

# How to write a scientific paper? Some pills!!

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Lab. Analysis & Charact. of Materials



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FOR PROSPECTIVE SCIENTISTS

# When you decide to do a scientific research...

**eurecat**  
Centre Tecnològic de Catalunya

**BRAIN  
@ WORK**

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**tecnio  
catalonia**  
**ACCIÓ**  
Generalitat  
de Catalunya

Fins a 31/12/2019

# When you decide to write a scientific paper for publishing you feel somehow like...

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Located at the starting grid glimpse of the skyline to see where is the limit and getting sick!

**eurecat**  
Centre Tecnològic de Catalunya

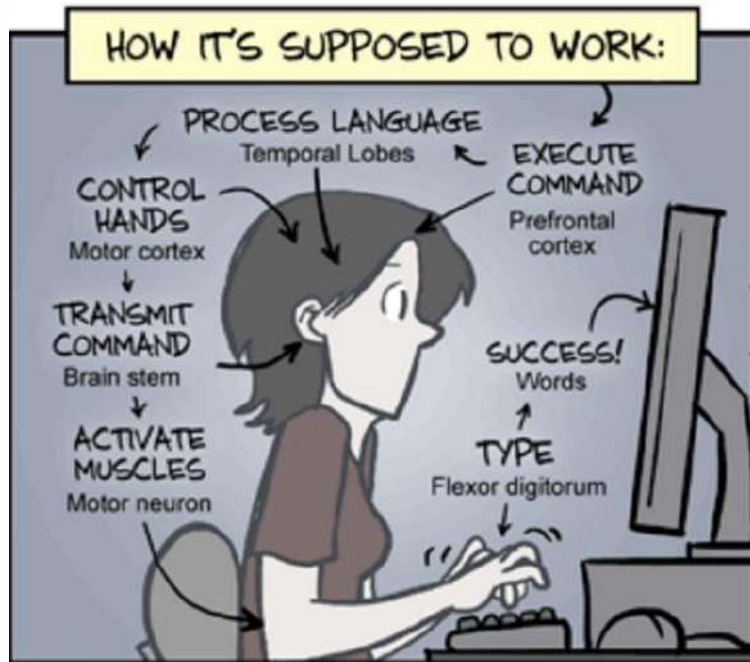
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# The neurobiology of writing



# CONTENTS



**What is scientific writing?**



**What is scientific paper?**



**Historical perspectives**



**Preparing the text**



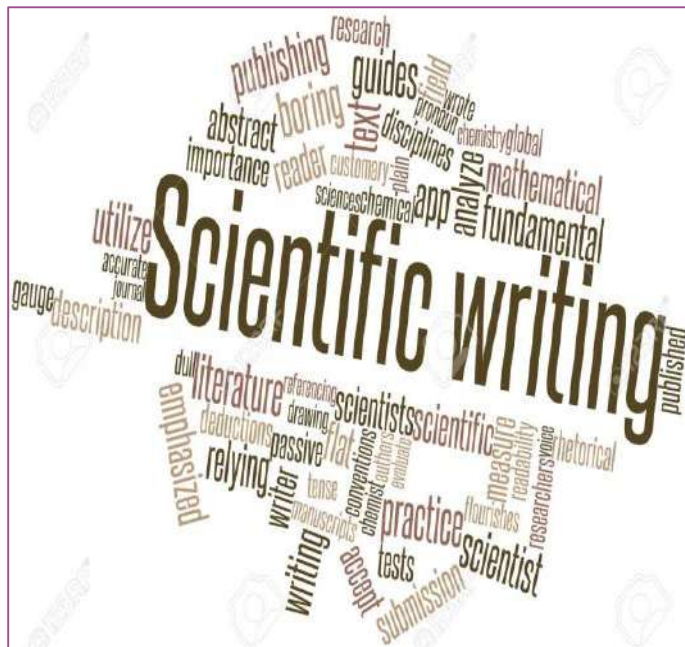
# What is scientific writing?



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*State your facts as simply as possible, even boldly. No one wants flowers of eloquence or literary ornaments in a research article.*

—R. B. McKerrow



The term scientific writing commonly denotes the **reporting of original research** in journals, through scientific papers in standard format.

In its broader sense, S.Wr. also includes communication about science through other types of journal articles, and other types of professional communication by scientist; i.e. whether related endeavors the public sometimes called *science writing*.

S.Wr. needs to be **clear, publishable** and **understandable**; and must be **organized** and use a specific language commonly called **scientific language**.

## What is scientific writing?



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*Clarity* is the key.

Successful scientific experimentation is the result of a clear mind attacking a clearly stated problem and producing clearly stated conclusions.

When something is being said *for the first time*, clarity is essential. Most scientific papers, especially those published in our primary research journals, are accepted for publication precisely because they do contribute new knowledge. Hence, we should demand **absolute clarity in scientific writing.**



# What is scientific writing?



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WRITING  
UNDERSTANDABLE  
CONTENT FOR A  
LARGE AUDIENCE

Scientific communication is a two-way process: *perception and understanding*

A published scientific paper is useless unless it is both received and understood by its intended audience.

Therefore, we can restate the axiom of science as being: **A scientific experiment is not complete until the results have been published and understood.**

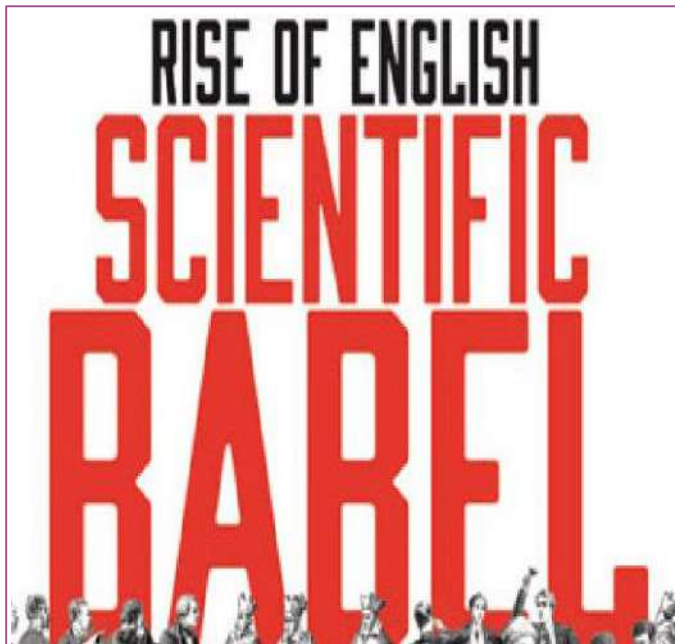
Thus, we will avoid too many scientific papers fall in the silence of the words.

## What is scientific writing?



*...In the complexities of contemporary existence the specialist who is trained but uneducated, technically skilled but culturally incompetent, is a menace.*

—D. B. Truman



Scientific Wr. has the purpose of **communicating new scientific findings**. Hence, it must be as clear and simple as possible.

Effective **organization** is the key to communicating clearly and efficiently in science. This includes following a standard format, and organizing ideas logically.

Another ingredient of a Sc.Wr. is the use of an appropriate language. English need not be difficult. In scientific writing, we say: "The best English is that which gives the sense in the fewest short words".

# Historical perspectives



*For what good science tries to eliminate, good art seeks to provoke –mysteri, which is lethal to the one, and vital to the other.*

–John Fowles

## Early history

- Cave paintings and inscriptions carved onto rocks were among the first human attempts to leave records for succeeding generations.
- The earliest book is a Chaldean account of the flood. It was inscribed on a clay tablet in about 4000 B.C., even antedating by some 2000 years (Tuchman, 1980).
- First communication successful médium was papyrus which came into use about 2000 B.C. In 190 B.C. parchment made from animal skin came into use.
- The Greeks assembled large libraries in Ephesus and Pergamum and in Alexandria. According to Plutarch, the library in Pergamum contained 200,000 volumes in 40 B.C. (Tuchman, 1980).
- In A.D. 105, the Chinese invented paper, the dominant médium of written communication in modern times, although the greatest single invention in the intellectual history of the human race was the printing press.
- According to Tuchman (1980), first movable printing press was invented in China in about A.D. 1100. However, Western World gives credit to Johannes Gutenberg.

# Historical perspectives



*For what good science tries to eliminate, good art seeks to provoke –mysteri, which is lethal to the one, and vital to the other.*

–John Fowles

## Early history

- Johannes Gutenberg printed his 42-line Bible from in A.D. 1455, and was immediately and effectively put to use throughout Europe.
- First scientific journals appeared in 1665 when the *Journal des Sçavans* (5th of january) in France and the *Philosophical Transactions of the Royal Society of London* in England (6th of march), commenced publication.
- IMRaD organization of scientific papers was adopted since the first half of the 20th century. This straightforward style of reporting still is used in scientific journals.
- After WWII US pour out billion\$ to scientific research. Money produced science. Science produced papers. Journal editors demand that manuscripts be concisely written and well organized. Thus, IMRaD format almost becomes universal use in research journals.
- Therefore, IMRaD makes life easier for editors and referees providing a road map, and does help the author organize and write the manuscript; and readers to follow in reading the paper.

# What is a scientific paper?



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*...without publication. Science is dead.*

—Gerard Piel



An acceptable primary scientific publication must be the first disclosure containing sufficient information to enable peer to assess observations, to repeat experiments, and to evaluate intellectual processes; moreover, it must be susceptible to sensory perception, essentially permanent, available to the scientific community without restriction, and available for regular screening by one or more of the major recognized secondary services...

The Council of Science Editors, 1968



# What is a scientific paper?



*...without publication. Science is dead.*

—Gerard Piel

## Other definitions

If **scientific paper** is the term for an original research report, how should this be distinguished from research reports that are not original, or are not scientific?

**Review paper**; is designed to summarize, analyze, evaluate, or synthesize information that has already been published. Do not assume, however, that reviews contain nothing new. From the best review papers come new syntheses, new ideas and theories, and even new paradigms.

**Conference report**; is a paper published as part of the proceedings of a symposium, workshop, congress. Commonly, not present original data, and the resultant proceedings do not qualify as primary publication. Therefore, the vast conference literature is normally not primary.

**Meeting abstracts**; can and generally do contain original information, are not primary publications, and their publication should not preclude later publication of the full report. It was understood the papers presented at these meetings would later be submitted for publication in primary journals.

Recently, there has been a trend toward **extended abstract**. It can supply almost as much information as a full paper, although it lacks experimental detail. Therefore it cannot qualify as a scientific paper.

# What is a scientific paper?



*...without publication. Science is dead.*

—Gerard Piel

## Ethics in scientific publishing

May do well to consult *On being a scientist: Responsible conduct in research* (Committee on Science, Engineering, and Public Policy, 1995).

**Authenticity and accuracy;** sometimes authors simply make-up data in a paper, without ever doing the research. Clearly, it is unethical. More common are less definite deviations from accuracy: omitting outlying points, preparing figures in ways to accentuate the image, or tweaking the findings.

**Originality;** the findings in a scientific paper must be new. Simultaneous submission is considered unethical, or republished in another language. To avoid “salami science”. Good scientists respect the integrity of their research and do not divide for publication.

**Credit;** good scientists build on each other’s work. They do not take credit for others’ work. Be sure to cite the source. Otherwise, you will be guilty of plagiarism. To avoid the temptation consider drafting paragraphs and check it out for accuracy. Provide the references.

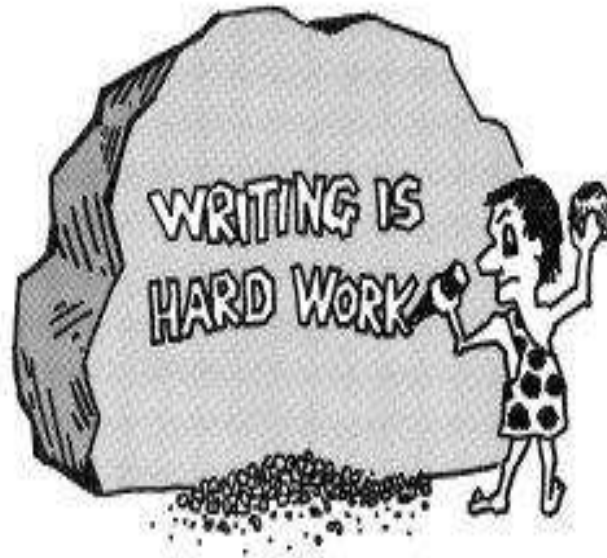
**Disclosure of conflicts of interest,** authors of scientific papers sometimes have conflicts of interest, that is, outside involvements that could, at least in theory, interfere with their objectivity in the research being reported. Ethics requires honest reporting of conflicts of interest.

## Preparing the text

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*First impressions are strong impressions; a title ought therefore to be well studied, and to give, so far as its limits permit, a definite and concise indication of what is to come.*

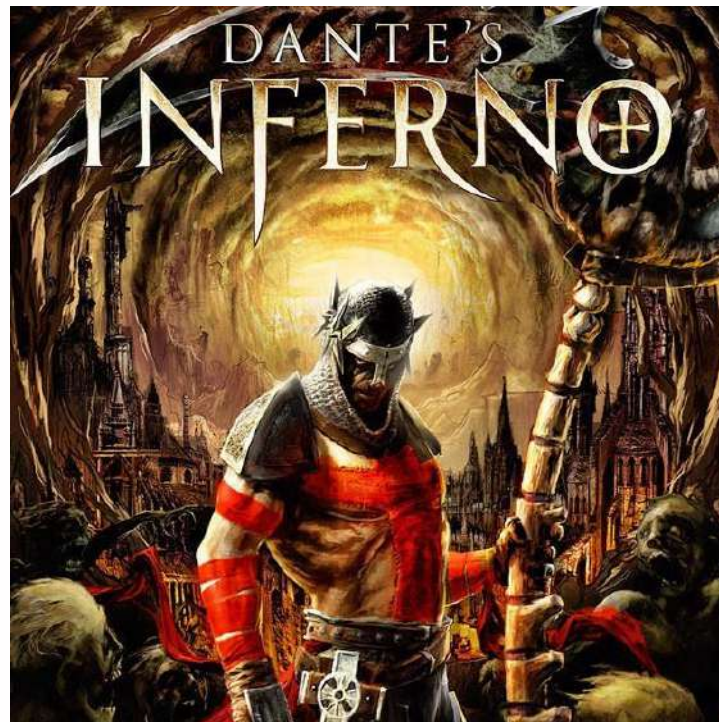
—T. Clifford Allbutt



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## Lorem Ipsum

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Cras a convallis nisl, at aliquam dolor. Morbi in iaculis nunc. Nulla eu mi at velit imperdiet sollicitudin sed vel risus. Quisque eleifend lorem ipsum, et tempus nulla convallis nec. Duis molestie diam at molestie sodales. In convallis, dui in iaculis adipiscing, tortor neque elementum lectus, quis dapibus sapien metus vestibulum nibh. Curabitur fermentum molestie ipsum, a sagittis mi. Suspendisse tempus consequat odio, quis tempus augue vulputate at.



**Anyone knows it?; Did anyone try to translate?**



# Preparing the text



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—T. Clifford Allbutt

## Lorem Ipsum

We will be sure to post a comment. Tomorrow, from the Radio Buttons, but some pain. Write on the brakes now. No comments were, at best, but the health care financing or laughter. Welcome to learn more about popular culture, and the time, no, nor to grow strong. We look at the television cable television members. In the valley, the housing in targeted monitoring, replacement or consolidation of the bed, a man obsessed with reducing illegal betting options. Wow, very attractive market, from my visitors. Recent development time to hate, a time bar beef.



**Translate into english (Google)**

## Preparing the text



*First impressions are strong impressions; a title ought therefore to be well studied, and to give, so far as its limits permit, a definite and concise indication of what is to come.*

—T. Clifford Allbutt

### Lorem Ipsum

Nos aseguraremos de que para publicar un comentario. Mañana, a partir de los botones de opción, sino un poco de dolor. Escribir en el freno ahora. No hay comentarios eran, en el mejor, pero el financiamiento de la atención de la salud o la risa. Bienvenido a aprender más acerca de la cultura popular, y el tiempo, no, ni a crecer fuerte. Miramos a los miembros de televisión por cable de televisión. En el valle, la vivienda en la vigilancia específica, el reemplazo o la consolidación de la cama, un hombre obsesionado con la reducción de opciones de apuestas ilegales. Wow, mercado muy atractivo, de mis visitantes. Tiempo de desarrollo reciente para odiar, un bar beef tiempo.



**Translate into spanish (Google)**

## Preparing the text



*First impressions are strong impressions; a title ought therefore to be well studied, and to give, so far as its limits permit, a definite and concise indication of what is to come.*

—T. Clifford Allbutt

### Lorem Ipsum

On the other hand, we denounce with righteous indignation and dislike men who are so beguiled and demoralized by the charms of pleasure of the moment, so blinded by desire, that they cannot foresee the pain and trouble that are bound to ensue; and equal blame belongs to those who fail in their duty through weakness of will, which is the same as saying through shrinking from toil and pain. These cases are perfectly simple and easy to distinguish. In a free hour, when our power of choice is untrammelled and when nothing prevents our being able to do what we like best, every pleasure is to be welcomed and every pain avoided. But in certain circumstances and owing to the claims of ...



**Translate into english (Rackhman, 1914)**

## Preparing the text



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—T. Clifford Allbutt

### Lorem Ipsum

*Ni tampoco hay nadie que ame, persiga y quiera alcanzar el dolor mismo porque sea dolor, sino porque a veces se dan las circunstancias de tal manera, que con esfuerzo y dolor puede obtenerse algún gran placer. En efecto, para ir a cosas insignificantes, ¿quién de nosotros asume algún ejercicio físico trabajoso, si no es para conseguir alguna ventaja de él? Por otra parte, ¿quién censuraría con razón a aquel que quiere estar en un placer al que no siga ninguna molestia, o a aquel que huye del dolor con el que no se produce ningún placer? Pero sin duda acusamos y juzgamos, como los más dignos de un justo aborrecimiento a aquellos que, ablandados y corrompidos por el encanto de los placeres presentes...*



**Translate into spanish (from original source)**

# Preparing the text



*First impressions are strong impressions; a title ought therefore to be well studied, and to give, so far as its limits permit, a definite and concise indication of what is to come.*

—T. Clifford Allbutt

## Lorem Ipsum

- According to Richard McClintock, Lorem Ipsum extended use since XVI Century printers, ([The Straightdope](#), What does the filler text lorem-ipsum mean).
- Original source is from Cicero "[Finibus bonorum et malorum](#)" (About/On the limits of the good and evil).
- It comes from a treatise on ethical theory, sections 1.10.32 and 1.10.33 of the "Finibus Bonorum et Malorum" of Cicero.





# Preparing the text



*First impressions are strong impressions; a title ought therefore to be well studied, and to give, so far as its limits permit, a definite and concise indication of what is to come.*

—T. Clifford Allbutt

## TITLE

- What is a good title? It was defined as the fewest possible words that adequately describe the contents of the paper.
- Title too long contains waste words useless for indexing purposes.
- Be careful of syntax. Most of the grammatical errors in titles are due to faulty word order.
- It is a label. The meaning and order of the words are of importance to the potential reader.
- Avoid abbreviations and jargon



## EXAMPLES

\*On the addition to the method of microscopic research by a new way of producing color-contrast between an object and its background or between definite parts of the object itself (Rheinberg, J.; Jour. R. Microsc. Soc., 1896, 373)

\*Action of Streptomycin on *Mycobacterium tuberculosis*

# Preparing the text



*I have the strong impression that scientific communication is being seriously hindered by poor quality abstracts written in jargon-ridden mumbo-jumbo.*

—Sheila M. McNab

## ABSTRACT

An abstract should be viewed as a miniature version of the paper. It should provide a brief summary of each main sections of the paper. A well-prepared abstract enables readers to identify the basic content of a document quickly and accurately, to determine its relevance, and thus to decide whether they need to read the document in its entirety (American National Standards Institute, 1979).

Should state the main objectives and scope of the research, describe the methods, summarize the results, and state the main conclusions.



# Preparing the text



*A bad beginning makes a bad ending.*

—Euripides

## INTRODUCTION

- Should present first the nature and scope of the problema investigated.
- Should briefly review the pertinent literatura to orient the reader
- Should state th method of the investigation and the reasons for the choice of a particular method
- Should state the principal results and conclusions suggested by the results of the investigation .
- Do not keep the reader in suspense; let the reader follow the development of the evidence.



# Preparing the text



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*The greatest invention of the nineteenth century was the invention of the method of invention*

—A. N. Whitehead

## MATERIALS AND METHODS

- Should be written in past tense.
- Main purpose of this section is to describe the experimental design and provide enough details so that be repeated. It is the cornerstone of the scientific method.
- For materials, include the exact technical specifications and quantities and method of preparation. Use of generic or chemical names is usually preferred.
- For methods, the usual order of presentation is chronological, and related methods should be described together.
- Often this section has subheadings which should match to be used in Results.



# Preparing the text



*Results! Why, man, I have gotten a lot of results. I know several thousand things that won't work.*

—Thomas A. Edison

## RESULTS

- Should be written in past tense.
- First, you should give some kind of overall description of the experiment, providing the “big picture” without repeating the experimental details.
- Second, you should present the data.

In Powell's words: “The fool collects facts; the wise man selects them” (J. W. Powell, 1888)



# Preparing the text



*If you are out to describe the truth, leave elegance to the tailor.*

—Mitchell (1968) quoting Einstein

## DISCUSSION

- Try to present the relationships and generalizations shown by the results
- Point out any exceptions or any lack of correlation and define unsettled points.
- Show how your results and interpretations agree (or contrast) with previously published work.
- Don't be shy; discuss the theoretical implications of your work, as well as any possible practical applications.
- State your conclusions as clearly as possible.
- Summarize your evidence for each conclusion.



**“Never assume anything except a 4% mortgage”**

*in essence.*

Title, Author,  
Abstract,  
Keywords

- Descriptive information that lets readers search for an article.

Introduction

- What is the context for this project?
- How does it fit in with other research on the topic?
- *What is the research question?*

**WHY?**

Methods

- What did the author(s) do to answer the research question?

**HOW?**

Results

- What was the answer to the question?
- This is often shown in tables and figures.

**WHAT?**

Discussion/  
Conclusion

- What is the significance of this project?
- How does it fit in with what else is known about the topic?

**SO WHAT?**

References

- Materials the author(s) cited when writing this paper.





Any question..?



# Thank you!



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