Workshop Week 1

Dr Michael Cowley

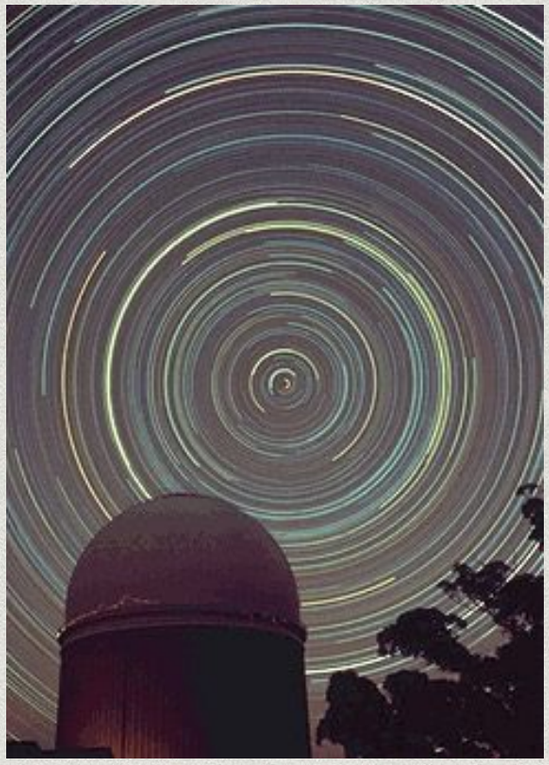
SEB104 Grand Challenges in Science: Space Exploration

School of Chemistry and Physics
Faculty of Science

Space Exploration Challenge

Challenge Leader:
Dr Michael Cowley
Astrophysicist
michael.cowley@qut.edu.au

My research involves extragalactic astrophysics and cosmology, including galaxy formation and evolution, star-formation, actively accreting supermassive black holes, multi-wavelength photometry, infrared spectroscopy, and spectral energy distribution modelling.

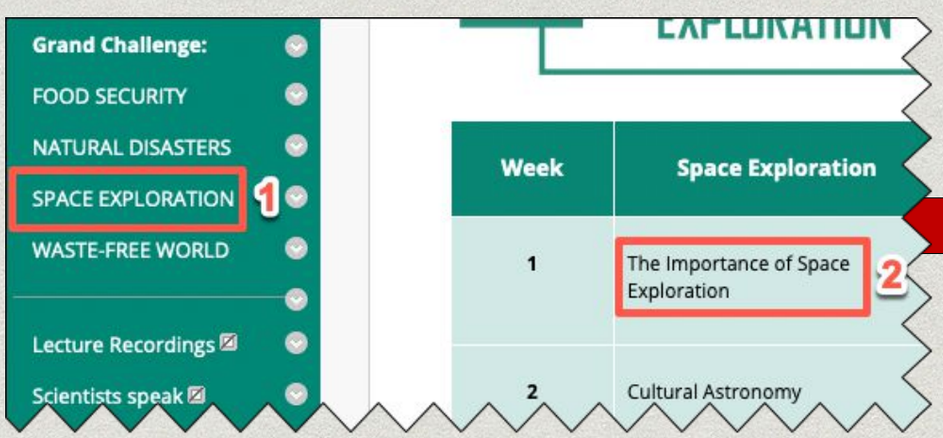


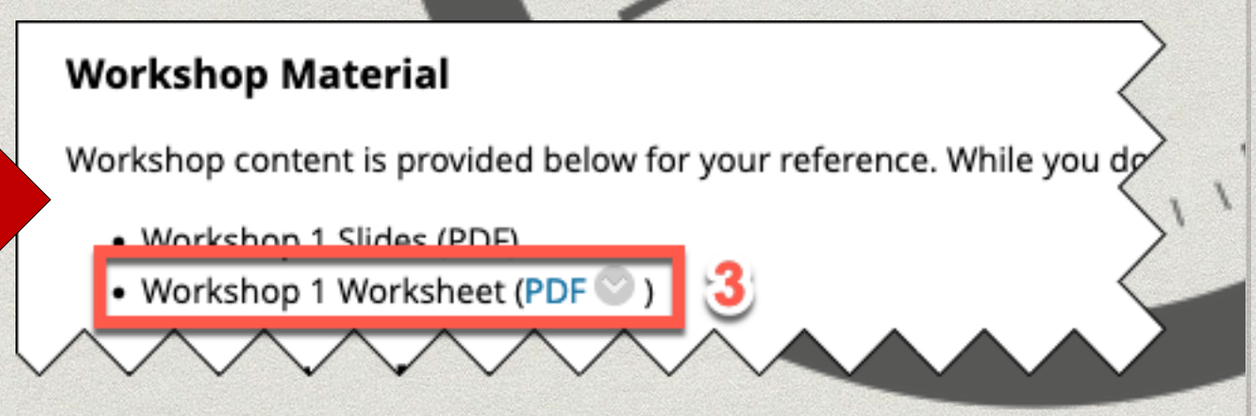
Activity

Welcome to your first SEB104 Workshop!

For the first 10 minutes, please do the following:

1. Log onto QUT Blackboard
2. Locate the SEB104 unit
3. Complete “Workshop 1 Worksheet”.





News
Olympia

Space News

SPACE CONNECT

Aussie telescope helps listen to the Milky Way galaxy for signs of civilisation in new program

- Parkes telescope conducts the most comprehensive survey of radio emissions from the Milky Way galaxy
- Over a petabyte of data will come from the radio spectrum between 1 and 12 GHz in this program
- Thanks to its location, Parkes is perfectly situated and instrumented to perform such scans
- The telescope is funded by the Australian Government and managed by the CSIRO
- It's hoped the data will reveal something new and interesting, be it other intelligent life or an undiscovered astronomical phenomenon

Hard Drives

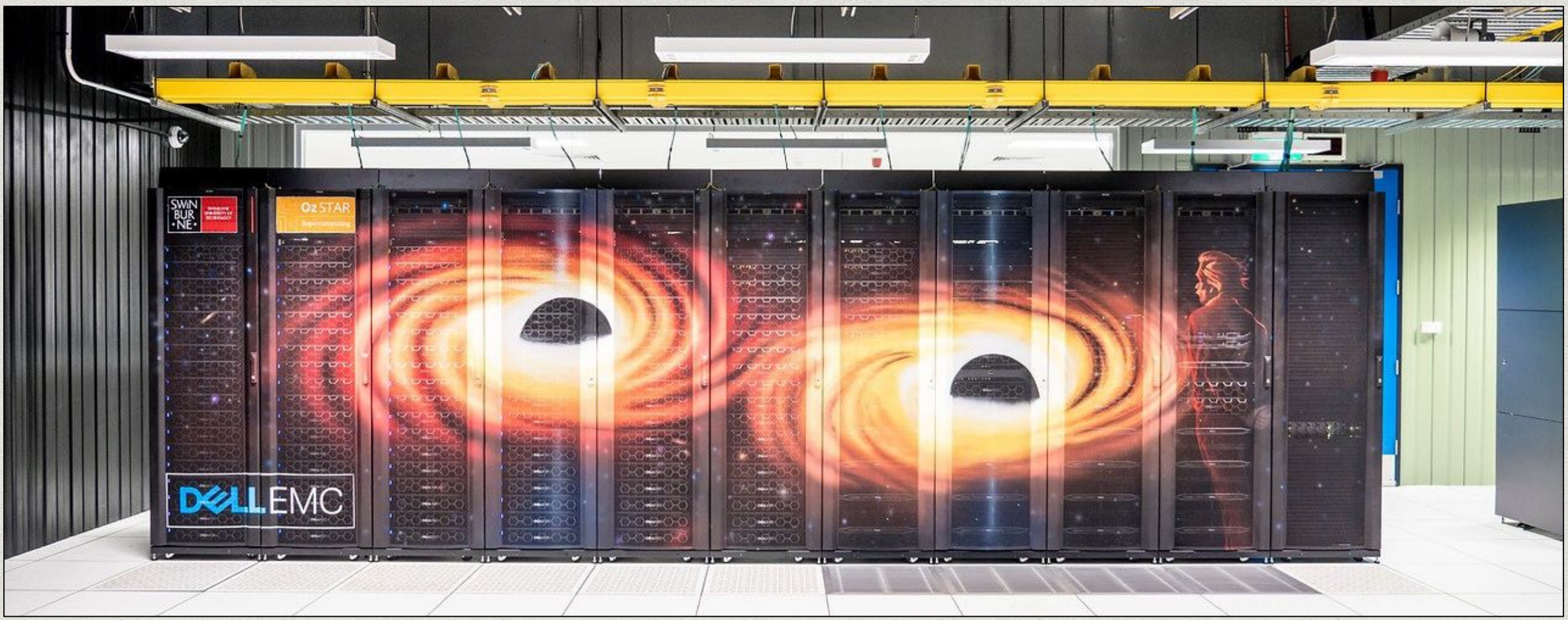
The IBM 350 hard drive was introduced in 1956. It had fifty 0.6 m platters, with a total capacity of five million 6-bit characters (3.75 megabytes). The average seek time (time it takes the head on the actuator arm to travel to the track on the disk) was ~1 second.

<u>Average hard drive today:</u>

Platter: 200 nm (3,000,000x smaller)

Size: 1 TB (200,000x capacity)

Seek time: ~0.2ms (5,000x faster)

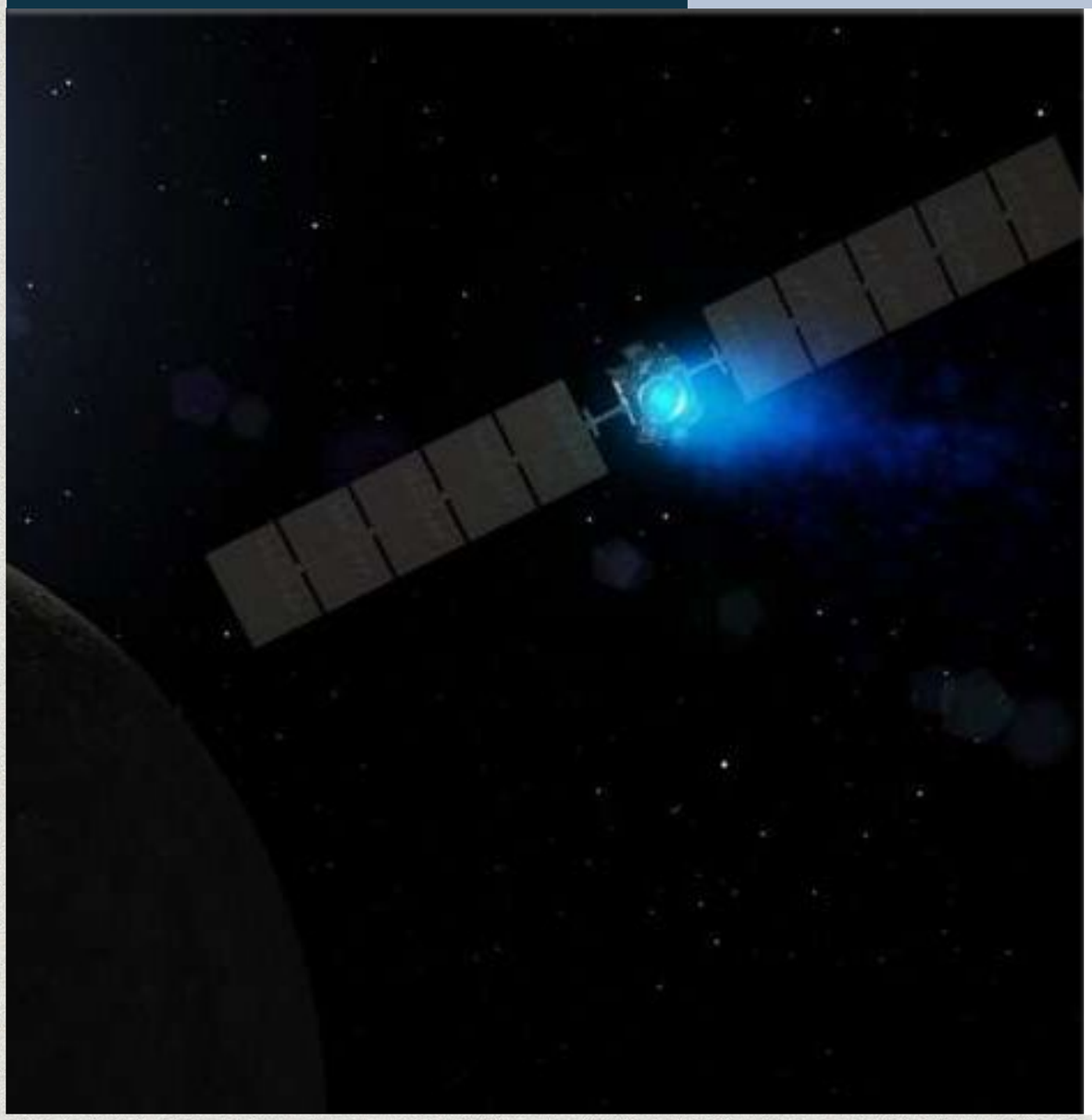


OzSTAR is one of the fastest supercomputers in Australia and in the top 500 supercomputers worldwide.
It is a Petaflops facility which means it's capable of performing more than a thousand million million calculations per second.
OzSTAR comprises over 5,000 processing cores, 230 GPUs, a collective 25 Terabytes of system memory and access to over 6 Petabytes of storage.

Space News

PHYS.ORG

How better propulsion systems can improve space exploration



- Rockets require massive amounts of fuel to launch and guide a limited crew and/or cargo into and through space
- Today, new thruster technology uses a process known as ionisation to create a stream plasma to propel satellites through space
- The ionized gases used as propellant weigh less than the fuels burned by the thrusters of the Apollo era
- Such thrusters can also accelerate over time in a way that a fuel-burning craft can't, ultimately giving these lightweight engines a speed advantage as well.
- Mathematical modelling continues in an effort to refine the technology.

Remember...
Space Exploration is Highly Interdisciplinary

Physics
Fundamentals of space flight.

Dynamics of celestial objects.

Materials Science
High-performance materials for space vehicles.

Geology
Planetary tectonics.

Mining of other planets and comets.

Chemistry
Rocket fuels.

Batteries.

Novel composites and polymers.

Robotics
Remotely controlled vehicles.

Mathematics
Control theory and mission optimisation.

Computer simulations of space missions and planetary orbits.

Biochemistry
Nutrition for space conditions.

Computer Science
Computer systems and software for mission control.

Medicine
Well-being of flight crew

Engineering
Designing and building efficient and reliable space vehicles.

Biology
Looking for life in space.

Psychology
Crew selection.

Crew wellbeing.

Workshop Goals

Form a group

↓

Identify a challenge related to space exploration

↓

Split this challenge up into easy to manage components

↓

Research your challenge (group and individual components)

↓

Evaluate and report solutions to your challenge

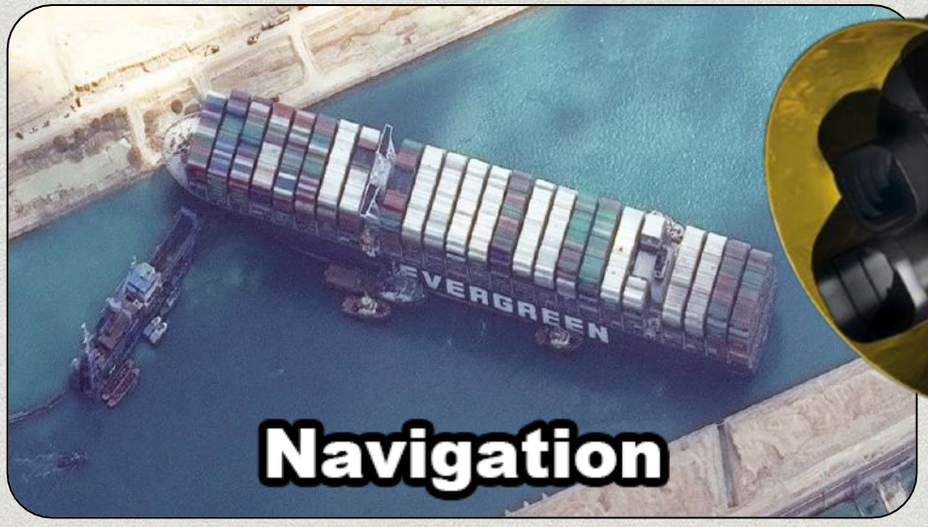
↓

Communicate your findings (poster, essay, etc.)

Previous Popular Topics

- Life on Mars
- Building a base on the Moon
- Mars Station
- Establishing a Moon Base
- Living on Mars
- Colonising Mars
- Mission to Mars

Reliance on Foreign-owned Satellites



What's required for sovereignty?

- Do we have the infrastructure to launch, monitor and maintain?
- Do we have the materials and the know-how?
- Government, private or a combination?
- Can we do it cheaper and safer than competitors?

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Psychology
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Crew wellbeing.

Assessment

1. Workbook 20% (individual)
   - Annotated Bibliography (10%) – Due Week 4
   - Reflective Writing Submission (10%) – Due Week 12
2. Poster 30% (group)
   - Poster Presentation – Due Week 7
3. Essay 50% (individual)
   - Discussion Forum (5%) – Week 10
   - Research Essay Submission (45%) – Week 13

Late Assessment Policy

QUT policy for late assessments

- The policy states that assignments submitted after the due date, without an approved extension, will normally not be marked and will receive a grade of 0%.
- This policy reflects the expectations of professional practice for meeting deadlines and provides a consistent University-wide approach for students.
- To support the policy a single online assignment extension process for applying for assignment extensions has been developed.

Changes to assignment extensions

You now have two options for assignment extension.

Automatically approved 48-hour extension

Available 48 hours either side of the due date

Longer extension

Application based on special circumstances with documentation

There is one assignment extension online form with options for Longer extension and Automatically approved 48-hour extension. You must select unit, assignment and extension type.

More information and extension form: **qut.to/late-assessment**

Late Assessment Policy

Late assignments and extensions

Assessment submitted after the due date without an approved extension will not be marked and will receive a grade of 1 or 0%. If special circumstances prevent you from meeting the assessment due date, you can apply for an extension. If you don't have an approved extension you should submit the work you have completed by the due date and it will be marked against the assessment criteria.

Professional Ethics Criteria

Overriding criteria				
Professional ethics *appropriate level of academic and professional integrity - evidence of plagiarism or direct copying of material*	No evidence of academic dishonesty or plagiarism – **No penalty**	Inadequate, incorrect or inconsistent citation and/or referencing of sources, paraphrasing too close to the original, including minor copying of material, such as copying up to a few sentences: **Maximum grade of 6 for task, dependent of remaining CRA**	Significant levels of plagiarism or direct copying of material (e.g. copying whole paragraphs): **Maximum grade of 3 for task, dependent on remaining CRA; recorded in faculty misconduct database**	High level of plagiarism e.g. a lot of the assessment item is copied directly from a source (e.g. website, journal article, video, text book, previous assignment by another student or your own): **Referred to SEF as major academic dishonesty.**

https://www.citewrite.qut.edu.au/academic-integrity/

Workbook: Annotated Bibliography

- Read the Task Description and Marking Criteria in your own time.
- Summarise ten (10) relevant information sources.
- This may include government reports, industry or associated reports, reputable web sites and at least six (6) peer reviewed journal articles that relate to your Grand Challenge/ problem

Why Write Annotated Bibliographies?

- To provide a review of the literature on your chosen subject.
- To demonstrate the quality and depth of your reading.
- To show the scope of sources or research available, e.g. journals, books, websites.
- To inform the reader of the relevance, accuracy and quality of sources that may be of interest.
- To explore and organise sources for further research (i.e. poster and essay).

Annotated Bibliography

There are two main sections to each annotated bibliography entry:

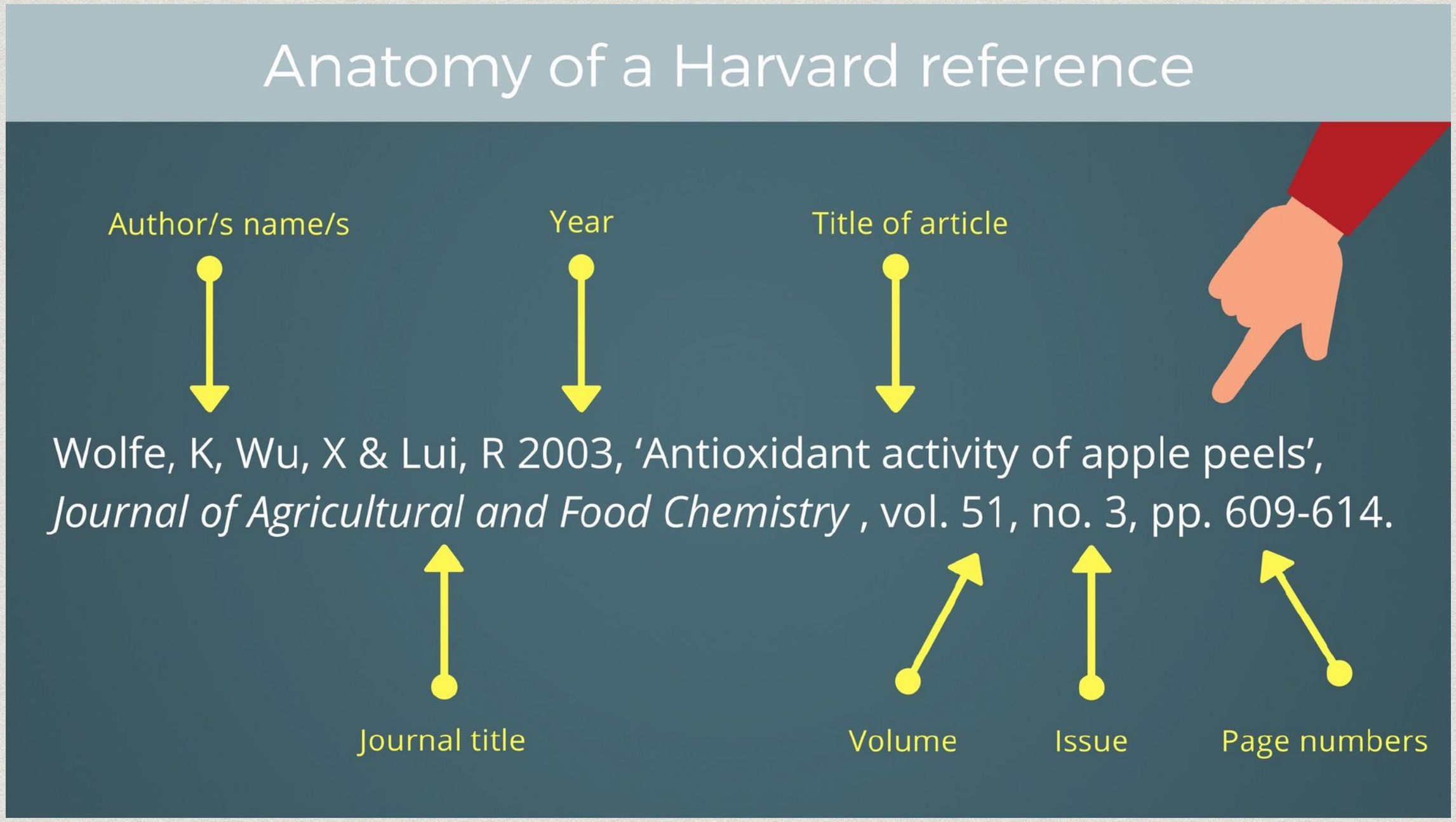
1. The bibliographical information (the reference itself).

2. The explanatory paragraphs (the annotation).

Bibliographical Information

- A reference typically includes the author name/s, year of publication, and information about the source itself (e.g. article name, website, journal name, etc.)
- Universities and publications have standard referencing styles. QUT recommends either APA, Harvard, Vancouver or Legal.
- In your own time, visit and review www.citewrite.qut.edu.au and read the QUT cite | write booklet (from the link above or Blackboard)
- Choose a style and be consistent.

Harvard Style



Source: ANU

Reference Management Tools

A report, article or even a thesis will have many references, so some time spent at the beginning can save you many hours towards the date of submission!

Reference management programs (also known as citation managers or bibliographic management software) provide many useful features that can help you with your research such as:

- storing and organising your references
- generating citations and bibliographies in the style you prefer; and,
- easily converting referencing styles to suit publication requirements.

Reference Management Tools

- Store references in a searchable database
- Attach PDFs and other files
- Auto-generate citations and bibliographies/ reference lists in your document in your chosen style (e.g., Word, Google Docs, LaTeX)
- Share collections of references with others
- Sync your references across multiple devices

Reference Management Tools

Heads up! Not all reference management software will:

- create a perfect bibliography or reference list according to your preferred style (or your supervisor's or tutor's)
- correct typos or errors or omissions from references manually entered or downloaded from databases
- know what reference type you are downloading (e.g., conference proceedings? Journal article? Book?)

Reference Management Tools

As there are a number of different programs available it is important to choose the one that suits your needs. QUT has licensed access to: EndNote (including EndNote online).

https://qut.to/clmdh

Reference Management Tools

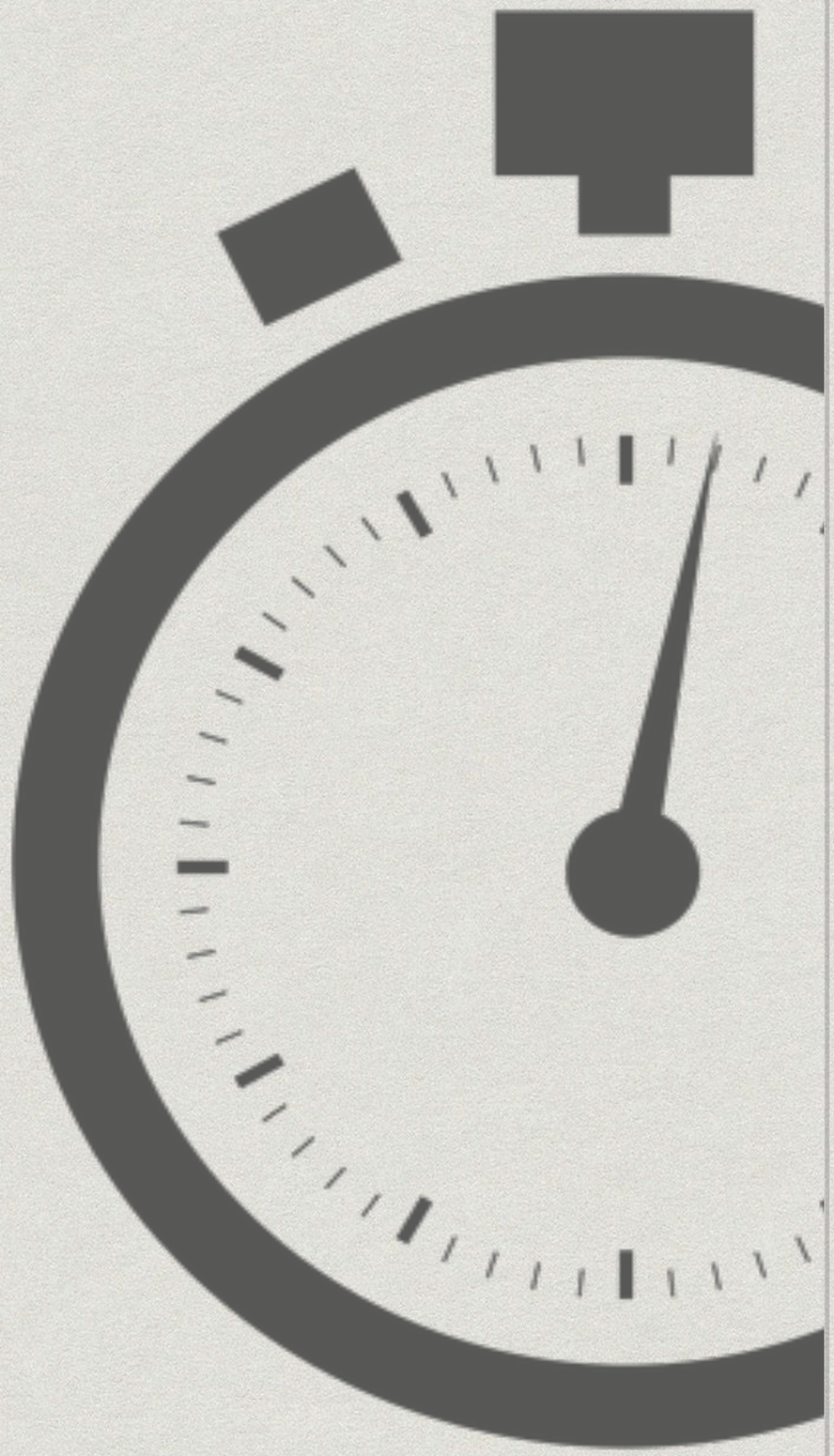
What do I recommend?

The open-source, Zotero:

zotero https://www.zotero.org/

- 300 MB cloud storage limit
- Individual reference styles can be downloaded and implemented with ease
- Built-in browser plugin is pretty awesome

Activity



- Download Zotero and work through the example with Michael

zotero https://www.zotero.org/

Annotated Bibliography

There are two main sections to each annotated bibliography entry:

1. The bibliographical information (the reference itself).

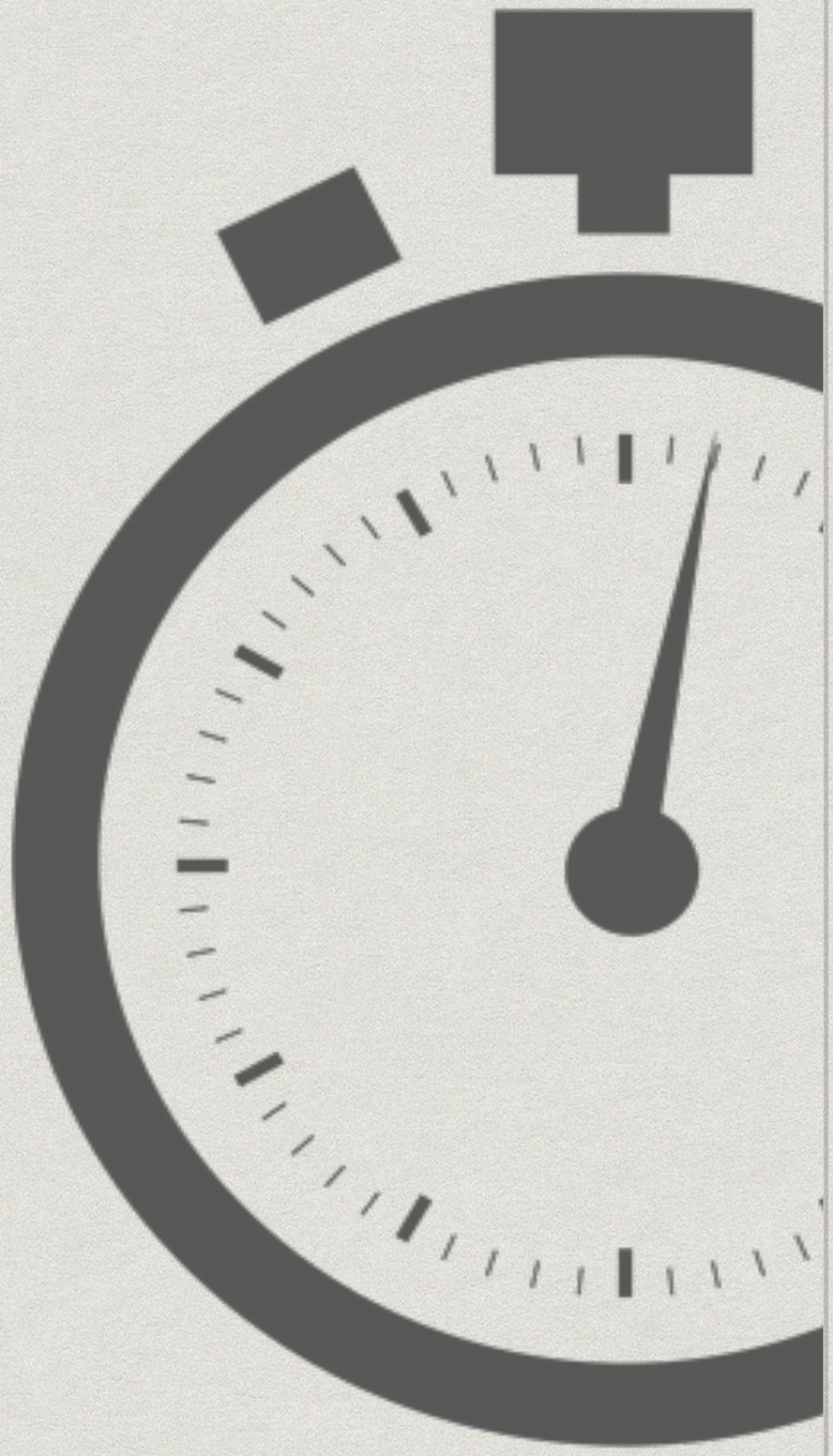
2. The explanatory paragraphs (the annotation).

The Annotation

- A summary of the main arguments or ideas presented by the author/s and depending on your assessment requirements.
- An evaluation of how useful you found the source. Assess its objectivity, reliability and bias, and compare it with other sources you have used.
- A reflection on how you may use the source in your research.

Exercise

- Download the Annotated Bibliography Example from this week's Blackboard section.
- Let's review this together right now.



What Not To Do:

Bibliography

Abadie, L. J., Lloyd , C. W., & Shelhamer , M. J. (2020, February 7). Retrieved from National Aeronautics and Space Administration: https://www.nasa.gov/hrp/bodyinspace

Al-Rodhan, N. (2018, February 27). Nayef Al-Rodhan. Retrieved from Prospect: https://www.prospectmagazine.co.uk/science-and-technology/this-is-your-brain-on-mars-what-space-travel-does-to-our-psychology

*Burke , C. M., & Scott, D. M. (2016, October). The space race: A framework to evaluate the potential travel-time impacts of reallocating road **space** to bicycle facilities. Retrieved from Science Direct: https://www.sciencedirect.com/science/article/pii/S0966692316301612*

Carbonnel, A. d. (2010, June 3). 'Mars crew' locked up for 520 days of isolation. Retrieved from Phys Org: https://phys.org/news/2010-06-mars-crew-days-isolation.html

Chambers, C. (2013, September 9). Mars One: The psychology of isolation, confinement and 24-hour Big Brother. Retrieved from The Guardian : https://www.theguardian.com/science/head-quarters/2013/sep/09/neuroscience-psychology

Chow, D. (2011, November 4). 6 Mock Mars Explorers Emerge from 520-Day Virtual Mission. Retrieved from Space: https://www.space.com/13500-mock-mars-mission-mars-500-ends.html

Reputable Web Sites

Is the Internet a reliable source of scientific information?

Google

how old is the Earth

Web | Images | Maps | Shopping | More | Search tools

About 315,000,000 results (0.22 seconds)

4.54 billion years Source?

Earth Age

Editable encyclopedia

Science Blog

Religious Sites (some claim "young Earth")

Age of the Earth - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Age_of_the_**Earth**
William Smith's nephew and student, John Phillips, later calculated by such means that **Earth** was about 96 million years **old**. The naturalist Mikhail Lomonosov, ...
Development of modern geologic ... - Early calculations - Radiometric dating

How Old is the Earth: Scientific Age of the **Earth**
www.talkorigins.org/faqs/dalrymple/scientific_age_**earth**.html
The results from these methods indicate that the **Earth**, meteorites, the Moon, and , by inference, the entire Solar System are 4.5 to 4.6 billion years **old**.

The Earth Is 6000 Years **Old**
www.missiontoamerica.com/genesis/six-thousand-years.html
The Bible says the **earth** is about 6000 years **old**. Evolution says the **earth** is billions of years **old**. What is the truth?

How Old is the Earth According to the Bible and Science?
www.godandscience.org/young**earth**/age_of_the_**earth**.html
by Richard Deem - in 143 Google+ circles
Jun 21, 2012 – Many Christians believe the Bible says the **earth** is 6000 years **old**. In reality, the Bible says humanity is at least 50000 years **old** and science ...

How old is the earth? - Answers in Genesis
www.answersingenesis.org/articles/2007/05/30/**how-old**-is-**earth**
May 30, 2007 – Of course, the Bible doesn't say explicitly anywhere, "The **earth** is 6,000 years **old** ." Good thing it doesn't; otherwise it would be out of date the ...

Marco Rubio: **Earth** Is 4.5 Billion Years **Old**, Created By God
www.huffingtonpost.com/.../marco-rubio-**earth**_n_224448...
by Elise Foley - in 395 Google+ circles
Dec 5, 2012 – On Wednesday, he assured the public that he does know the **Earth's** age: it's about 4.5 billion years **old**, and he doesn't think that fact is ...

How old is the world?
lavistachurchofchrist.org/LVanswers/2004/2004-12-28.htm

Earth

Earth is the third planet from the Sun, and the densest and fifth-largest of the eight planets in the Solar System. It is also the largest of the Solar System's four terrestrial planets. Wikipedia

Radius: 6,371 km
Surface area: 510,100,000 km²
Mass: 5.972E24 kg
Area: 510,100,000 km²
Orbits: Sun
Moon: Moon

People also search for

Mars | Moon | Sun | Jupiter

Feedback/More info

No University, Research or Peer-Reviewed Science Site!

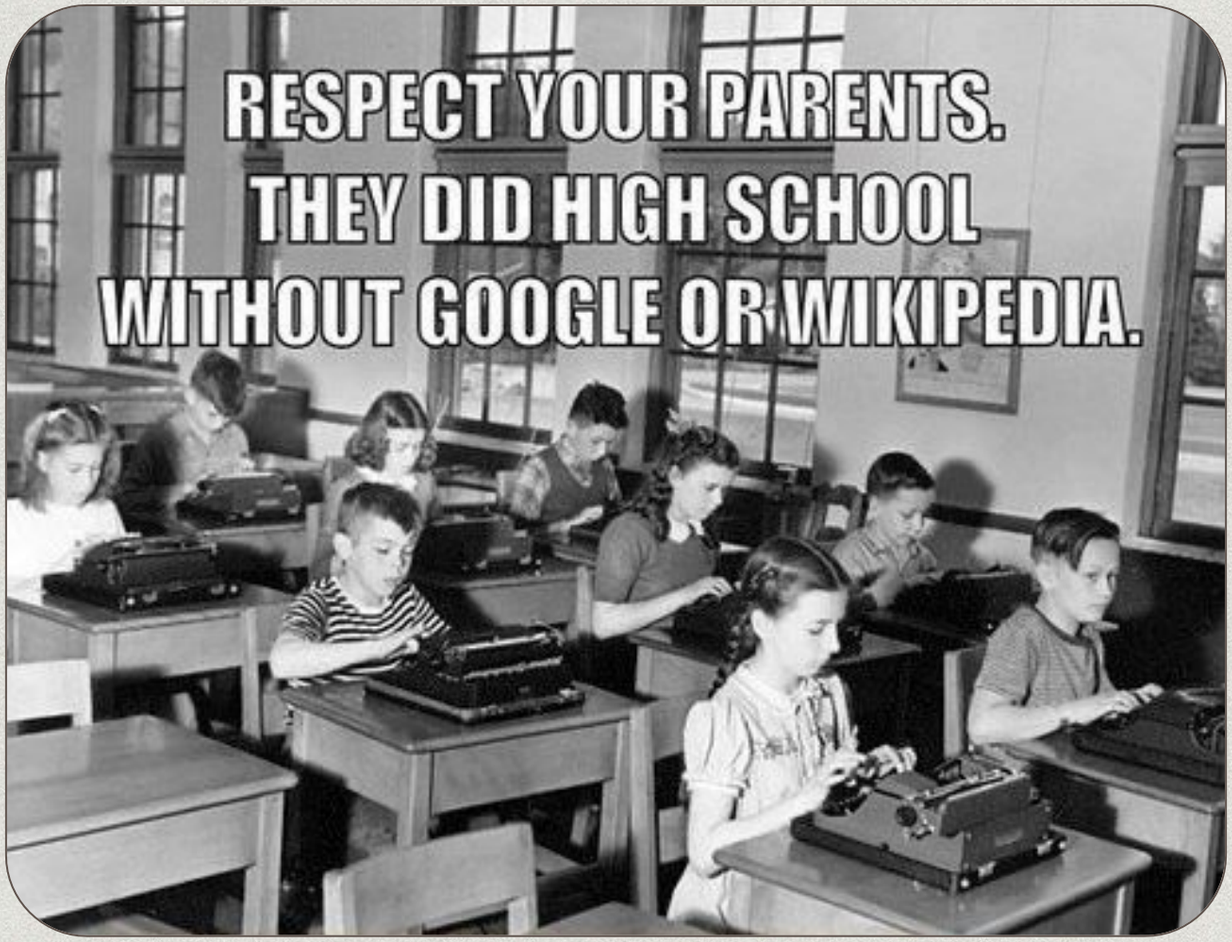
But Everyone Uses Wikipedia!?

- Even Wikipedia says "Wikipedia is not a reliable source for academic writing or research." *https://en.wikipedia.org/wiki/Wikipedia:Wikipedia_is_not_a_reliable_source*
- Wikipedia can be edited by anyone at any time. This means that any information it contains at any particular time could be vandalism, a work in progress, or just plain wrong.
- Do your research properly and wisely. Remember that any encyclopedia is a starting point for research, not an ending point.

When to use Wikipedia

- An encyclopedia, like Wikipedia, is great for checking general knowledge that you have forgotten, like the starting date of the First World War or the boiling point of water.
- Citation is not needed for fact-checking general knowledge.
- What about something like the population of Australia?

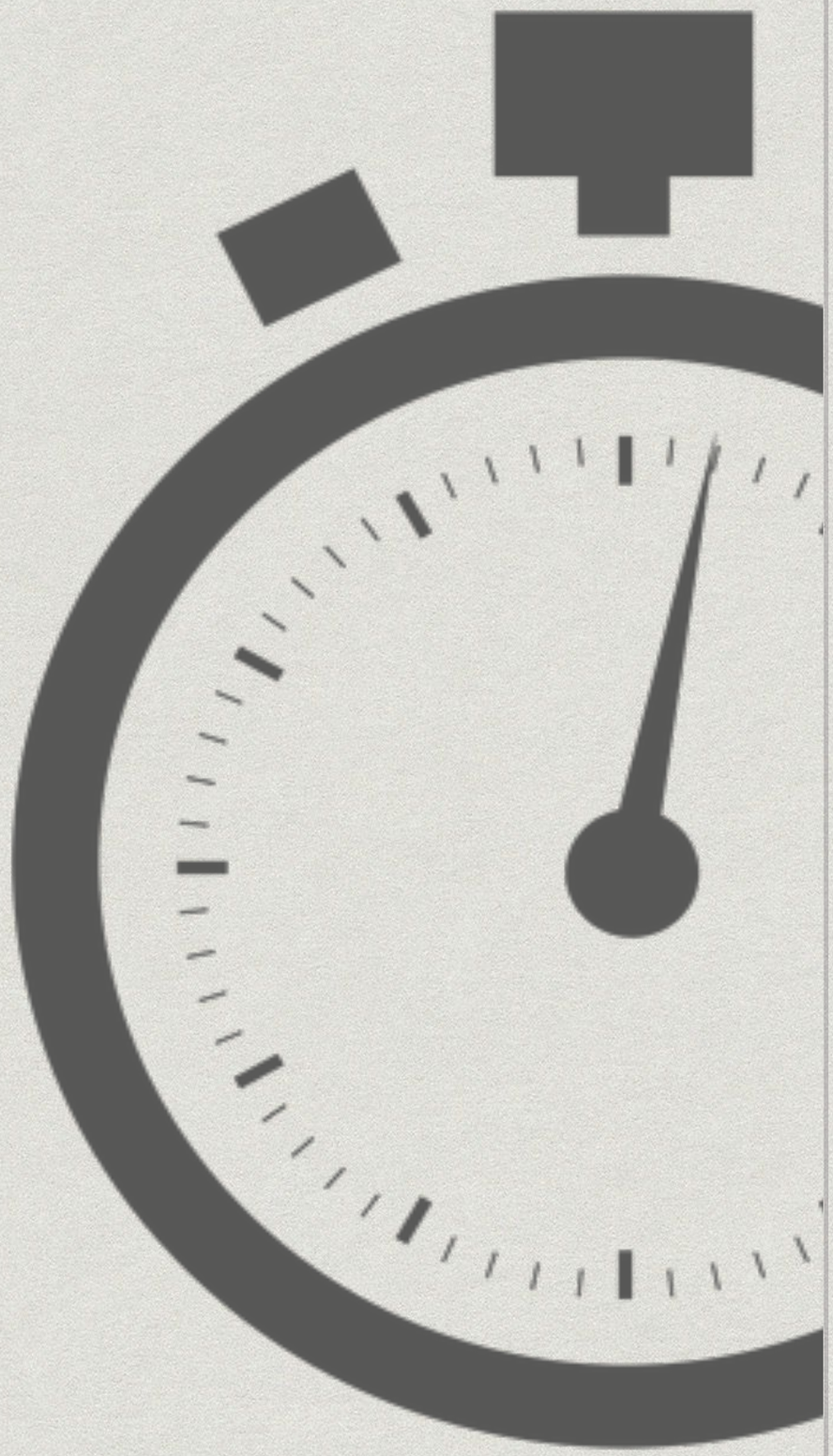
Google and Wikipedia



However… a recent study at Princeton and New York University says that people over 65 years old (the Baby Boomer Generation) were far more likely to share intentionally false or misleading information on Facebook!

Exercise

- Try a general web search for: “Mars Retrograde”
- Let’s review the top 5 hits and discuss their reliability



Peer Reviewed

Peer review is one of the gold standards of science.

It's a process where scientists ("peers") evaluate the quality of other scientists' work.

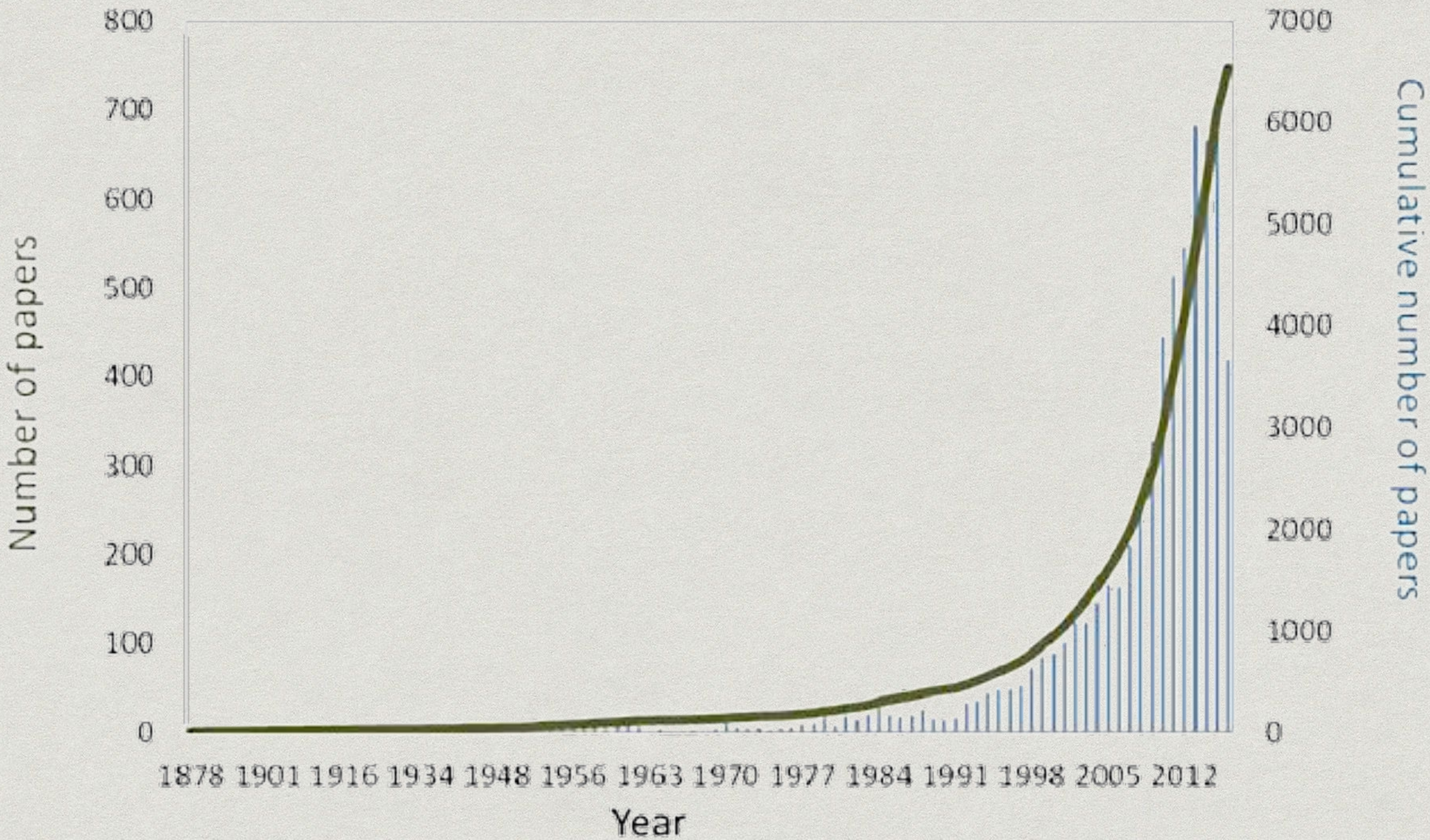
By doing this, they aim to ensure the work is rigorous, coherent, uses past research and adds to what we already knew.

Peer Reviewed

Peer-reviewed journal articles are a type of scholarly report that:

- have been assessed by the author's peers and an editorial board of subject specialists
- present more highly regarded and authoritative information
- include bibliographies that provide further reading of a similar quality and standard
- focus on original academic research

Drowning in Articles



Source: Monteiro, M., Séneca, J., & Magalhães, C. 2014, J Microbiol, 52 (Springer Science and Business Media LLC), 537

Peer Review: The Desk Evaluation

- When a paper is submitted to a journal, it receives an initial evaluation by an editor with relevant expertise.
- At this stage, it may be “desk rejected”: that is, they reject the paper without sending it to referees.
- Generally, papers are desk rejected if the paper doesn’t fit the scope of the journal or there is a fundamental flaw which makes it unfit for publication.
- In this case, the rejecting editors might write a letter summarising their concerns.
- Some journals desk reject up to two-thirds or more of the papers.

Peer Review: The Blind Review

- If the editorial team pass it, they send for review to blind referees.
- Reviewers are selected by the editor on the basis of their expert knowledge and their absence of a link with the authors.
- Reviewers decide whether to reject the paper, to accept it as it is (which rarely happens) or to ask for the paper to be revised.
- The reviews deal with the validity and rigour of the empirical method, and the importance and originality
- The editor collects those comments, weights them, takes a decision, and writes a letter summarising the reviewers' and his or her own concerns.

Peer Review: Revision

- If the paper has not been rejected after this first round of review, it is sent back to the author(s) for a revision.
- The process is repeated as many times as necessary for the editor to reach a consensus point on whether to accept or reject the paper.
- In some cases this can last for several years.
- Ultimately, less than 10% of the submitted papers are accepted in the best journals.
- The renowned journal Nature publishes around 7% of the submitted papers.

Peer Review: Not Perfect!

- Despite the strengths, the peer review process has been criticised.
- It involves a number of social interactions that might create biases – for example, authors might be identified by reviewers if they are in the same field, and desk rejections are not blind.
- It might also favour incremental (adding to past research) rather than innovative (new) research.
- Finally, reviewers are human after all and can make mistakes, misunderstand elements, or miss errors.

Google Scholar

- http://scholar.google.com.au
- Indexes mostly peer-reviewed journals
- Search across many disciplines and sources
- Sources are ranked based on where it was published, who it was written by, and how often and how recently it has been cited in other scholarly literature.
- Check the author/s

Check the author/s

Google Scholar

Michael Cowley

FOLLOW

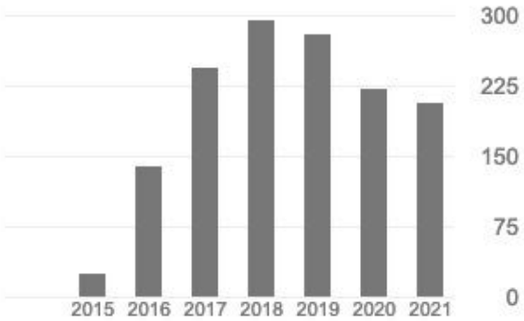
Queensland University of Technology
Verified email at qut.edu.au - Homepage

Cosmology Galaxy Evolution Black Holes Astrophysics

TITLE	CITED BY	YEAR
The SFR-M* Relation and Empirical Star-Formation Histories from ZFOURGE at 0.5 < z < 4 AR Tomczak, RF Quadri, KVH Tran, I Labbé, CMS Straatman, C Papovich, ... The Astrophysical Journal 817 (2), 16	236	2016
The FourStar Galaxy Evolution Survey (ZFOURGE): Ultraviolet to Far-infrared Catalogs, Medium-bandwidth Photometric Redshifts with Improved Accuracy, Stellar Masses, and … CMS Straatman, LR Spitler, RF Quadri, I Labbé, K Glazebrook, ... The Astrophysical Journal 830 (1), 51	157	2016
ZFOURGE/CANDELS: On the Evolution of M* Galaxy Progenitors from z=3 to 0.5 C Papovich, I Labbé, R Quadri, V Tilvi, P Behroozi, EF Bell, K Glazebrook, ... The Astrophysical Journal 803 (1), 26	124	2015
The Taipan galaxy survey: scientific goals and observing strategy E Da Cunha, AM Hopkins, M Colless, EN Taylor, C Blake, C Howlett, ... Publications of the Astronomical Society of Australia 34	99	2017
The sizes of massive quiescent and star forming galaxies at z~4 with ZFOURGE and CANDELS CMS Straatman, I Labbé, LR Spitler, K Glazebrook, A Tomczak, R Allen, ... The Astrophysical Journal Letters 808 (1), L29	72	2015
The absence of an environmental dependence in the mass–metallicity relation at z= 2 GG Kacprzak, T Yuan, T Nanayakkara, C Kobayashi, KVH Tran, ... The Astrophysical Journal Letters 802 (2), L26	67	2015
Satellite Quenching and Galactic Conformity at 0.3 < z < 2.5 L Kawinwanichakij, RF Quadri, C Papovich, GG Kacprzak, I Labbé	56	2016

Cited by

	All	Since 2016
Citations	1421	1392
h-index	22	22
i10-index	25	25



Public access VIEW ALL

0 articles 27 articles

not available available

Based on funding mandates

Co-authors EDIT

Ivo Labbe
Swinburne University of Technol…

Lee Spitler
Senior Lecturer, Macquarie Univ…

Exercise

- Try searching “Mars Retrograde” on Google Scholar
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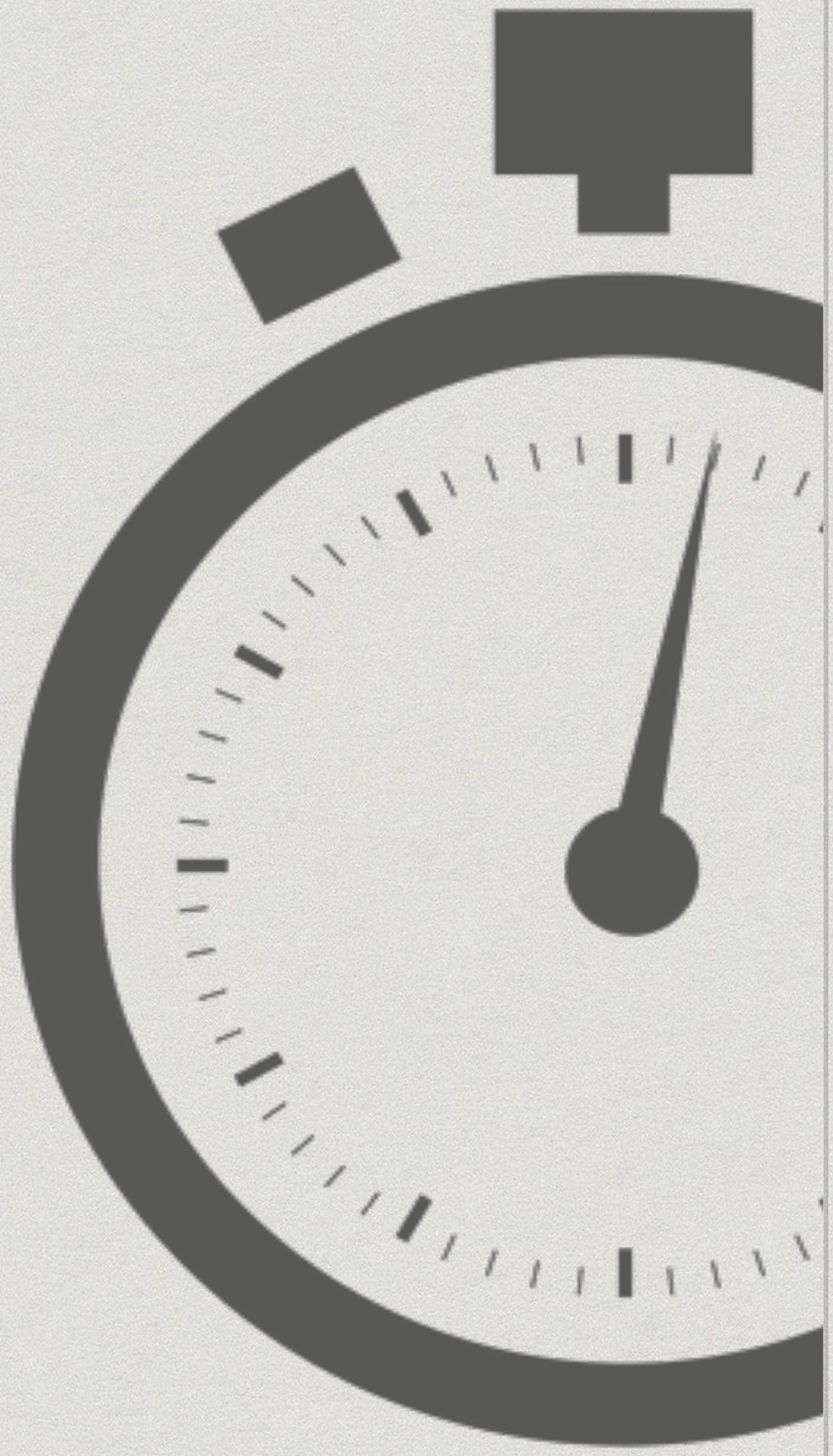


Avoid Predatory Journals

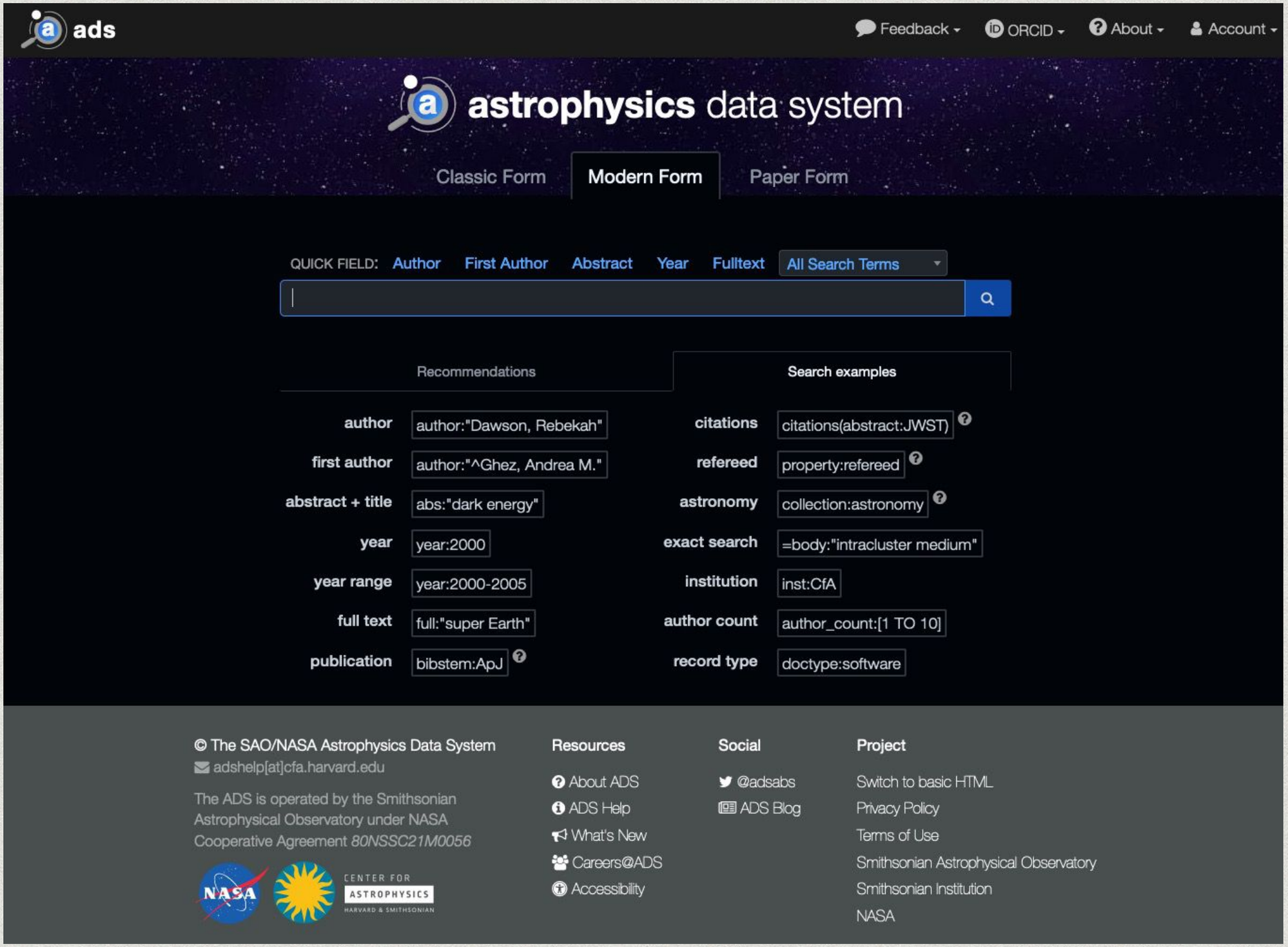
- The academic “publish or perish” scenario has inadvertently created a market ripe for the exploitation of academic authors.
- Some journals are predatory on purpose, while others may make mistakes due to neglect, mismanagement, or inexperience.
- Often charge for publication fees, without checking articles for quality and legitimacy and without providing the other editorial and publishing services that legitimate academic journals provide.

Avoid Predatory Journals

Use this resource to check if a journal is potentially a predatory journal or publisher:

https://beallslist.net/

NASA ADS


ads
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About
Account
astrophysics data system
Classic Form
Modern Form
Paper Form
QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms
Recommendations
Search examples
author author:"Dawson, Rebekah"
first author author:"^Ghez, Andrea M."
abstract + title abs:"dark energy"
year year:2000
year range year:2000-2005
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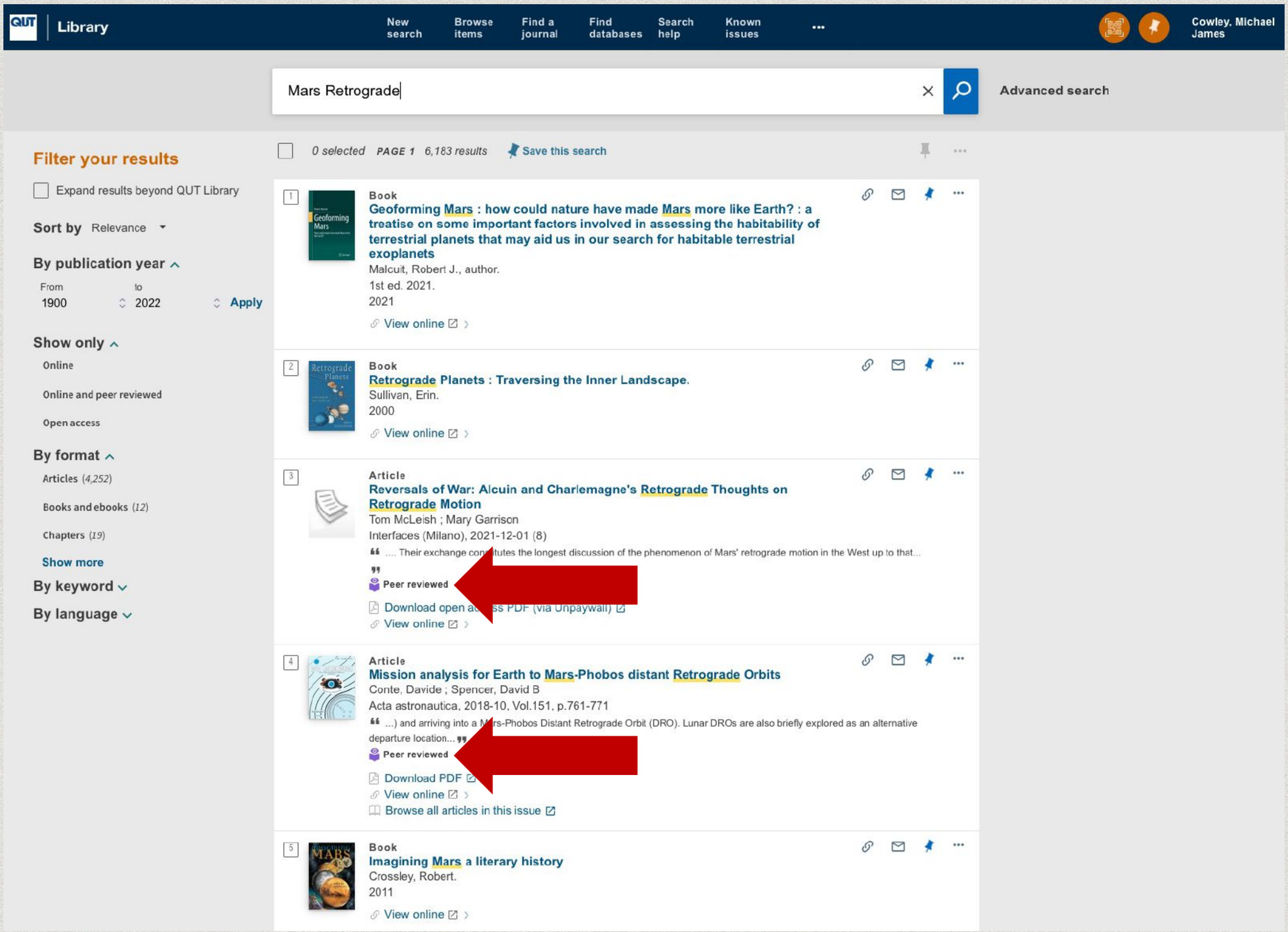
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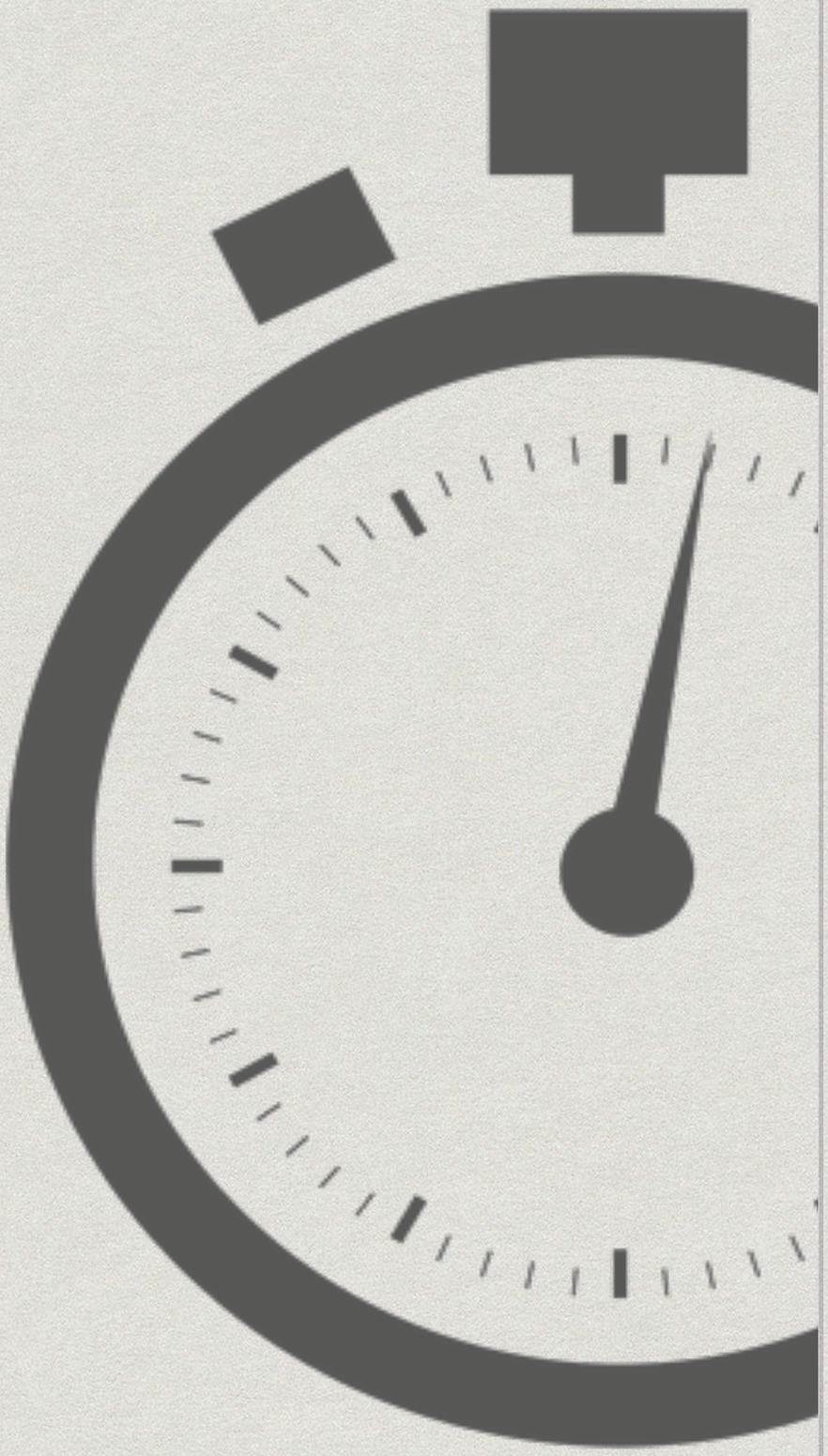
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