How to Read a Scientific Paper

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Material

At first we will follow indications from https://pubmed.ncbi.nlm.nih.gov/18695858/, a pretty old but actual paper that explains fundamentals of writing a scientific paper.

Basic structure of a paper

The basic structure of a paper can be summarised with the acronym IMRAD:

Box 1. IMRAD stands for:

Introduction	(What question was asked?)
Methods	(How was it studied?)
Results	(What was found?)
And	
Discussion	(What do the findings mean?)

Types of paper

Nevertheless there are lots of different types of paper:

Box 2. Types of papers include:

1. Original article
2. Case report
3. Technical note
4. Pictorial essay
5. Review
6. Commentary
7. Editorial
8. Letter to the editor
9. Others
10. Non-scientific material

We will focus on the principal ones, Reviews and Original articles.

Review

It is a detailed research on recent advances in a specific topic. It is meant to highlight important points that have been previously reported in literature.

Does not contain new research or informations, neither explicit author's opinions or personal experience.

Lots of references are expected.

The general structure of a review is: abstract, introduction and subheadings.

Where's the IMRAD structure here? Is masked, but even present! We will see it in the last lesson of the course.

Original articles or Research article

It is the most important type of paper. It contains original researches, supported by experiments and statistical analyses.

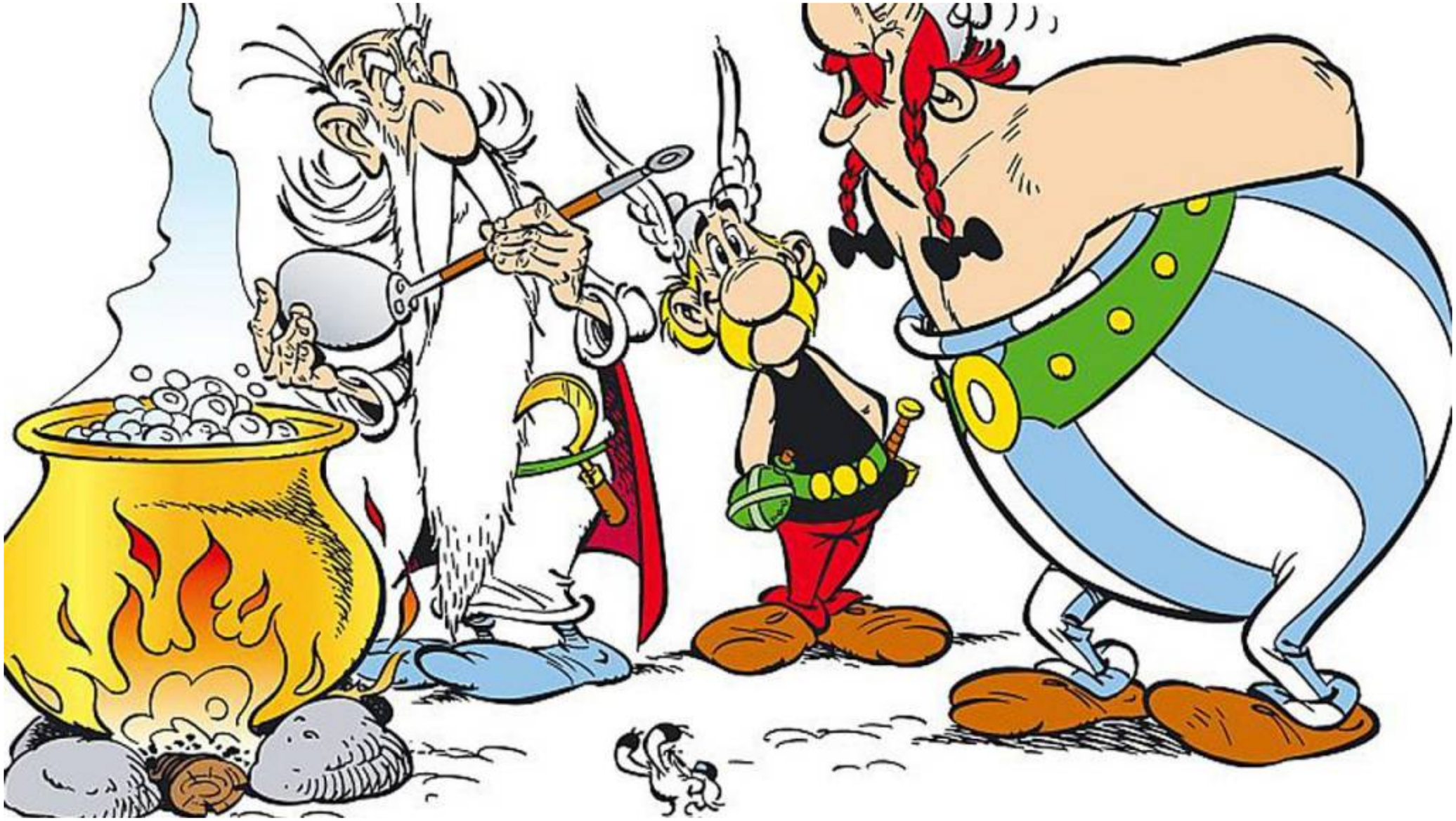
The conclusions should be supported by the data provided in the results.

Here, the IMRAD structure is more clear, in fact chapters are literally:

- Abstract
- Introduction
- Methods
- Results
- Discussion

In the next we will focus on how to read a research article.

Is there a magic formula that explains the best way to read a paper?



Is there a magic formula that explains the best way to read a paper?

The answer is: **of course NOT**

Each person is different as well as **each paper**, nevertheless there are some **general rules** we have to follow as well as some **advices**.

1. Do not read a paper like a novel or a newspaper article

In fact:

- The information is **too dense** to comprehend it with a simple reading

- You may be interested in a specific aspect of the article and not on the entire document. In this sense, the **IMRAD** structure helps a lot in finding parts we are interested in.

- The understanding of an excerpt of the paper often requires **backward** or **forward reference** to other parts of the paper itself or of other works.

- For adequate understanding of an article, you should be prepared to read it at least **two**, **three** or **four times**. Things that can seem to be obscure at the first reading will become more clear in the next.

- Often, it can happen that you do not have an adequate **background**. You have to be willing to temporary set aside the paper you are reading to read other works that may help you (maybe picking them from **references**).

2. Screen the article

Before diving into the article you have in hands it is fundamental to:

- Read and understand the **title**. Usually the title contains the context and partial results.

- Look through the **authors** to see if there is anyone whose name you recognise. In particular focus on the first and the last authors: the first is who made the work, while the last is the leader of the laboratory, so he represents it.

- Control the **date of publication**. Information, in fact, is rapidly changing and you certainly want to keep up with the times. Notice that there is a definite lag period between when the research gets done, when the article gets written and when it gets published. In addition to the publication date, many journals list the date the article was received and then the date when the article was accepted

- Some articles have a brief list of **key words**. Check them! They are usually quite informative.

3. Get the point

You now approach the paper text:

- Read the **abstract** until until it makes sense.

- Read **introduction**, as:

  - It contains **background** and many references that can help us understand the rest of the article.

  - Often explains the line of the paper in a way that is **easier to understand** the way it is presented in the abstract.

  - Gives a hint into the **point of view** of **authors**.

4. Understand the approach

Now that we know the context and the line the authors will follow we want to discover the building blocks and the final opinion of authors with respect to the obtained results.

To do that:

- Examine **figures** and **tables** and their caption. You probably do not understand completely them this first time though this will help you know what to look for when you actually read the article.

- Read the **discussion**. It contains a summary of the whole article, as well as comments on results and explanation of the interpretation and message the authors want to share.

5. First reading

We can finally read the complete paper:

- Recapitulate **abstract** and **introduction**.

- Go through **results** section.

- To better understand how results have been obtained you often have to jump to methods, nevertheless at first you can also read all results and then all **methods**.

- Study all **figures** and **tables**.

- Re-read the **discussion**. Now it has to make more sense.

6. Increase understanding

You have read all the complete article. All the pieces of the puzzle are at their place? Maybe not:

- **Re-read** parts you have not understood

- Make sure you **write** on the article: circle words you do not know, highlight important points, question things you do not understand, pin down further ideas or questions.

- Consult more **references**.

- Before leaving the article re-read the **abstract** to fix the paper in your head.

- At least… do not forget supplementary files!!

How to choose a paper?

We saw how to read a paper, but in the ocean of papers that are published on a certain topic, how can we decide **which** one to choose?

High Impact Factor (IF) journals

or

Highly specific journals

Recent papers

Authors whose work you know

How to choose a paper?

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or
Highly specific journals

The impact factor is a **scientometric index**, that evaluates the yearly mean **number of citations** of articles published in the last two years in a given journal. It is used as a proxy for the relative importance of a journal.

See https://impactfactorforjournal.com/highest-impact-factor-journals/ for latest **ranking** of journals.

Journals as “**Nature**”, “**Cell**”, “**Science**” and “**The Lancet**” are the most suggested.

How to choose a paper?

We saw how to read a paper, but in the ocean of papers that are published on a certain topic, how can we decide **which** one to choose?

Recent papers

As we said research in **biosciences** proceeds rapidly, so papers get old quickly. To make sure of staying tuned always search for **newest papers** (last two-three years).

Notice that, however, there are some exceptions: there are some papers that **wrote the history** of biology/medicine/statistics and **never go out of fashion**.

How to choose a paper?

We saw how to read a paper, but in the ocean of papers that are published on a certain topic, how can we decide **which** one to choose?

Authors whose work you know

If you know that a certain researcher is a "**guru**" of his field, follow him/her!

Where to search a paper and how?

You can directly type your keywords of interest on google, but the most efficient way to find a paper on a biomedical topic is going on **Pubmed** @ https://pubmed.ncbi.nlm.nih.gov

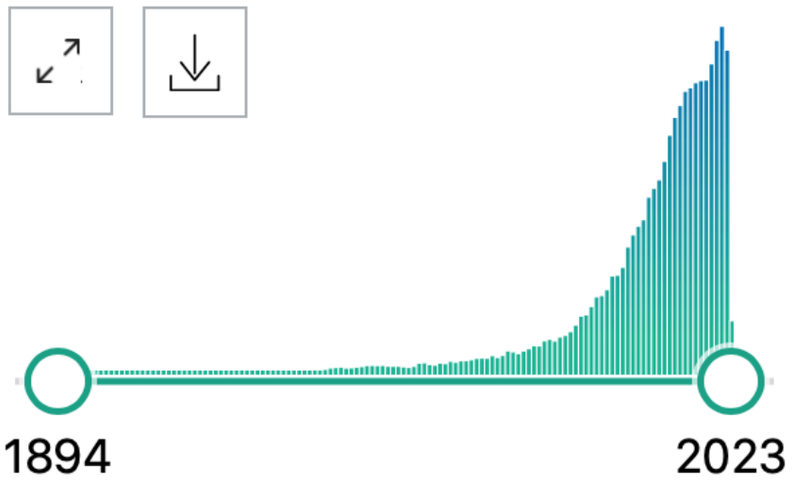
Type your **keywords** and PubMed will display all papers that fit your research.

Let’s try searching “Prostate cancer” as an example.

Where to search a paper and how?

On the left you will find…

RESULTS BY YEAR



TEXT AVAILABILITY

- [ ] Abstract
- [ ] Free full text
- [ ] Full text

ARTICLE ATTRIBUTE

- [ ] Associated data

ARTICLE TYPE

- [ ] Books and Documents
- [ ] Clinical Trial
- [ ] Meta-Analysis
- [ ] Randomized Controlled Trial
- [ ] Review
- [ ] Systematic Review

PUBLICATION DATE

- ( ) 1 year
- ( ) 5 years
- ( ) 10 years
- ( ) Custom Range

You can choose **filters** and the order you prefer.

Notice that the more **keywords** are **generic** (as in this case) the **higher** is the **number of results**.

And on the right…

Sorted by: Most recent | Display options

1 Cite Share

Risk factors for lymphorrhea and lymphocele after radical prostatectomy: a retrospective case-control study.

Zheng WC, Ke ZB, Wu YP, Chen JY, Chen SH, Zheng QS, Wei Y, Sun XL, Xue XY, Li XD, Xu N.

World J Urol. 2023 Feb 16. doi: 10.1007/s00345-023-04321-2. Online ahead of print.

PMID: 36792813

2 Cite Share

Low hemoglobin and PSA kinetics are prognostic factors of overall survival in metastatic castration-resistant **prostate cancer** patients.

Hakozaki Y, Yamada Y, Takeshima Y, Taguchi S, Kawai T, Nakamura M, Iwaki T, Teshima T, Kinoshita Y, Akiyama Y, Sato Y, Yamada D, Suzuki M, Kume H.

Sci Rep. 2023 Feb 15;13(1):2672. doi: 10.1038/s41598-023-29634-5.

PMID: 36792713

The objective of this study was to identify the prognostic factors and to propose a new risk model in metastatic castration-resistant **prostate cancer** (mCRPC) patients. The clinical data were retrospectively obtained for 102 mCRPC patients who received **cancer** ...

…

5 Cite Share

An Update on the Use of Wearable Devices in Men's Health.

Qureshi FM, Golan R, Ghomeshi A, Ramasamy R.

World J Mens Health. 2023 Jan 27. doi: 10.5534/wjmh.220205. Online ahead of print.

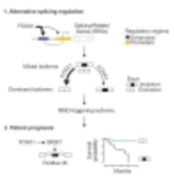
PMID: 36792091 Review.

Men have higher mortality rates worldwide and are more negatively affected by chronic conditions such as obesity and heart disease, as well as addiction to alcohol and tobacco. Men also have health issues such as **prostate cancer** and male sexual dysfunction which onl ...

Where to search a paper and how?

If you open the preview of a paper, moreover, PubMed provides you useful information, like:

Figures



Graphical abstract

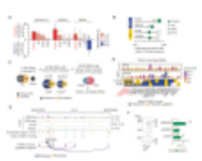


Figure 1 FOXA1 transcriptionally controls splicing-related genes...

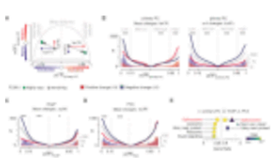


Figure 2 FOXA1 calibrates the alternative splicing...

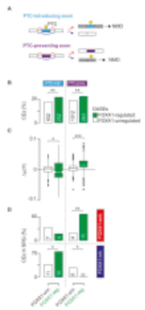


Figure 3 FOXA1 controls nonsense-mediated decay determinant...

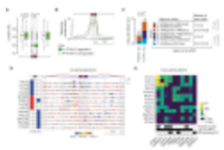


Figure 4 FOXA1 mediates exon silencing by...

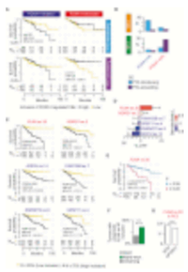


Figure 5 FOXA1-regulated NMD-determinant exons

References

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2. Aran D., Sirota M., Butte A.J. Systematic pan-cancer analysis of tumour purity. Nat. Commun. 2015;6:8971. - PMC - PubMed

Similar articles

Mechanism of Nonsense-Mediated mRNA Decay Stimulation by Splicing Factor SRSF1.
Aznarez I, Nomakuchi TT, Tetenbaum-Novatt J, Rahman MA, Fregoso O, Rees H, Krainer AR.
Cell Rep. 2018 May 15;23(7):2186-2198. doi: 10.1016/j.celrep.2018.04.039.
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Development. 2021 Aug 1;148(15):dev199754. doi: 10.1242/dev.199754. Epub 2021 Jul 29.
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RNA-Binding Proteins CLK1 and POP7 as Biomarkers for Diagnosis and Prognosis of Esophageal Squamous Cell Carcinoma.
Yang X, Han B, He Z, Zhang Y, Lin K, Su H, Hosseini DK, Sun H, Yang M, Chen X.
Front Cell Dev Biol. 2021 Sep 9;9:715027. doi: 10.3389/fcell.2021.715027. eCollection 2021.
PMID: 34568328 **Free PMC article.**

Role of long interspersed nuclear element-1 in the regulation of chromatin landscapes and genome dynamics.
Ramos KS, Bojang P, Bowers E.
Exp Biol Med (Maywood). 2021 Oct;246(19):2082-2097. doi: 10.1177/15353702211031247. Epub 2021 Jul 25.
PMID: 34304633 **Free PMC article.** Review.

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You can also find papers on journal's web page directly.

https://www.nature.com

https://www.cell.com

https://www.science.org

https://www.thelancet.com

Where to search a paper and how?

If instead, you are searching for **all** the work of an "**important**" **researcher**, the best to use is Google Scholar. Let's search, for example, "Gene Yeo".

Google Scholar

Gene Yeo PhD MBA

SEGUI

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Author Correction: Expanded encyclopaedias of DNA elements in the human and mouse genomes JE Moore, MJ Purcaro, HE Pratt, CB Epstein, N Shoresh, J Adrian, T Kawli, ... Nature 605 (7909), E3-E3		2022
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Discovery and functional interrogation of SARS-CoV-2 protein-RNA interactions G Yeo, J Xiang, J Mueller, EC Luo, B Yee, D Schafer, J Schmok, F Tan, ... Research Square, rs. 3. rs-1394331		2022
Engineering sequence specificity in an RNA-binding zinc finger protein Q Liang, JS Xiang, KD Corbett, G Yeo Biophysical Journal 121 (3), 479a-480a		2022
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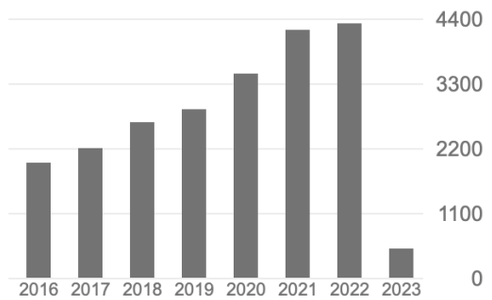

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