



How_{to}

READ

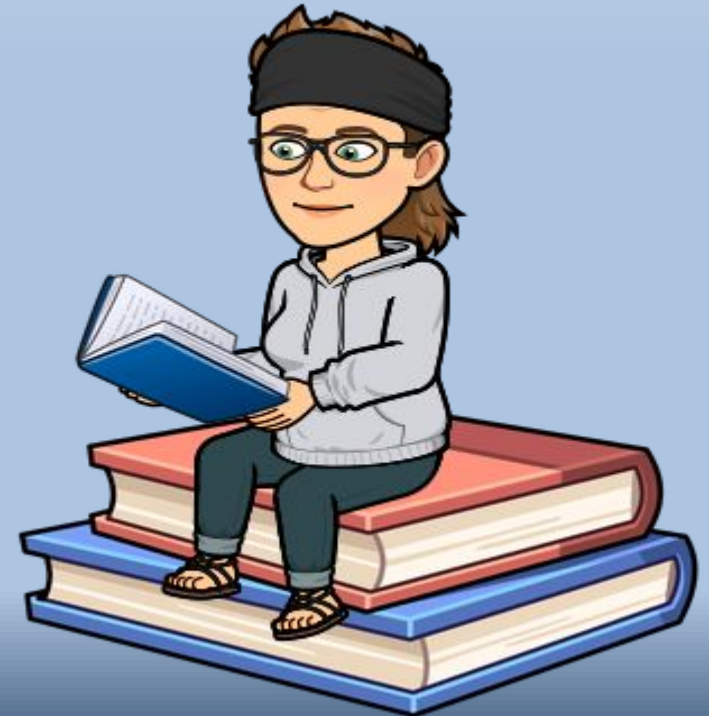
A Scientific

Paper



Challenges to reading a scientific paper

- Not taught how to read them
- Not an expert in the field
- Technical language
- Hard to understand graphics and statistics
- Sounds like a different language/not accessible

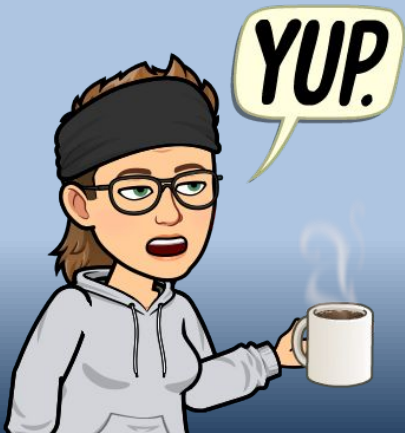


What are the categories of written scientific information resources? *(frequently updated)*

- Newspapers and magazines
- Blogs and online articles
- Journals
- Peer-reviewed or scholarly journals

When you do online searches:

- A. Limit searches to peer-reviewed journals only (use a filter)
<https://www.jstor.org/>
- B. Articles written by academics and/or professionals (though “expert” isn’t always an accurate title)



What is a Scholarly Article? Peer-review process

1. Author writes & submits article manuscript to journal



2. Journal Editor sends manuscript to expert reviewers to evaluate quality of research, write-up, and conclusions



3. Expert reviewers return manuscript to editor with suggestions for changes, if any, or recommendations to publish or not to publish



4. Editor reviews suggestions & returns manuscript to author for revision



5. Author revises manuscript and resubmits



6. Journal Editor includes in Journal issue



HINT: Not all information in a peer-reviewed journal is peer-reviewed!

Sometimes editorials, letters to the editor, book reviews, and such are in the journal, but they aren't counted as peer-reviewed articles.

Why Read a Scientific Paper?

Is there a good reason to
read the literature?



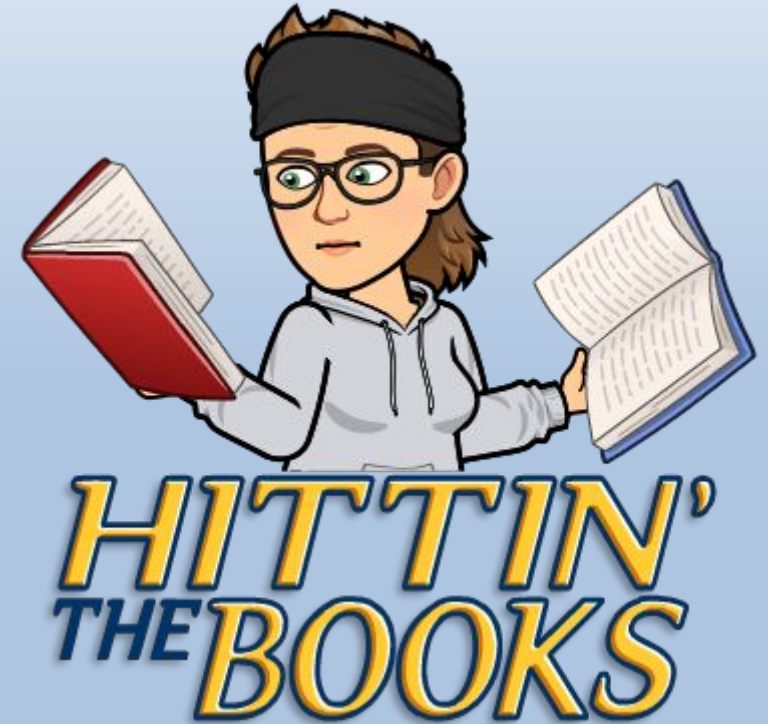
#ADULTING

Why Read?

It's Current!

Textbooks can be years out of date by the time they are published. Journals tell you what is happening...

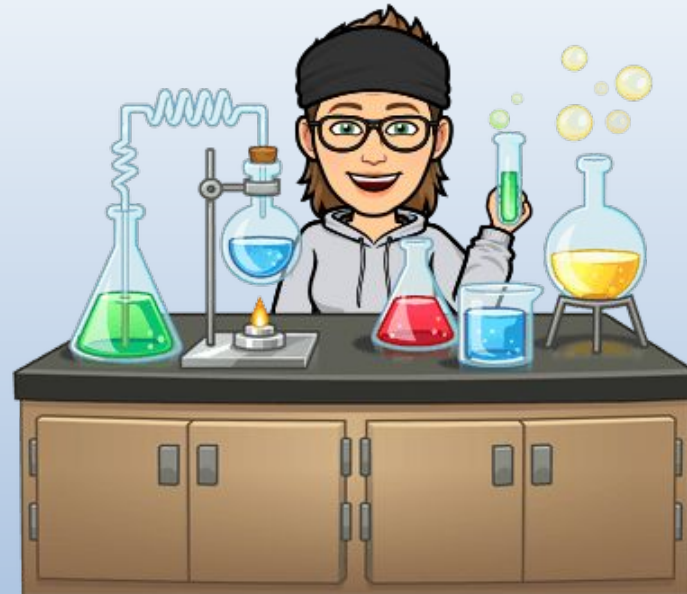
RIGHT NOW!



Why Read?

It's Current!

It Can Be Replicated!



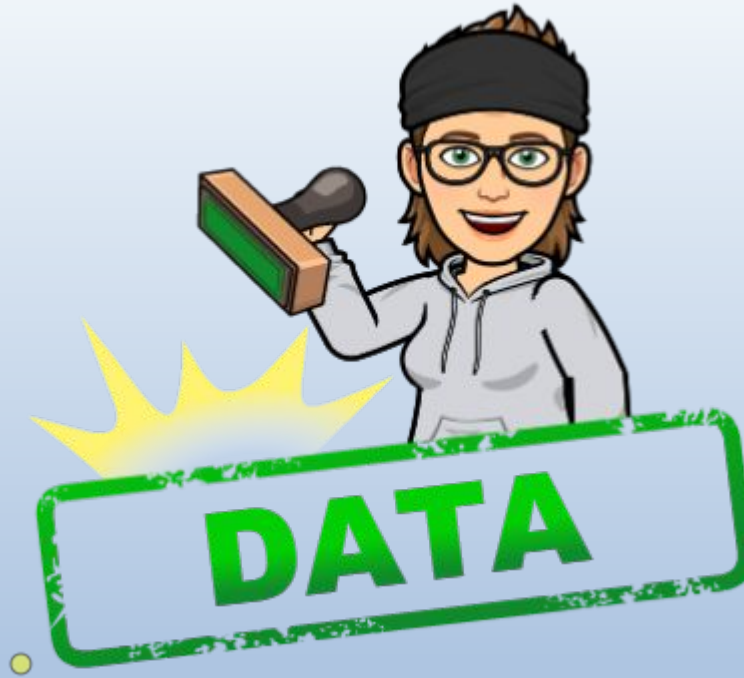
Popular articles and books give you general information and results. Scholarly journals give you enough information that

you could do the experiment yourself.

You can verify the research to see if you get the same results.

Why Read?

It Has Actual Data!



If you need to know **exact results or properties** for your own research...

Articles include actual data, uncertainties, conditions of the experiment, and much more.

Why Read?

You Can Evaluate The Conclusions!

Do You Believe It... Or Not?

Articles provide the authors' explanation of their results and conclusions. You can see their assumptions and determine whether you believe them or not.



Let's put a
pin in That



Why Read?

So, There You Have It...

Current

It's the most up to date stuff

Has Raw Data

Save time - use their results

Replicable

I can redo the experiment
myself

Shows Logic

Do you believe it... or not?

All the Reasons to Read Scientific Papers

How To Read...

Before you read, you need the right equipment....

A Scientific Dictionary:

- Look up terms you don't know.
- Try <https://www.thesciencedictionary.com> for an online dictionary.
- Reading online is helpful, because you can copy and paste as you go.

Your handy-dandy notebook:

- Make notes so you'll remember your insights. Add a highlighter, pen or marker.

Your friends and colleagues:

- Explaining to others will help you understand the paper yourself.

All packed...

Then, let's go!



Don't Read Straight Through!

HELP!



It's like drowning in quicksand!

- Give yourself a task while reading,
 - *taking notes
 - *looking up terms you don't know
 - *writing information and questions in the margins.
- Save informative sentences in your notebook.
- Keep a tab with the scientific dictionary open on your computer, or a dictionary on hand
- Be patient with yourself
- Print and highlight

Have a clear idea about
the information that you
need or want





The Scientific Paper Exposed

Everything you ever wanted to know...
why it's there and what it's good for.

ANATOMY



Anatomy

How to Read and Comprehend Scientific Research Articles

How to read, take effective notes, and find the main points
in scientific research articles

The Title, Authors, Publisher and Year

- Make sure the authors are credible
- Is there one author or many?
- What year was the paper written?
- Where was the paper published?
- Is it a credible source? Publisher?



The Abstract

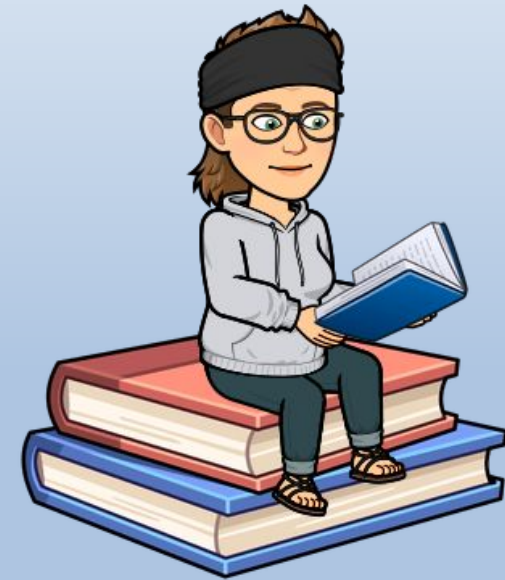
Gives you a **brief overview** of what the paper is all about (hypothesis, methodology, and results)

Explains **why** the authors did the experiment, **how** they did it, and **what they found out and what it means**.

It's very important to read abstracts to help you decide **whether to read** the whole paper or not.

Abstracts are **available in many indexes** to the journal literature, so you don't even need to find the actual article to determine whether it might be interesting to read.

HINT: Abstracts may be bold, italicized, or unlabeled.



The Introduction

Provides the motivation for doing the experiment, explaining **'Why did they bother'?**

Gives you background and context

It gives you background, **explains prior research**, and what the accepted understanding of the field is.

Will often end with the hypothesis of the study.



Methods (*super dense*)

Skip this section until last.

Gives details on how the experiment was set up and carried out. Methods, techniques, scope

Should explain well enough that **you could replicate** the experiment yourself, if you wanted to.

Often the hardest section to understand, since it contains specialized techniques.

When reading, skim and **try to pick out basic methods** used. Don't worry that much about the details.

Consult a scientific encyclopedia or textbook if you don't understand the concepts of the technique.



Results

This section provides the **data the authors use** to reach their conclusions.

Figures are often included to **make the data more compact** and intuitive, and **Tables organize data** in one place for easier reading.

Understanding Figures and Tables is **EXTREMELY** important in understanding a paper.

For figures, make sure you understand what quantities are on the axes. Are they linear or logarithmic? What units are plotted?

RESULTS



Discussion/Analysis/Conclusion

(This section may be named any of these things)

This is where the author connects the dots - explaining what the data means, and why they support the conclusion. Also provide context and how results measure up to the hypothesis.

Compare your own conclusions about the data with the authors' analysis.

When skimming the paper for the first time, after reading the abstract **read the concluding section.** It gives more detail on the specific results that were found, and **helps you determine whether the paper is relevant** to your research question.

Let's
DISCUSS



References/Bibliography

Provides a list of resources quoted or referenced by the authors.

Allows you to go back to those sources to **see why the authors referenced** that work, and **whether those sources seem reliable** and accurate.

Format of bibliography differs between journals. **Author. (Year) Journal Title. Volume(Issue): pages.**



Article Information

Combined with the author/title information, it **enables you to create a citation for the article** - so you can tell other people where to find it.

Remember, if you use the data or concepts from this paper, **you must cite it** in your reports or publications. Failure to do that is plagiarism.

It's always better to be safe, and cite all of your sources.



IN GENERAL: Survey the Paper to see if it's worth it

Read the title & keywords

You can stop after
any of these steps

Read the abstract

- Look for main points, look up terms, see what they concluded

Read the conclusion/Discussion

- What did the scientists conclude?
- Did it make sense?
- Do you need to read another section or graphs to understand?

Look at plots and figures

- Know what the axes mean, and what scale they are
- Facts/data don't lie, but the abstract and conclusion can be bent to fit

Lastly look at the introduction and methods

Strategies for Reading

Some people start by Reading very fast, and then Rereading.



Strategies for Reading

As you read, ask yourself, “Do I need to understand this part to continue on?”

- Reflect on what you read
- Draw your own conclusions
- Do you believe the credibility of the research?
- How do these results relate to my interests?
- Read the paper again in chronological order

READ



Where to Find Articles

- Libraries
- Online at researcher's website
- Journals online
- Free libraries online or in person
- Google Scholar



LETS
TRY IT



Credits

Created by Michael Fosmire

Designed & Illustrated by Aly Edmondson



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Main Menu