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## How to (seriously) read a scientific paper

By Elisabeth Pain | Mar. 21, 2016 , 1:15 PM

Adam Ruben's tongue-in-cheek column about **the common difficulties and frustrations of reading a scientific paper** broadly resonated among *Science Careers* readers. Many of you have come to us asking for more (and more serious) advice on how to make sense of the

scientific literature, so we've asked a dozen scientists at different career stages and in a broad range of fields to tell us how they do it. Although it is clear that reading scientific papers becomes easier with experience, the stumbling blocks are real, and it is up to each scientist to identify and apply the techniques that work best for them. The responses have been edited for clarity and brevity.

Do you have your own tips or other questions you'd like answered? Leave them in the comments section.

## How do you approach reading a paper?

I start by reading the abstract. Then, I skim the introduction and flip through the article to look at the figures. I try to identify the most prominent one or two figures, and I really make sure I understand what's going on in them. Then, I read the conclusion/summary. Only when I have done that will I go back into the technical details to clarify any questions I might have.

- **Jesse Shanahan**, *master's candidate in astronomy at Wesleyan University in Middletown, Connecticut*

I first get a general idea by reading the abstract and conclusions. The conclusions help me understand if the goal summarized in the abstract has been reached, and if the described work can be of interest for my own study. I also always look at plots/figures, as they help me get a first impression of a paper. Then I usually read the entire article from beginning to end, going through the sections in the order they appear so that I can follow the flow of work that the authors want to communicate.

If you want to make it a productive exercise, you need to have a clear idea of which kind of information you need to get in the first place, and then focus on that aspect. It could be to compare your results with the ones presented by the authors, put your own analysis into context, or extend it using the newly published data. Citation lists can help you decide why the paper may be most relevant to you by giving you a first impression of how colleagues that do similar research as you do may have used the paper.

- **Cecilia Tubiana**, *scientist at the Max Planck Institute for Solar System Research in Göttingen, Germany*

If I'm aiming to just get the main points, I'll read the abstract, hop to the figures, and scan the discussion for important points. I think the figures are the most important part of the paper, because the abstract and body of the paper can be manipulated and shaped to tell a

compelling story. Then anything I'm unclear about, I head to the methodology.

If I want to delve deeper into the paper, I typically read it in its entirety and then also read a few of the previous papers from that group or other articles on the same topic. If there is a reference after a statement that I find particularly interesting or controversial, I also look it up. Should I need more detail, I access any provided data repositories or supplemental information.

Then, if the authors' research is similar to my own, I see if their relevant data match our findings or if there are any inconsistencies. If there are, I think about what could be causing them. Additionally, I think about what would happen in our model if we used the same methods as they did and what we could learn from that. Sometimes, it is also important to pay attention to why the authors decided to conduct an experiment in a certain way. Did the authors use an obscure test instead of a routine assay, and why would they do this?

- **Jeremy C. Borniger**, *doctoral candidate in neuroscience at Ohio State University, Columbus*

I always start with title and abstract. That tells me whether or not it's an article I'm interested in and whether I'll actually be able to understand it—both scientifically and linguistically. I then read the introduction so that I can understand the question being framed, and jump right to the figures and tables so I can get a feel for the data. I then read the discussion to get an idea of how the paper fits into the general body of knowledge.

I pay attention to acknowledgement of limitations and proper inference of data. Some people stretch their claims more than others, and that can be a red flag for me. I also put on my epidemiologist hat so that I can try to make sure the study design is adequate to actually test the hypotheses being examined.

As I go deeper into the argument framing, figures, and discussion, I also think about which pieces are exciting and new, which ones are biologically or logically relevant, and which ones are most supported by the literature. I also consider which pieces fit with my pre-existing hypotheses and research questions.

- **Kevin Boehnke**, *doctoral candidate in environmental health sciences at the University of Michigan, Ann Arbor*

My reading strategy depends on the paper. Sometimes I start by skimming through to see how much might be relevant. If it is directly applicable to my current topic, I'll read the paper closely, apart from the introduction that is probably already familiar. But I always try to figure out if there are particular places or figures that I need to pay close attention to, and then I go and read the related information in the results and discussion.

I also check if there are references that I may be interested in. Sometimes I am curious to see who in the field has—or more likely has not—been referenced, to see whether the authors are

choosing to ignore certain aspects of the research. I often find that the supplementary figures actually offer the most curious and interesting results, especially if the results relate to parts of the field that the authors did not reference or if they are unclear or unhelpful to their interpretation of the overall story.

- **Gary McDowell**, postdoctoral fellow in developmental biology at Tufts University in Medford, Massachusetts, and visiting scholar at Boston College

When reading papers, it helps me to have a writing task so that I am being an active reader instead of letting my eyes glaze over mountains of text only to forget everything I just read. So for example, when I read for background information, I will save informative sentences from each article about a specific topic in a Word document. I'll write comments along the way about new ideas I got or questions I need to explore further. Then, in the future, I'll only need to read this document instead of re-reading all the individual papers.

Likewise, when I want to figure out how to conduct a particular experiment, I create a handy table in Excel summarizing how a variety of research teams went about doing a particular experiment.

- **Lina A. Colucci**, doctoral candidate at the Harvard-MIT Health Sciences and Technology program

I usually start with the abstract, which gives me a brief snapshot of what the study is all about. Then I read the entire article, leaving the methods to the end unless I can't make sense of the

The results and methods sections allow you to put apart a paper to ensure it stands up to scientific rigor. Always think about the type of experiments performed, and whether these are the most appropriate to address the question proposed. Ensure that the authors have included relevant and sufficient numbers of controls. Often, conclusions can also be based on a limited number of samples, which limits their significance.

I like to print out the paper and highlight the most relevant information, so on a quick rescan I can be reminded of the major points. Most relevant points would be things that change your thinking about your research topic or give you new ideas and directions.

- **Lachlan Gray**, deputy head of the HIV Neuropathogenesis Lab at the Burnet Institute and adjunct research fellow in the Department of Infectious Disease at Monash University in Melbourne, Australia

What I choose to read is based on relation to my research areas and things that are generating lots of interest and discussion because they are driving the way we do psychology, or science

more widely, in new directions. Most often, what I am trying to get out of the papers is issues of methodology, experimental design, and statistical analysis. And so for me, the most important section is first what the authors did (methods) and second what they found (results).

It can also be interesting to understand why the authors thought they were doing the study (introduction) and what they think the results mean (discussion). When it is an area that I know a lot about, I don't usually care much about these sections because they often reflect the authors' theoretical predilections and one of many ways to think about the method and results. But when it is an area that I know very little about, I read these closely because then I learn a lot about the assumptions and explanatory approaches in that area of research.

- **Brian Nosek**, professor in the Department of Psychology at the University of Virginia and executive director of the Center for Open Science in Charlottesville

First I read very fast: The point of the first reading is simply to see whether the paper is interesting for me. If it is I read it a second time, slower and with more attention to detail.

If the paper is vital to my research—and if it is theoretical—I would reinvent the paper. In such cases, I only take the starting point and then work out everything else on my own, not looking into the paper. Sometimes this is a painfully slow process. Sometimes I get angry about the authors not writing clearly enough, omitting essential points and dwelling on superfluous nonsense. Sometimes I am electrified by a paper.

- **Ulf Leonhardt**, professor of physics at the Weizmann Institute of Science in Rehovot, Israel



...because when the paper makes sense to me, then, if the topic of the paper is one I know well, I generally skim the introduction, reading its last paragraph to make sure I know the specific question being addressed in the paper. Then I look at the figures and tables, either read or skim the results, and lastly skim or read the discussion.

If the topic is not one I know well, I usually read the introduction much more carefully so that the study is placed into context for me. Then I skim the figures and tables and read the results.

- **Charles W. Fox**, professor in the Department of Entomology at the University of Kentucky in Lexington

It is important to realize that shortcuts have to be taken when reading papers so that there is time left to get our other work done, including writing, conducting research, attending meetings, teaching, and grading papers. Starting as a Ph.D. student, I have been reading the conclusions and methods of academic journal articles and chapters rather than entire books.



- **Rima Wilkes**, professor in the Department of Sociology at the University of British Columbia, Vancouver

As editor-in-chief of *Science*, I have to read and comprehend papers outside of my field all the time. Generally, I start with the corresponding editors' summaries, which are meant for someone like me: a science generalist who is interested in everything but dives deeply only into one field. Next, I check to see if someone wrote a News article on the paper. Third, I check to see if there is a Perspective by another scientist. The main goal of a Perspective is to broaden the message of the paper, but often the authors do a great job of extracting the essence of the article for non-specialists at the same time.

Then I tackle the abstract, which has been written to broadly communicate to the readership of the journal. Finally, I move on to the paper itself, reading, in order, the intro, conclusions, scanning the figures, and then reading the paper through.

- **Marcia K. McNutt**, Editor-in-Chief, *Science journals*

## What do you do when there is something you don't understand?

I like to read online so that I can easily cut and paste words I don't know into a browser to check what they mean.

- McNutt

If it's only a few things in the article, I'll make a note to look them up later. If I am really struggling to proceed through the paper, I try to look up a review article or a textbook chapter to give me the necessary background to proceed, which I generally find much more efficient.

There are a lot of acronyms and jargon that can be subfield-specific, so I usually don't wade through the details unless it's for my own research. But I always try to take my time to really understand the methods being used.

- Shanahan

I will typically pause immediately to look up things I don't understand. The rest of the reading may not make sense if I don't understand a key phrase or jargon. This can backfire a bit, though, as I often go down never-ending rabbit holes after looking something up (What is X? Oh, X influences Y. ... So what's Y? etc...). This can be sort of fun as you learn how everything is

connected, but if you're crunched for time this can pull your attention away from the task at hand.

Sometimes, all the jargon in a paper can cloud the whole point of the experiments in the first place. In such cases, it helps to ask yourself, "What question were the authors trying to answer?" Then you can determine whether they succeeded or failed.

- *Borniger*

It depends on how much the non-understandable bits prevent me from following the main ideas. I usually do not try to understand all the details in all the sections the first time I read a paper. If non-understandable parts appear important for my research, I try to ask colleagues or even contact the lead author directly. Going back to the original references to get all the background information is the last resort, because time can be limited and collaborations and personal contacts can be much more efficient in solving specific problems.

- *Tubiana*

Sometimes, you can just read through a paper and any terms you're not familiar with will become clearer by the end. If it is very heavy going, then stopping and seeking additional information is usually the way to go. I do a quick Google search on the topic, theme, method, jargon, etc. If it is a very dense article, sometimes it will require a few read-throughs before it all starts to make sense.

- *Gray*

The question I ask myself is, "Do I need to understand what that means in order to get what I need from this paper?" I now read articles in research areas well outside of my expertise, and I often don't need more than superficial knowledge of the substantive content. If I can't do anything with the paper unless I don't understand that depth, then I do more background research.

- *Nosek*

Lately, I have had to read a number of papers outside my area of expertise with a lot of unfamiliar jargon. In some cases, I am able to directly extract the information I need from the results or figures and tables. In other cases, I use Google searches to define terms and concepts in the paper or read the cited references to better understand the points being made. Occasionally, papers are so incomprehensible (to me, at least) that I don't bother reading them.

- Fox

## Do you ever feel overwhelmed reading papers, and how do you deal with that?

All the time. If the paper is relevant to a problem I am trying to solve, you can be sure that there are key things in the paper that I do not understand. That confusion is not a threat; it is an opportunity. I am **ignorant**; I need to become less ignorant. This paper may help me.

Simultaneously, some papers are written terribly and are not worth the effort. Someone else has surely written about the concepts more clearly so that I can keep my confusion focused on understanding substance rather than poor grammar.

- Nosek

I especially get overwhelmed if it's not in my subfield, if it's long, and if it's full of technical jargon. When this happens, I break it down into chunks and will read it over the course of a few days, if possible. For really difficult papers, it also helps to sit down and work through it with a colleague.

- Shanahan

Yes, many times. This is why I developed my own reading strategies, by talking to other scientists and by trial and error. I also have thrown up my hands in frustration and tossed the offending papers away, never to read them again.

- Boehnke

Yes, and in these cases you have to realize that some papers are the result of years of work by dozens of scientists. Expecting to digest and understand everything in it in one afternoon is a far-fetched idea.

- Borniger

I have often felt overwhelmed! But certain sections might not need as deep an understanding as others. You also need to know your own limits: Are there some parts of the paper that you would like to emulate but are not part of your expertise and might become “accessible”



through collaborations?

- *Tubiana*

If I feel the paper is very important to what I'm doing, I'll leave it a while and go back to it again a couple of times. But if it's too overwhelming, then I have to leave it aside, unless someone among the colleagues I have contacted has been able to interpret it.

- *McDowell*

## Do you have any other tips you'd like to share?

If there is a seminal paper I want to thoroughly understand, I find some way to give a journal club-style presentation about it. Speaking about a particular paper and answering questions is the best way for me to learn the material.

Also, get a good reference manager. Mendeley helps me do my research, read literature, and write papers.

- *Colucci*

At the beginning, new academic readers find it slow because they have no frame of reference for what they are reading. But there are **ways** to use reading as a system of creating a mental library, and after a few years, it becomes easy to slot papers onto your mental shelves. Then you can quickly skim a paper to know its contribution.

- *Wilkes*

Be patient. Don't be afraid or ashamed to use Wikipedia or other, more lay-audience sources like blog posts to get a feel for your topic. Ask many, many questions. If you can't get a clear understanding of the paper, talk with people in your circle. If you are still confused and it's really important to understand the concepts, email the authors.

- *Boehnke*

Don't hesitate to talk to more experienced scientists. You will be doing THEM a favor by having them explain to you in terms you understand what a complex paper means. All scientists need more experience translating complex concepts into common terms.

- McNutt

If at all possible, read often. Try to keep a bibliography file with a summary of the article, any important points, even a figure or two, along with citation information. Pay attention to different ways of structuring an article, and pay attention to different styles of writing. This will help you develop a style that is effective and also unique.

- Shanahan

Posted in: [scientific literature](#), [Advice](#)

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## Elisabeth Pain

Elisabeth Pain is contributing editor for Europe.

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41 Comments

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**Jayarava** • 3 months ago

A lot of respondents seem to be saying that don't look closely at the methods. Which surprises me as that is where the errors usually lurk.

11 ^ | ▾ • Reply • Share ›



**Rafael Jonathan Camilo Vera** → Jayarava • 3 months ago

Indeed. I thought exactly the same. Nevertheless, now I understand why in my writing skills lectures they spend 85% of the time teaching how to write the abstract, introduction, and conclusion sections.

2 ^ | ▾ • Reply • Share ›



**Felipe Riveroll Aguirre** → Jayarava • 25 days ago

If the paper is relevant for you, to learn experimental design, you need to understand every detail at the methodology, and look for every cited paper for the not described experiments

^ | ▾ • Reply • Share ›



**Lars Steffensen** → Jayarava • 3 months ago

I'm often happy if I can just find someone who have expressed what I'm looking for in a peer reviewed article. This is a big step up from just speculatively assuming that something is true. If something really need strong support, I start looking for consensus in a wider circle of authors. Forming an opinion on the research design is a last resort for me as that

brings me back to relying on my own thinking.

^ | v • Reply • Share ›



**Jayarava** → Lars Steffensen • 3 months ago

What you are describing is textbook confirmation bias.

3 ^ | v • Reply • Share ›



**Lars Steffensen** → Jayarava • 3 months ago

Oh - I am biased as heck. And I don't have the means to mount a peer reviewed opposition to the vast amounts of corporate funded research. But that is a rather different discussion.

Are you suggesting that peer reviewed science should be used as reference for thought-policing of "lesser" discussions?

^ | v • Reply • Share ›



**Jayarava** → Lars Steffensen • 2 months ago

No. I'm suggesting that confirmation bias is a \*bias\* and that invalidates any conclusions you may come to because you have not weighed the evidence.

The assumptions piled high in your response would take me far too long to untangle and you've already said admitted you're only looking for confirmation of your own views, so I can't see the point.

1 ^ | v • Reply • Share ›



**Bermondsey** → Lars Steffensen • 3 months ago

"corporate funded research"? What are you talking about? Maybe we are in different fields. If you can't do your job as a reviewer, please don't agree to do it.

^ | v • Reply • Share ›



**LE Sacks** • 3 months ago

Odd answers because, to me, it all depends on why one is reading the paper. Maybe you want to learn how to apply a method; or you are doing a review of past experiments - maybe just the key results or differences in methods; or you might be surveying a subject just to get a feel for key issues and questions; or maybe it's just recreational, and you want to know what's up in something that you won't actually use; or maybe you are reviewing for publication - and need to find (if there are) critical flaws ... In each situation, I'd read the paper quite differently.

4 ^ | v • Reply • Share ›



**Bermondsey** → LE Sacks • 3 months ago

exactly.

^ | v • Reply • Share ›



**Tim in Albion** • 3 months ago

Barely a mention of the assumptions. For me this is absolutely critical to understanding anything: what assumptions were made, and how were they justified? Every analysis proceeds from some basic assumptions, and these must be identified and justified before the analysis can be understood. So when I read a paper, that's the first thing I look for - what assumptions underlie the work?

3 ^ | v • Reply • Share ›

**Michelle Baker** • 3 months ago

I am really not trying to be glib, but the answer truly is better writing. I have been teaching environmental scientists how to write clearly for a decade, and some basic writing techniques simply need to become more widely known and practiced.

1) Use topic sentences at the start of every single paragraph so readers can easily skim your document and get a sense of its structure.

2) Keep subjects and verbs close together, and put them at the start of your sentence.

3) Use adverbs, adjectives and prepositional phrases to break up long word strings, otherwise known as stacked nouns or stacked modifiers.

These and other writing practices help you write faster. They help your editors and peer reviewers pinpoint substantive problems with the text so you can quickly correct them and speed the publishing process. And they help your readers understand what you wrote.

2 ^ | v • Reply • Share ›

**Lars Steffensen** → Michelle Baker • 3 months ago

No. It is 42.

^ | v • Reply • Share ›

**Joe Atkinson** → Michelle Baker • 3 months ago

To Michelle Baker

I am not familiar with the term "topic sentences". It is obviously important, so an explanation would be appreciated.

Is there a reference to an expanded version of your remarks?

Thank you very much.

^ | v • Reply • Share ›

**Andy Buckley** → Joe Atkinson • a month ago

Google? Wikipedia?

^ | v • Reply • Share ›

**Brock Dubbels** • 3 months ago

I look at the questions, examine whether there is a review of literature that supports the question, and whether it provides insight into the chosen methods. How old are the citations? Does the review represent the current state of the field? I can check specialties outside of my focus by looking around at highly cited papers with similar keywords. If not, what reasoning is provided for the review focus? Do the methods seem a good fit for the questions? Do the methods align with the cited literature? Do any of the citations misrepresent the cited articles? What choices are made in sampling? Does the analysis technique align with the sample data? Do the outcomes of the analysis seem realistic or exaggerated? How does this inform and extend the field as in the literature review?

2 ^ | v • Reply • Share ›

**Heidi Clark** → Brock Dubbels • 3 months ago

Excuse my ignorance (new student here), how do you determine if a paper is 'highly cited'? As opposed to one that is not?

Eg, I have a topic to research for upcoming assignment and want to know which papers

are 'more credible' or 'highly cited' but I do not know how to tell from one paper to the next of their credibility in the field. Thanks in advance.

1 ^ | v • Reply • Share ›



**Charles Miller** → Heidi Clark • 3 months ago

Google Scholar tracks article citations.

1 ^ | v • Reply • Share ›



**leilani\_k** → Heidi Clark • 3 months ago

Check the article in Web of Science. That gives you a lot of information like the number of times the article has been cited since publication. It also gives you information and links to the articles your article of interest has cited, the authors, specific keywords or general topic. It is where I start for any literature search.

1 ^ | v • Reply • Share ›



**Heidi Clark** → leilani\_k • 3 months ago

Thank you! I'd not even heard of that site. Will check it out now.

^ | v • Reply • Share ›



**Xavier Fernando Vela** → Heidi Clark • 3 months ago

ResearchGate is another website that keeps track of citation of articles.

^ | v • Reply • Share ›



**Lauren Do** → Heidi Clark • 3 months ago

There's a research hierarchy pyramid if you're interested. Just google those stream of words and you'll be able to see what type of articles are "more credible" than others. For example, meta analysis, systematic reviews, and randomized control trials are the top 3 of the hierarchy in terms of credibility.

Most journal search engines will allow you to filter the types of articles, so if you filter in the highly cited ones, you should be good. Hope this helps!!

^ | v • Reply • Share ›



**RogerWilco** • a month ago

The date when the article was written is key to me, because it tells me whether it's possibly an article which is outdated or superseded, or on the contrary, if it's brand new.

I'm surprised none of the answer mentioned that.

1 ^ | v • Reply • Share ›



**Marcial Delgado Fernandez** • 3 months ago

I should recommend "How to read a paper" by Trisha Greenhalgh, a Classic in this field.

1 ^ | v • Reply • Share ›



**anObserver** • 17 days ago

Some times you may not understand a figure or text without actually getting a feel (& hopefully description) of the data. Is there a way to actually get hold of the data described in a paper.

Excuse me if it is a dumb question!

^ | v • Reply • Share ›



**Mike Wofsey** • a month ago

Much of my job requires me to be a bit skeptical of any new research or request for funding,



because I help other scientists and Federal officials to allocate taxpayer's money to proposals and research. So before I read a paper or request, I first make sure I have enough background to understand what they're doing and what makes their work novel. Assuming the work is roughly in my own area, that usually means spending an hour or so reading some background information. I have a tendency to be awe-struck by great research, and I tend to get super-excited by interesting work and I often end up thinking that research is the greatest thing since sliced bread. I can't help it, but I'm an insufferable fan of science! Getting some background of other recent work in the area helps me to remain clear-eyed with what they have actually done, and helps me to more clearly see the deficiencies and strengths of the work and the proposal. And once I get into research or a proposal, I like to scribble some estimates and notes ... do their results seem reasonable? Do any thoughts for further work come to mind? Any other inputs? Ultimately, the papers and applications are living documents; the reader's ideas, questions and concerns can and should feed back to the researchers in some way, like a spirited conversation at the saloon, the more the merrier. - Michael Wofsey, AST, contract to DOE.

^ | v • Reply • Share ›



**Chucky Arla** • a month ago

I read articles about the paper, and then act as if I read the paper itself.

^ | v • Reply • Share ›



**Dr Gautam Kaul** • 3 months ago

A very nice compilation of how to read what you want to read.

^ | v • Reply • Share ›



**Vaughn-Debbie Payne** • 3 months ago

I always read the accompanying editorial first.

^ | v • Reply • Share ›



**WW** • 3 months ago

...the best way , for physics and engineering or math papers..is to work through the math. Even write a computer program (if you can) for at least their final results..or primary equations they discovered. Others suggested finding similar papers and related topics...yes but if you need the "introduction to book"..then stay within the parameters of what you already know. I never had a full formal course in General Relativity (but watched a couple of nice lessons online..MIT has good math courses on youtube)...but did find some of those "mini-dover books" in my local public library. Even television programs can help, if you know where to look. the show "Stargate Universe" has the brief outlines of Kip Thorne's "wormhole theory" papers (as does the movie "Interstellar")..and you can almost follow along using Professor Thorne to interpret "Dr. Rush". Engineering students know the only real way to understand a circuit is to build it..but recently one of the primary manufacturers of power control chips put out a circuit simulator.for all to use for FREE. Check out lineartechnologydotcom and their program LTSPICE,

^ | v • Reply • Share ›



**Lars Steffensen** • 3 months ago

These suggestions makes sense to me, but they are a bit surprising. I mostly just plow through all in "chronological order" with the exception of the experimental design (almost always so boring). This might work better for partly because I often read studies that are done outside my own field. The boring bits give me time to get a sense of the thinking of the author as he is closing in on his conclusions.

I usually make multiple copies of the same article: One pristine for printing. One paper print for



reading. I mark up the paper print with a yellow marker as I go along. When I'm done reading I make a digital version of the markings in second digital copy. Both digital copies will reside in a note in Evernote, titled and tagged with author names and relevant search tags. If I need to process the text any further, I might make a translation of excerpts into my native Danish language or indeed in English if that is appropriate. This resides in the text section of the note. I try to put in a few well chosen tags but it is always hard to predict what kind of searches I will make to find it again. Paper version gets archived in a relevant binder.

^ | v • Reply • Share ›



**Kirti Sawant** → Lars Steffensen • a month ago

Thank you Lars for sharing the methodology you follow. From what I deduct, what you do might be of a great help when recollecting an article of interest or even quoting it a research article. That is really a very cool idea and is about to be followed by novice researchers like me. :)

^ | v • Reply • Share ›



**PhoneLuzer** • 3 months ago

Why not emphasis readability and de-emphasize jargon?

^ | v • Reply • Share ›



**Moose** → PhoneLuzer • 2 months ago

That's the job of scientific news outlets....if readability were emphasized at the cost of jargon (assuming that the article was already well-written), it would either A. hugely increase the length of the manuscript or B. necessitate a decrease in content per manuscript. Salami-slicing is bad enough as it is (in chemistry at least), so I personally don't favor B. Increased length leads to decreased readership, even if it also leads to increased comprehension. That's what reviews are for, anyway, as they typically focus on one main "quantum of jargon" per manuscript, so its usually more palatable....but they also average 10-100 pages in small point font so they're not good bathroom reading unless you're really really constipated.

Modern scientific endeavor is composed of many interlocking ideas that are INDIVIDUALLY conceptually challenging as it is. Most meaningful research, particularly in the biomedical sciences, requires understanding and proper usage of many ideas, imaging data, analytical techniques, etc. and consequently it takes decades to master most subject areas. Thus, its hard to concisely weave everything together without jargon....it would take too long to explain everything in the conventional way.

I suggest a quick search on wikipedia for most jargon thats unfamiliar to you (contrary to

[see more](#)

1 ^ | v • Reply • Share ›



**Tiffany Manning** • 3 months ago

I PRINT IT OUT on coloured paper - it ends up being a good memory cue. Of course, read the abstract first .. then I read a paragraph, and paraphrase it by summarising and noting keywords. I consider the paper critically by getting another sheet of paper and writing up two columns: GOOD /BAD - so I have a spot to jot notes while I'm reading of those things. All that paraphrasing helps me understand what I have read and is great to use in the future If I want to discuss that paper. I also dive into what the article cites, and see if I have an interest in looking at those. Sometimes, If I have to read manv. for a literature review. I make mvself a little checklist template of all the things I

need to examine and clip it to the front of each paper. Although most of my work is on computers, I still print out and manually write on research papers because of how often I flip back and forth and like to scribble. Also, printing it out on coloured paper ( usually light blue) helps me locate them in a pile of other papers!!!!

^ | v • Reply • Share ›



**Nicole González** → Tiffany Manning • 19 hours ago

Thanks for sharing, Tiffany! These tips are so helpful; I usually do the little summaries of each paragraph in small text boxes (I use PDFs) but don't tend to do it so organized. Definitely applying your approach from now on.

^ | v • Reply • Share ›



**Bui Dinh Ba** • 3 months ago

Wow this article is some thing I am trying to pursue to get courage to read and understand complicated paper in my research field. Thank you very much for sharing precious experiences

^ | v • Reply • Share ›



**Keith Tinkler** • 3 months ago

When I taught an undergraduate research methods course I spent a whole lecture on this topic , especially telling them that the last thing to do was read the paper (guffaws). Jesse Shanahan (above) summarizes well the approach I took. The next year in one of my courses with many of the same students I had 12 set papers - and a mid-term asking for a summary of two I chose at random.

^ | v • Reply • Share ›



**Kiem Nguyen** • 3 months ago

How can I read and understand a article just by imagination? Introduction is the easiest and method is the most difficult. Some research they use experimental setup and statistical analysis such as genetics, metagenomics. It has taken a year for me just catch up a few limited concepts. I wish they would be written more concisely and comprehensively.

^ | v • Reply • Share ›



**Anwar Hossain** • 3 months ago

My way to read a paper is to go through the paper at a glance. Then Abstract, Conclusion, Figure reported. Then if seems interesting then from the beginning to the conclusion. For difficult or important articles better to read at least thrice.

^ | v • Reply • Share ›



**dengdeng** • 3 months ago

my way is reading abstract deeply, than read the body at high speed to find relevant keywords and if something catch my attention, I start read the entire sentence or paragraph. The more I read the more I want to know so, at the end (if interested) I read from abstract to the end.

^ | v • Reply • Share ›

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