

Reading Scientific Papers

In 8 easy steps!



Before we start....

- Realize that everything I tell you is only a **SUGGESTION**
- Use this as a guide, but feel free to try your own thing



The tool of the trade: SAO/NASA Astrophysics Data System (ADS)

- <http://www.adsabs.harvard.edu/>
- Go to Search>Astronomy and Astrophysics
- You can search for different authors, title keywords, abstract keywords, etc
- **Pro Tip:** putting a “^” before an author’s name tells the system to look for papers where that person is the FIRST author

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The SAO/NASA Astrophysics Data System

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The screenshot shows the SAO/NASA ADS Astronomy Query Form for Sun Sep 29 05:03:17 2013. The page includes a navigation menu with links for Sitemap, What's New, Feedback, Basic Search, Preferences, FAQ, and HELP. A button labeled "Check out ADS Labs!" is visible. The main search area contains several sections: "Databases to query" with checkboxes for Astronomy (checked), Physics, and arXiv e-prints; "Authors" with a text input field and checkboxes for SIMBAD, NED, ADS Objects, Exact name matching, and Object name/position search; "Publication Date" with fields for month and year, and checkboxes for Require author for selection and Require object for selection; "Title Words" with a text input field and checkboxes for Require title for selection and simple logic/boolean logic; and "Abstract Words/Keywords" with a text input field and checkboxes for Require text for selection and simple logic/boolean logic. At the bottom, there are fields for "Return" (set to 200) and "items starting with number" (set to 1). Links for "ADSLabs Full Text Search", "myADS", and "Private Library" are also present.

General Suggestions

- Take notes and/or annotate
- Note of any words you don't know and **look them up**
- Be mindful of the meaning of words you think you know. For example, “significant” and “non-significant” have a very specific statistical meaning.
- Don't be afraid to use google/wikipedia as you go
- Make notes of important references as you go along so that you can look them up later.

General Structure of Papers

- Abstract
- Introduction
- Methods
- Results
- Discussion/Conclusions

The Abstract

- Really just an advertisement
- Gives a summary of the paper: the, problem, the experiment, and the conclusion
- Used mostly as a way to decide if a paper is what you are looking for
- Avoid reading the abstract in too much detail before you read the paper itself

Abstract MadLibs!!

This paper presents a _____ method for _____
(synonym for *new*) (sciencey verb)
the _____. Using _____, the
(noun few people have heard of) (something you didn't invent)
_____ was measured to be _____ +/- _____
(property) (number) (number)
_____. Results show _____ agreement with
(units) (sexy adjective)
theoretical predictions and significant improvement over
previous efforts by _____, et al. The work presented
(Loser)
here has profound implications for future studies of
_____ and may one day help solve the problem of
(buzzword)

(supreme sociological concern)

Keywords: _____, _____, _____
(buzzword) (buzzword) (buzzword)

The Introduction

- This is where all the background info is!
- **Step One:** Identify the **BIG QUESTION**

What is the problem being addressed by the entire field (or sub-field)?

- **Step Two:** Summarize the background in *five sentences or less*

What work has already been done?

What hasn't been done? (or what hasn't been done well enough?)

Why is this work important?

etc...

The Introduction

- **Step Three:** Identify the SPECIFIC QUESTION(S) being addressed

What exactly are the authors addressing?

How does it fit into the bigger picture question(s)?

- **Step Four:** Identify the approach being taken to answer the questions. Usually the introduction will give a brief overview of this.

Methodology

- **Step Five:** Understand as best you can the methods used by the authors to answer their questions.
- This can be very difficult. This section can have a lot of technical details.
- See if you can understand the reason behind each step the authors take in their experiment.

Results

- **Step Six:** Be able to summarize the results of the paper.
- This section is like a story that the authors are trying to tell you.
- Most of the information here should be contained in the figures
- **Step Six-point-five:** For each figure, be able to explain
1) what they are showing, 2) what conclusions can be drawn from them, and 3) what they add to the authors' arguments

Results

- **Step Seven:** Ask yourself, “did the authors succeed in addressing the questions they set out to answer?”
- What conclusions would **YOU** draw and why?
- Ask yourself this **before** you read the conclusion section

Discussion/Conclusions

- **Step Eight:** Read this section. Be able to summarize what the authors conclude and why. Do the author's conclusions make sense based on the data presented?
- Try to connect each conclusion made by the authors to plots or data presented in the "results" section.
- How are these results significant to the big picture question(s)?

Done!

- Hooray! You're done reading the paper!
- **Note:** This is not as linear as it sounds. Expect a lot of flipping back and forth between sections.

What now?

- Look up those references you made note of, then see step one...
- Read it again. Knowing the story already can allow you to catch things you missed before
- Look up papers that cite the one you just read