present your findings, and explain what was found
- Show that your new results are contributing to the body of scientific knowledge
- Follow a logical sequence based on the *tables and figures* presenting the findings to answer the question or hypothesis
- Figures should have a brief description (*a stand alone legend*), providing the reader sufficient information to know how the data were produced

Mistake:

Goes beyond describing the data and began interpretation/discussion. It's ok to say "These data show that something is larger than something else ($p < 0.001$)". But not "The reasons why something is larger than something else are..."

Discussion/Conclusion

- Describe what your results mean in context of what was already known about the subject
- Indicate how the results relate to expectations and to the literature previously cited
- Explain how the research has ***moved the body of scientific knowledge forward***
- Outline the next steps for further study
- Do not extend your conclusions beyond what is directly supported by your results - avoid undue speculation

Mistake: Over-interpret the results, resulting in undue speculation

References

- Whenever you draw upon previously published work, you **must** acknowledge the source
- Any information not from your experiment and not 'common knowledge' should be recognized by a citation
- How references are presented varies considerably - refer to notes for authors for the specific journal
- Avoid references that are difficult to find
- Avoid listing related references that were not important to the study
- Use a bibliography software to manage your citations



Suddenly realized that the reference list had too many self citations...

Publish more/read less **dichotomy**

- **Author behavior**

- Want to publish more
- Peer review essential
- Other journal functions crucial
- Wider dissemination

- **Reader behavior**

- Want integrated system
- Browsing is crucial
- Quality information important
- Want to read less

Elsevier study of 36,000 authors (1999-2002) presented by Michael Mabe at ALPSP Seminar on “Learning from users” 2003; www.alpsp.org

How to Get Better at Writing?

**Read. Write with another good writer a few times.
Repeat.**

Gopen, G.D., Swan, J.A., 1990. The science of scientific writing. American Scientist, 550-558.

Strunk, W., Jr. and White, E.B. 2000. The Elements of Style (4th edition) First published in 1935.

<http://www.jlakes.org/ch/web/The-elements-of-style.pdf>

<https://faculty.washington.edu/heagerty/Courses/b572/public/StrunkWhite.pdf>

Read about 1000 papers during your PhD studentship.

Exercise: Analyze and improve a few writing samples

Misplacement of old and new information – No. 1 Problem

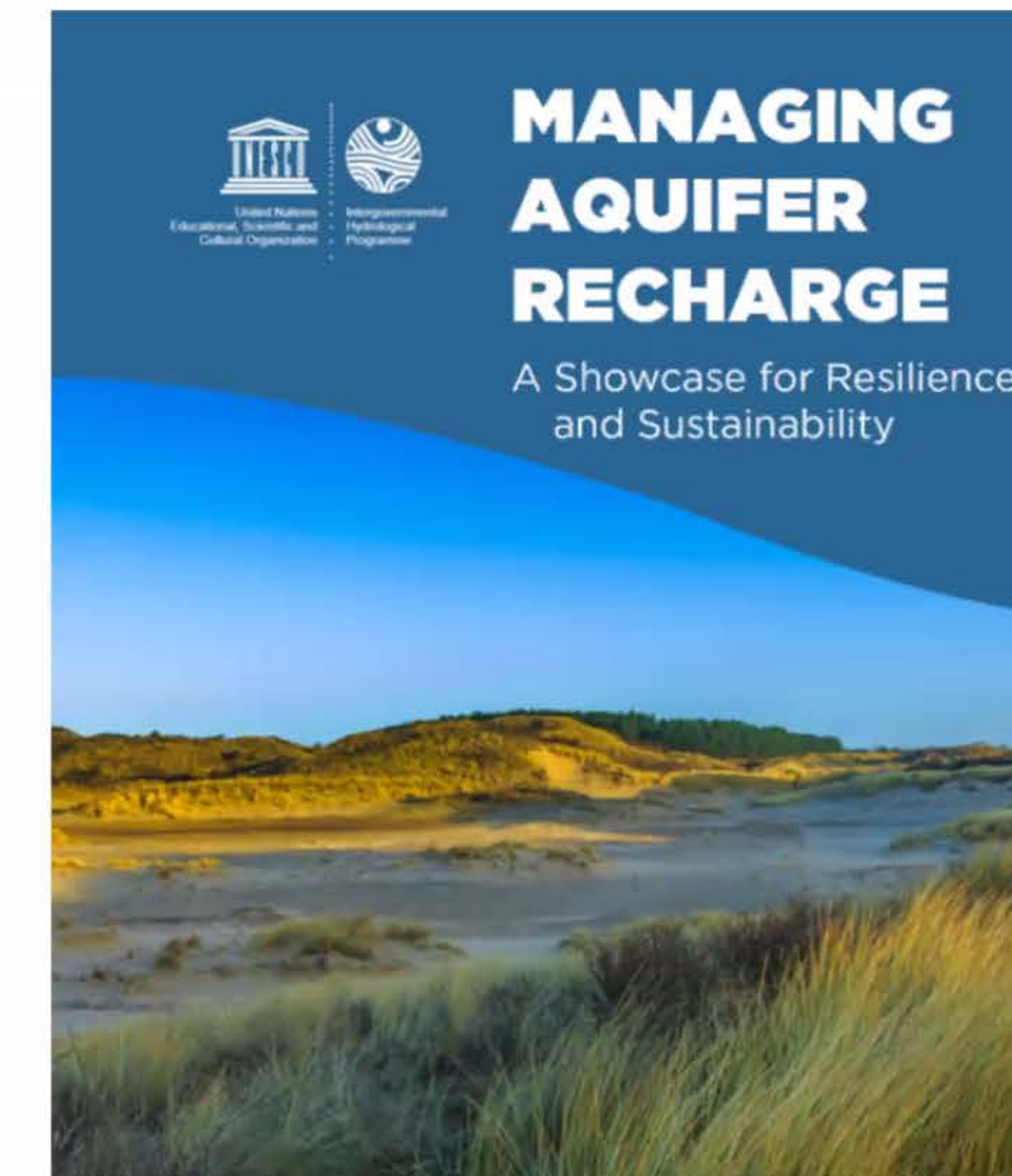
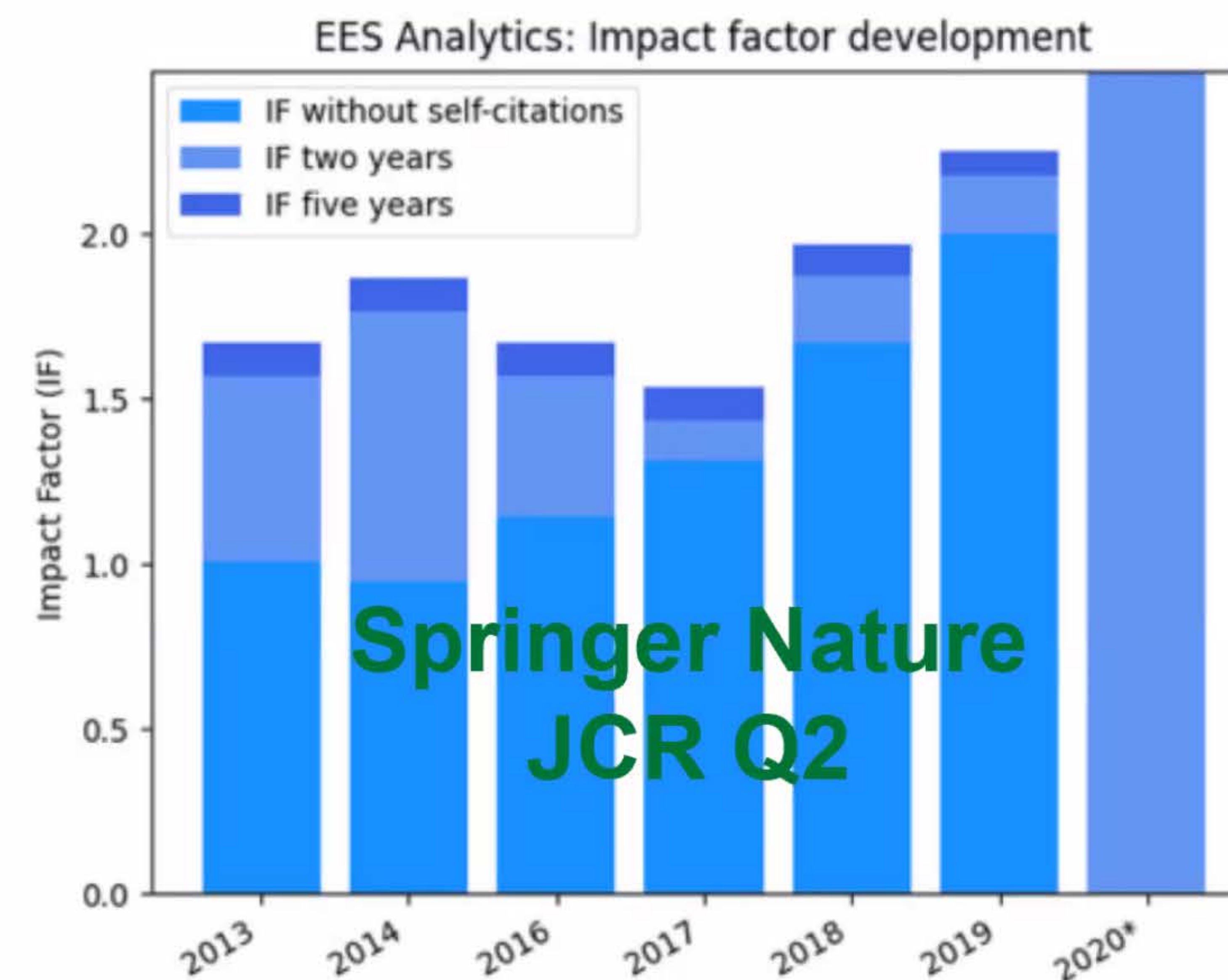
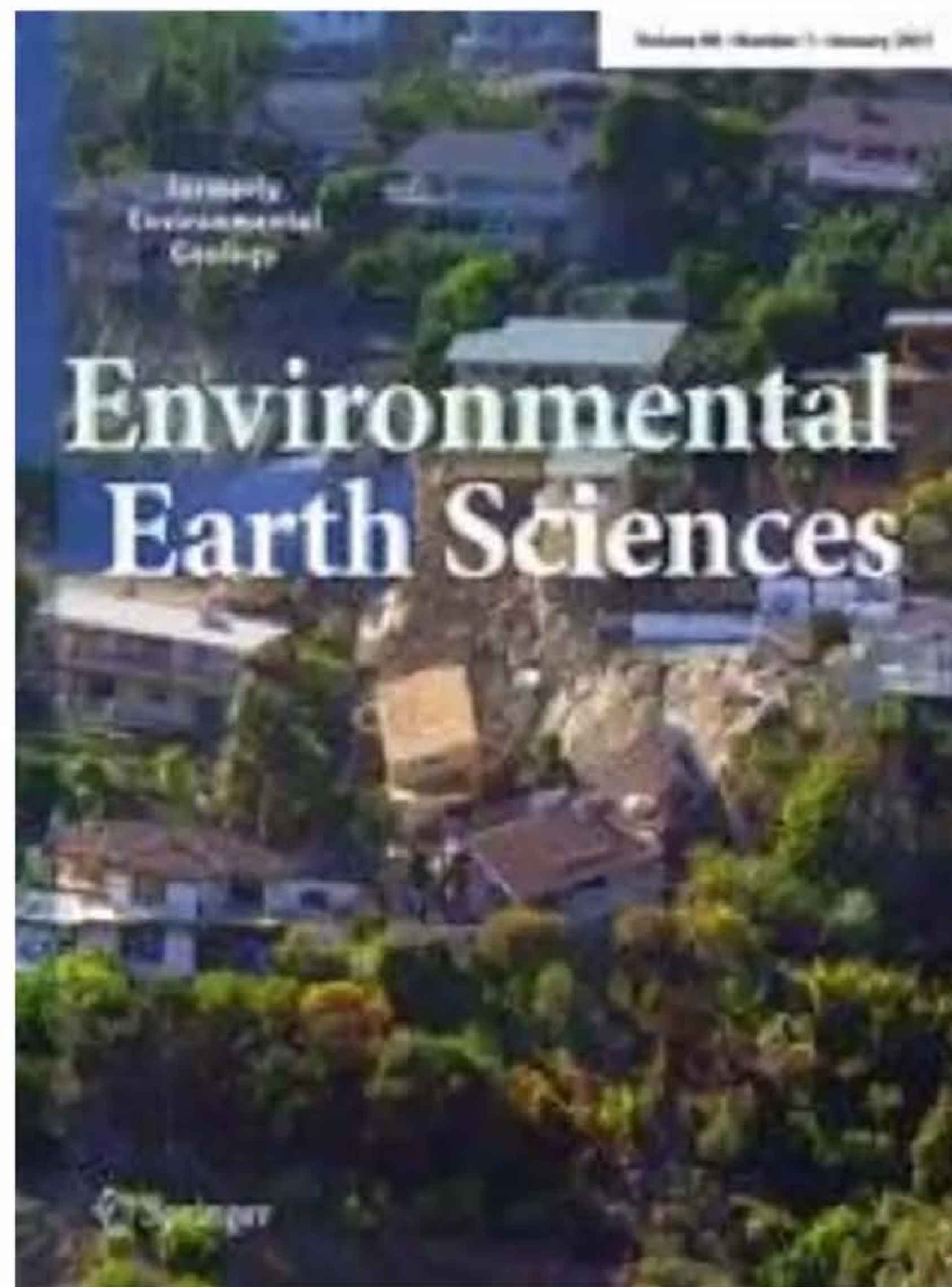
Large earthquakes along a given fault segment do not occur at random intervals because it takes time to accumulate the strain energy for the rupture. The rates at which tectonic plates move and accumulate strain at their boundaries are approximately uniform. **Therefore, nearly constant time intervals (at first approximation) would be expected between large ruptures of the same fault segment.** [However?], the reoccurrence time may vary; the basic idea of periodic main shocks may need to be modified if subsequent main shocks have different amounts of slip across the fault. [Indeed?], the length and slip of great plate boundary ruptures often vary by a factor of 2. [For example?], the recurrence intervals along the southern segment of the San Andreas fault is 145 years with variations of several decades. The smaller the standard deviation of the average recurrence interval, the more specific could be the long term prediction of a future main shock.

Some Take Home Messages

- Information is interpreted more easily and more uniformly if it is placed where most *readers* expect to find it.
- *Keep subject-verb close* in a sentence, maintain the sense of momentum by beginning and ending with exciting material.
- Put in the *topic position the old* information that links backwards, put in the *stress position the new* information you want the reader to emphasize.
- Good writing varies, readers' interpretations make your paper complete.

Best wishes for becoming a competent writer!

- Interested in graduate student and post-doctoral researcher positions, please contact yan.zheng@sustech.edu.cn



Previously: Environmental Geology