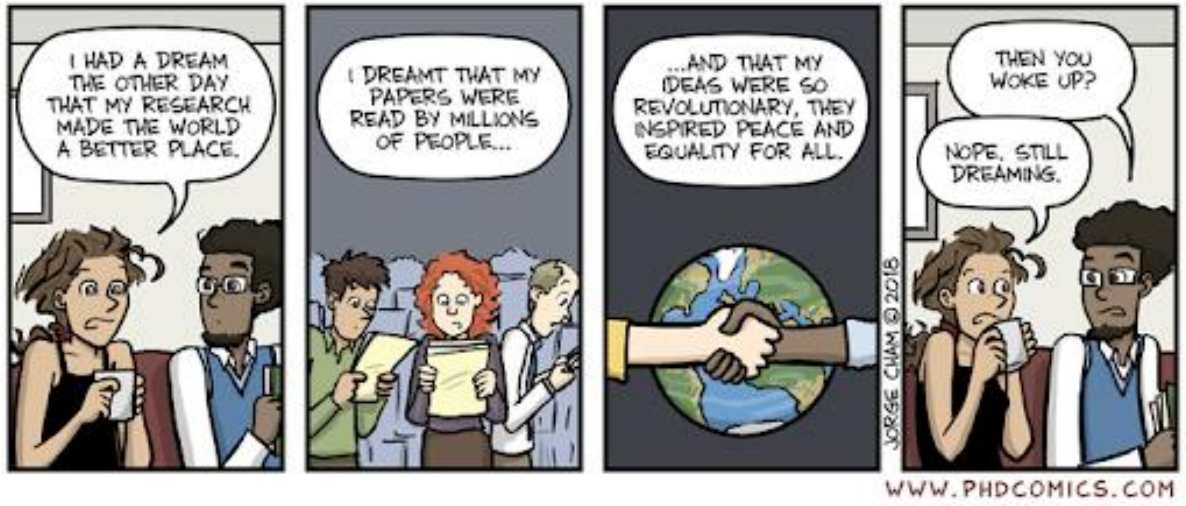
Reading, Writing, and the Scientific Literature

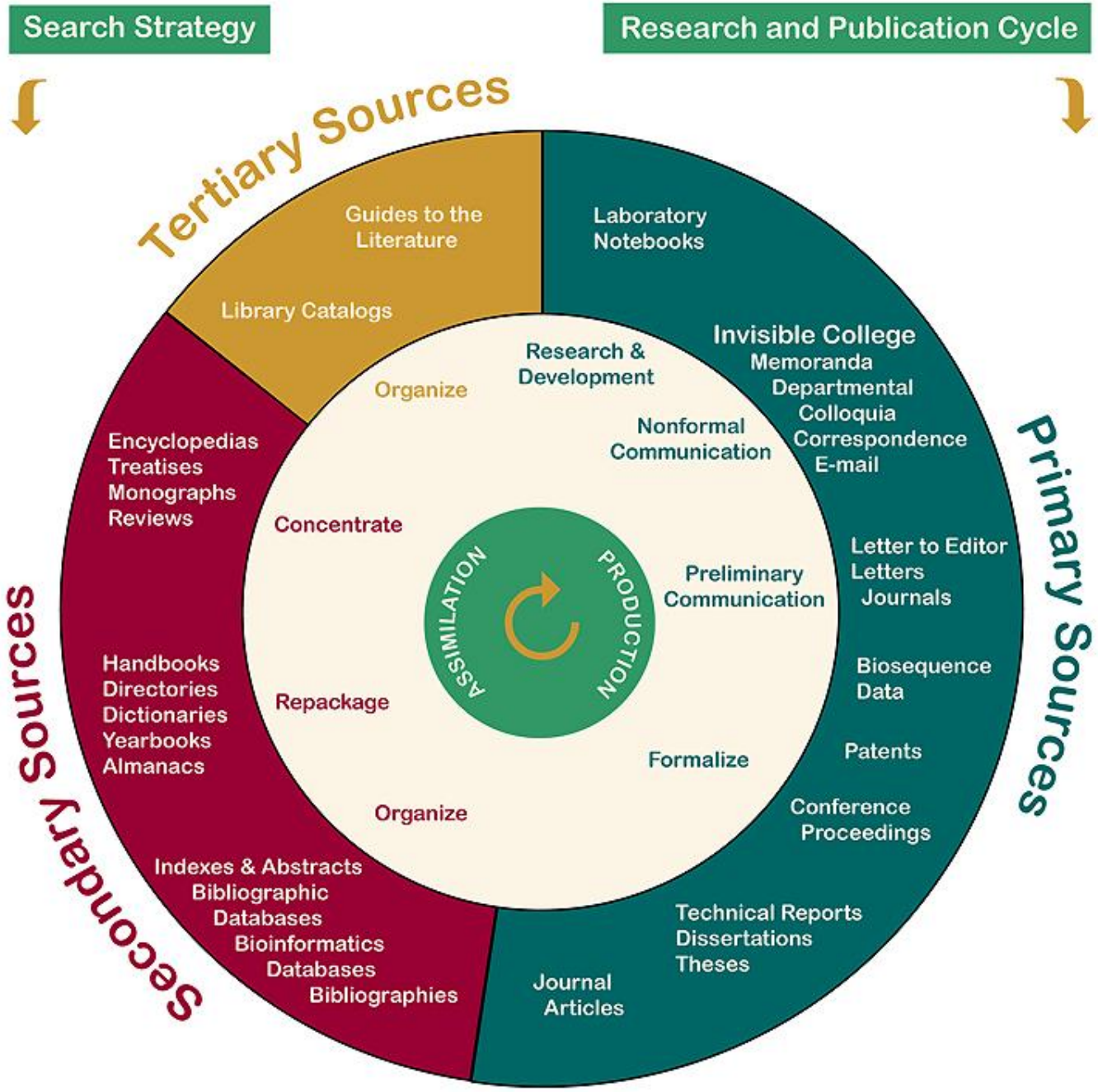
Daily Agenda

- Categorizing, evaluating, finding, and organizing sources (20 min)
- Critically reading papers (20 min)
- Writing scientifically (20 min)
- Structuring a white paper (20 min)



I. Scientific Sources

Types of sources



Is this a primary, secondary, or tertiary source?

Received: 9 May 2022 | Accepted: 22 August 2022

DOI: 10.1111/2041-210X.13983

Methods in Ecology and Evolution

REVIEW

Methods in Ecological Forecasting

Recent developments in empirical dynamic modelling

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Handling Editor: Sydne Record

Abstract

1. Ecosystems are complex and sparsely observed making inference and prediction challenging.
2. Empirical dynamic modelling (EDM) circumvents the need for a parametric model and complete observations of all system variables. Classical univariate approaches, which require time-series observations of only a single focal variable, can produce verifiable out-of-sample forecasts; however, they can sometimes require long time series that may be difficult to obtain. More importantly, classical approaches limit the depth of mechanistic understanding that can be gained and the generalizability of forecasts to non-analogue futures.
3. We review the main ideas of EDM and more recent extensions that expand their capabilities for improving forecasts and understanding mechanism.
4. Algorithms are now available that allow for missing data, unequal sampling intervals and combining short time series, which increase the number of datasets that can be used. Recent extensions of EDM to multivariate time series substantially expand the range of applications and mechanistic questions that can be addressed, including detecting causal coupling, tracking changing interactions in real time, leveraging short time series from information shared in coupled variables, modelling dynamically changing stability, scenario exploration, and management applications involving optimal control.

KEYWORDS
convergent cross-mapping, early warnings, empirical dynamic modelling, gaussian process, scenario exploration, simplex, S-map, stability

Is this a primary, secondary, or tertiary source?

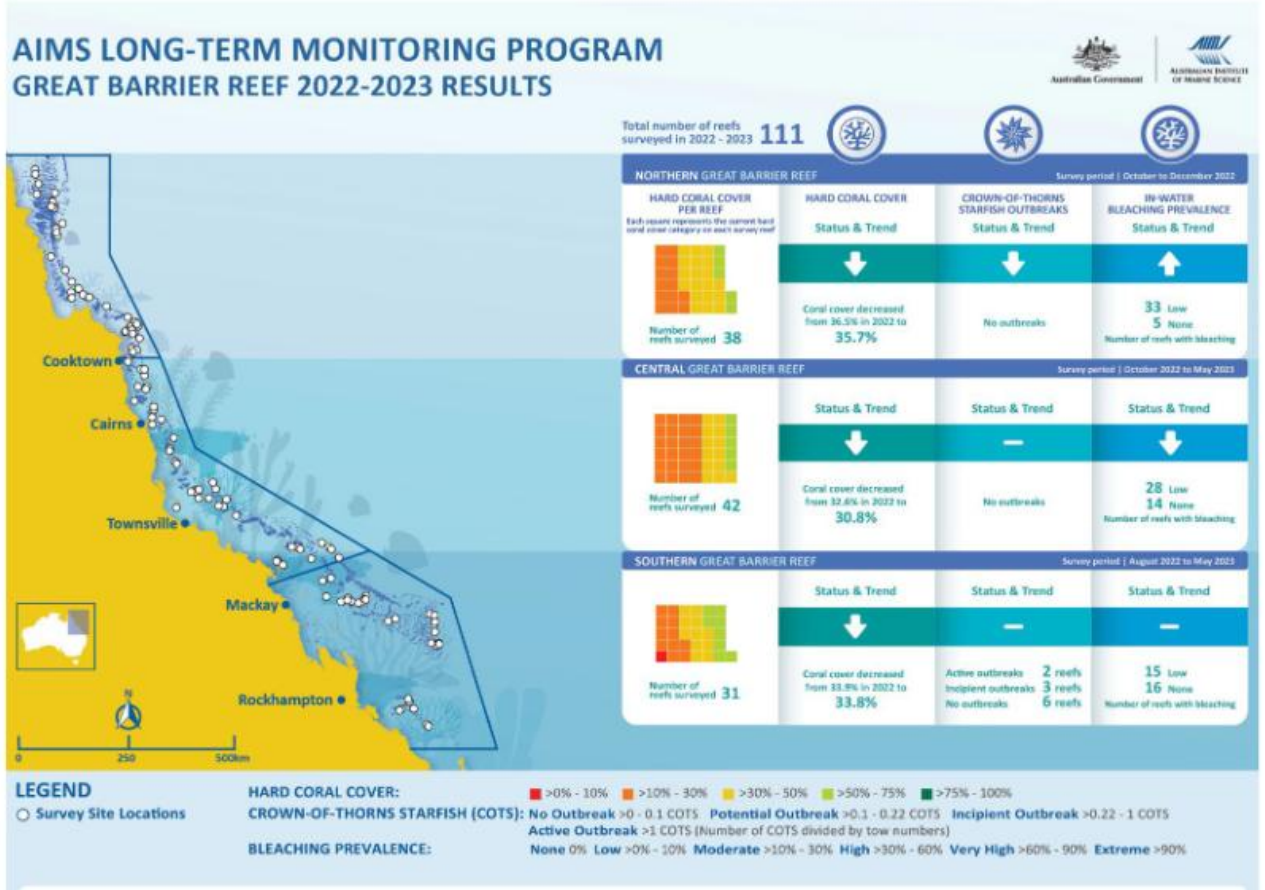
ANNUAL SUMMARY REPORT OF THE
GREAT BARRIER REEF CORAL REEF CONDITION 2022/2023

Australian Government | Australian Institute of Marine Science

A pause in recent coral recovery across most of the Great Barrier Reef

Published 9th August 2023

AIMS acknowledges the Traditional Owners of all the land and sea Countries in which we work, and pay our respect to their elders past, present and emerging. We honour their continuing culture, knowledge, beliefs and spiritual relationship and connection to Country.We also recognise Aboriginal and Torres Strait Islander peoples as the Traditional Owners of the land and sea Country on which the Australian Institute of Marine Science works, and as Australia's first scientists.



Is this a primary, secondary, or tertiary source?

Greenhouse gas

83 languages

Article Talk Read Edit View history Tools

From Wikipedia, the free encyclopedia

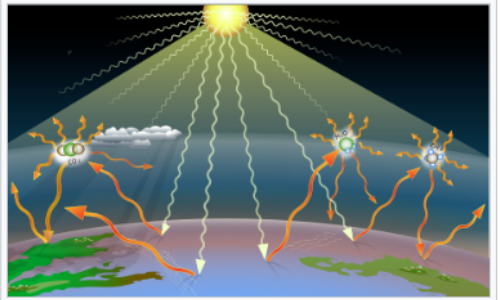
Checked

This article is about the physical properties of greenhouse gases. For how human activities are adding to greenhouse gases, see Greenhouse gas emissions.

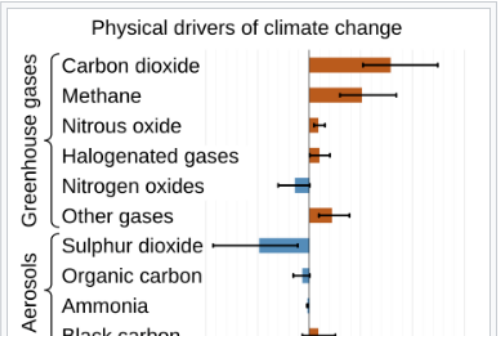
Greenhouse gases (**GHGs**) are the gases in the atmosphere that raise the surface temperature of planets such as the Earth. What distinguishes them from other gases is that they absorb the wavelengths of radiation that a planet emits, resulting in the greenhouse effect.[1] The Earth is warmed by sunlight, causing its surface to radiate heat, which is then mostly absorbed by greenhouse gases. Without greenhouse gases in the atmosphere, the average temperature of Earth's surface would be about −18 °C (0 °F),[2] rather than the present average of 15 °C (59 °F).[3][4]

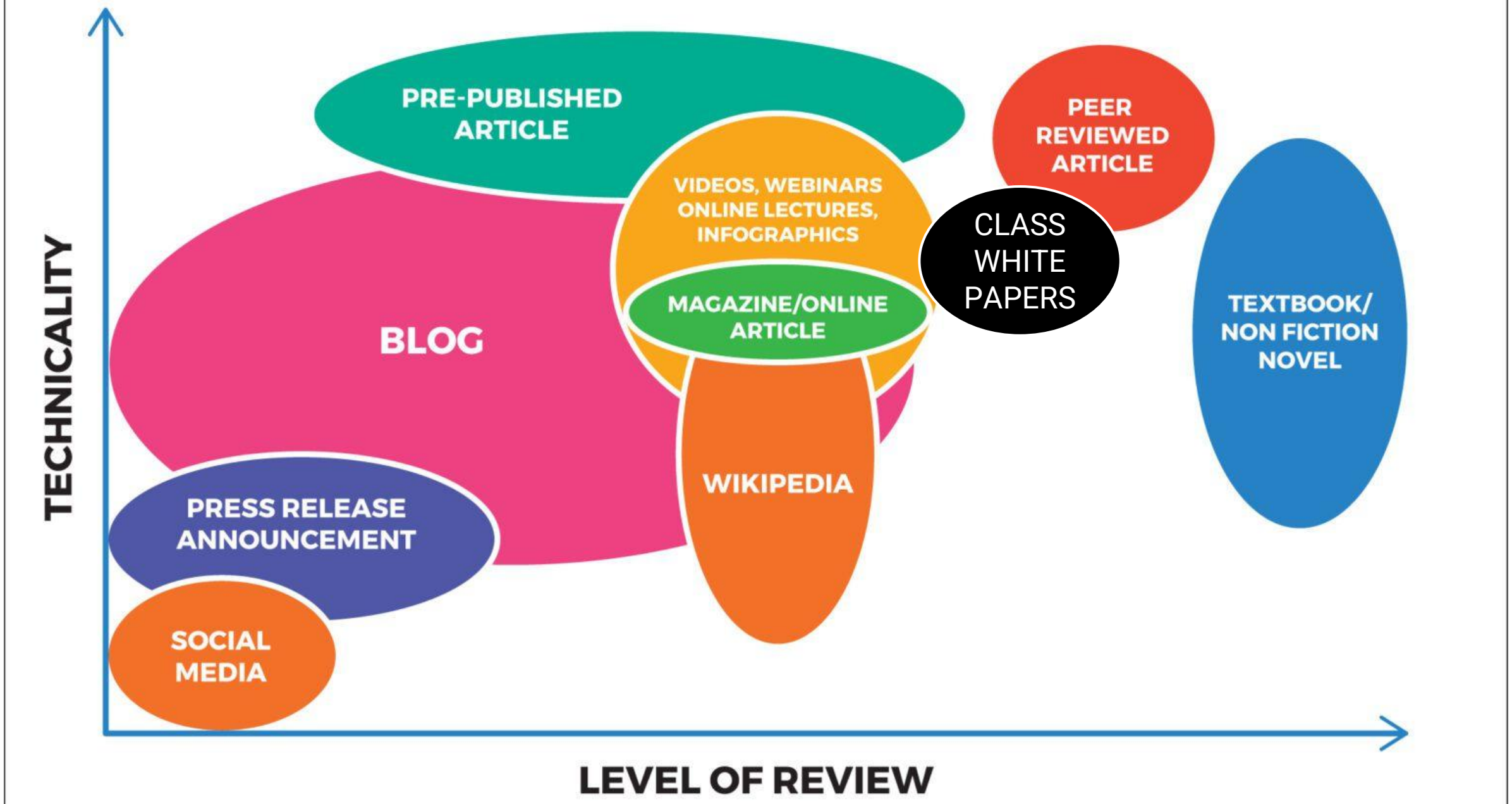
The five most abundant greenhouse gases in Earth's atmosphere, listed in decreasing order of average global mole fraction, are:[5][6] water vapor, carbon dioxide, methane, nitrous oxide, ozone. Other greenhouse gases of concern include chlorofluorocarbons (CFCs and HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons, SF_6, and NF_3. Water vapor causes about half of the greenhouse effect, acting in response to other gases as a climate change feedback.[7]

Human activities since the beginning of the Industrial Revolution (around 1750) have increased carbon dioxide by over 50%,[8] and methane levels by 150%.[9] Carbon dioxide emissions are causing about three-quarters of global warming, while methane emissions cause most of the rest.[10] The vast majority of carbon dioxide emissions by humans come from the burning of fossil fuels,[11] with remaining contributions from agriculture and industry.[12]:687 Methane emissions originate from agriculture, fossil fuel production, waste, and other sources.[13] The carbon cycle takes thousands of



Greenhouse gases trap some of the heat that results when sunlight heats the Earth's surface. Three important greenhouse gases are shown symbolically in this image: carbon dioxide, water vapor, and methane.




PRE-PUBLISHED ARTICLE
PEER REVIEWED ARTICLE
VIDEOS, WEBINARS ONLINE LECTURES, INFOGRAPHICS
CLASS WHITE PAPERS
MAGAZINE/ONLINE ARTICLE
TEXTBOOK/ NON FICTION NOVEL
BLOG
WIKIPEDIA
PRESS RELEASE ANNOUNCEMENT
SOCIAL MEDIA
TECHNICALITY
LEVEL OF REVIEW

What is citable for this class?

	Primary	Secondary	Tertiary
Peer-reviewed	YES	YES	NO
Non-reviewed	DEPENDS	DEPENDS	NO

Non-reviewed examples	Ok to cite?
Preprints	YES
Blog/Substack posts	NO
Dissertations/theses	YES
Social media posts	NO
Government documents	YES
Newspaper articles	YES

Is this source citable?

SCI AM

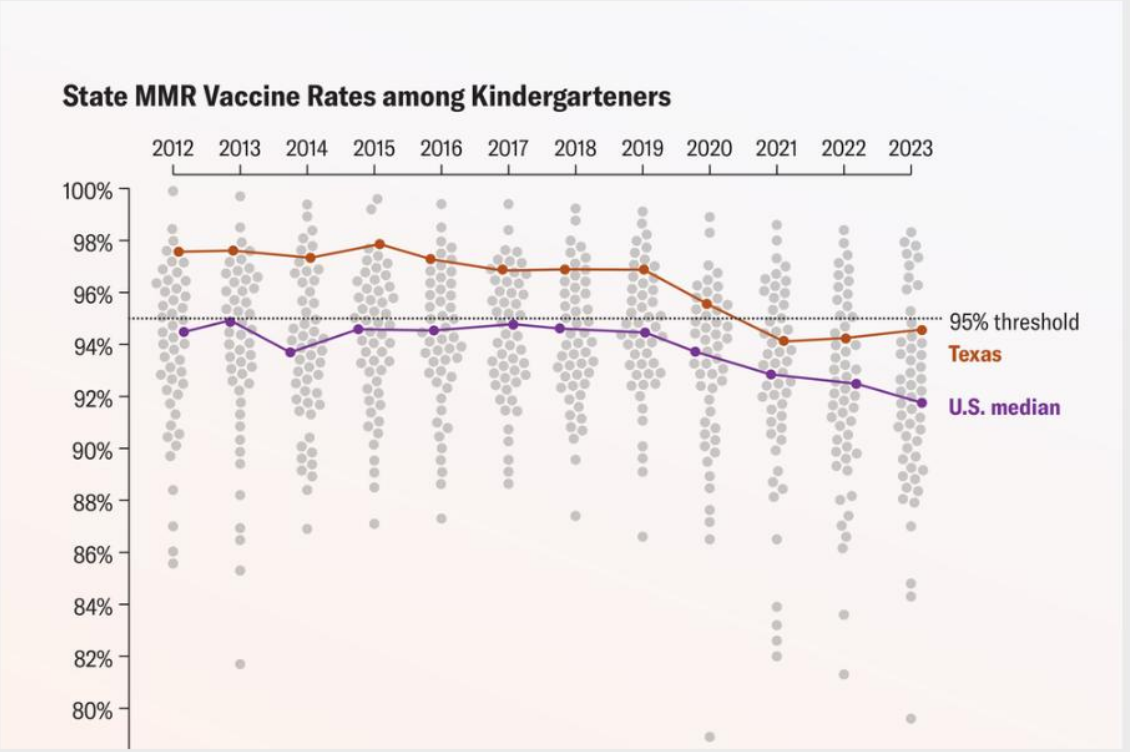
Play SciAm Games

MARCH 20, 2025 | 6 MIN READ

Measles Cases Are Surging—These 6 Charts Reveal Why

Measles continues to spread in Texas and other states and has caused the first reported U.S. death from the virus in a decade. Vaccination data over time reveal vulnerabilities in protection

BY RIPLEY CLEGHORN EDITED BY LAUREN J. YOUNG



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WIKIPEDIA
The Free Encyclopedia

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Measles

128 languages

Article | Talk | Read | View source | View history | Tools

From Wikipedia, the free encyclopedia

Contents hide

(Top)
Signs and symptoms
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Pathophysiology
Diagnosis
Laboratory testing
Prevention
Treatment
Medications
Prognosis
Epidemiology
Europe
Americas
United States
Brazil
Southeast Asia
South Pacific
Samoa
Africa
Madagascar
Democratic Republic of Congo
History
Society and culture
Alternative names

This article is about the disease. For other uses, see Measles (disambiguation).
Not to be confused with either rubella or roseola, which are also viral diseases with comparable features.

Measles (probably from Middle Dutch or Middle High German *masel(e)* ("blemish, blood blister"))[11] is a highly contagious, vaccine-preventable infectious disease caused by measles virus.[3][5][12][13][14] Other names include *morbilli*, *rubeola*, *red measles*, and *English measles*.[1][2] Both rubella, also known as *German measles*, and roseola are different diseases caused by unrelated viruses.[15]

Symptoms usually develop 10–12 days after exposure to an infected person and last 7–10 days.[7][8] Initial symptoms typically include fever, often greater than 40 °C (104 °F), cough, runny nose, and inflamed eyes.[3][4] Small white spots known as Koplik's spots may form inside the mouth two or three days after the start of symptoms.[4] A red, flat rash which usually starts on the face and then spreads to the rest of the body typically begins three to five days after the start of symptoms.[4] Common complications include diarrhea (in 8% of cases), middle ear infection (7%), and pneumonia (6%).[5] These occur in part due to measles-induced immunosuppression.[6] Less commonly seizures, blindness, or inflammation of the brain may occur.[5][7]

Measles is an airborne disease which spreads easily from one person to the next through the coughs and sneezes of infected people.[7] It may also be spread through direct contact with mouth or nasal secretions.[16] It is extremely contagious: nine out of ten people who are not immune and share living space with an infected person will be infected.[5] Furthermore, measles's reproductive number estimates vary beyond the frequently cited range of 12 to 18,[17] with a 2017 review giving a range of 3.7 to 203.3.[18] People are infectious to others from four days before to four days after the start of the rash.[5] While often regarded as a childhood illness, it can affect people of

Measles

Other names	Morbilli, rubeola, red measles, English measles[1][2]

A child showing a day-four measles rash

Specialty	Infectious disease
Symptoms	Fever, cough, runny nose, inflamed eyes, rash[3][4]
Complications	Pneumonia, seizures, encephalitis, subacute sclerosing panencephalitis,

Finding articles: Library resources

WILLAMETTE UNIVERSITY | Libraries

WU Libraries / Research Help / How to Find Journal Articles / **Main**

How to Find Journal Articles: Main

Search this Guide | Search

Main | Peer-Review Articles | Full-Text Articles | Library Map

Related Guides

These guides will help you find and locate other types of information.

- Find Books
- Find Journal Articles
- More...

Finding Journal Articles

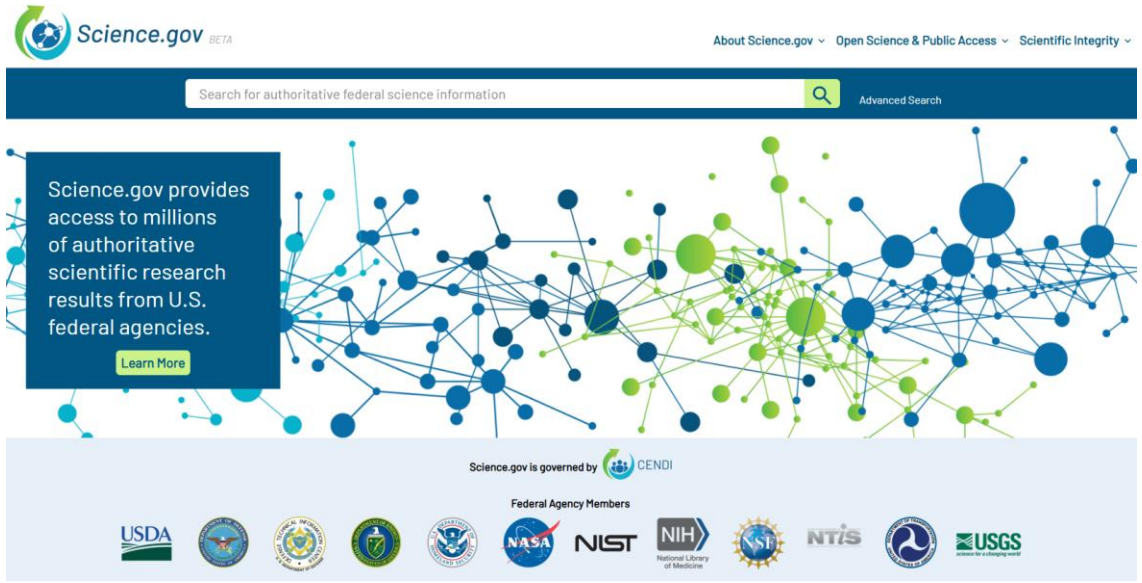
To search by subject...

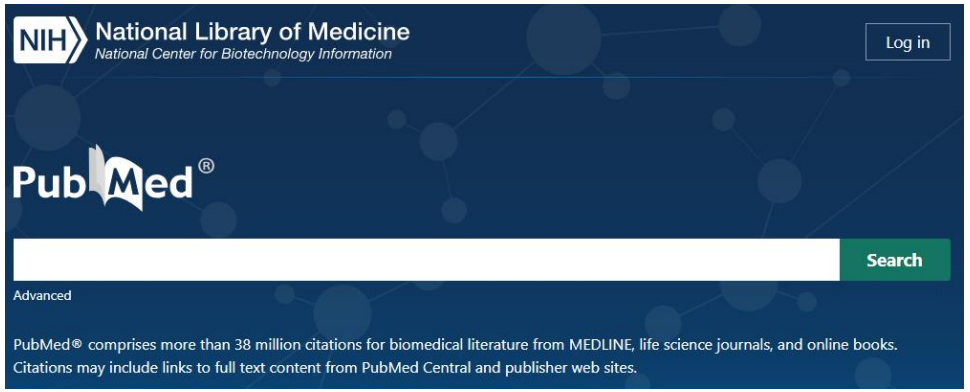
Go to the list of subject-specific databases. These databases index articles by subject area and are mostly proprietary (WU Libraries subscribe to them).

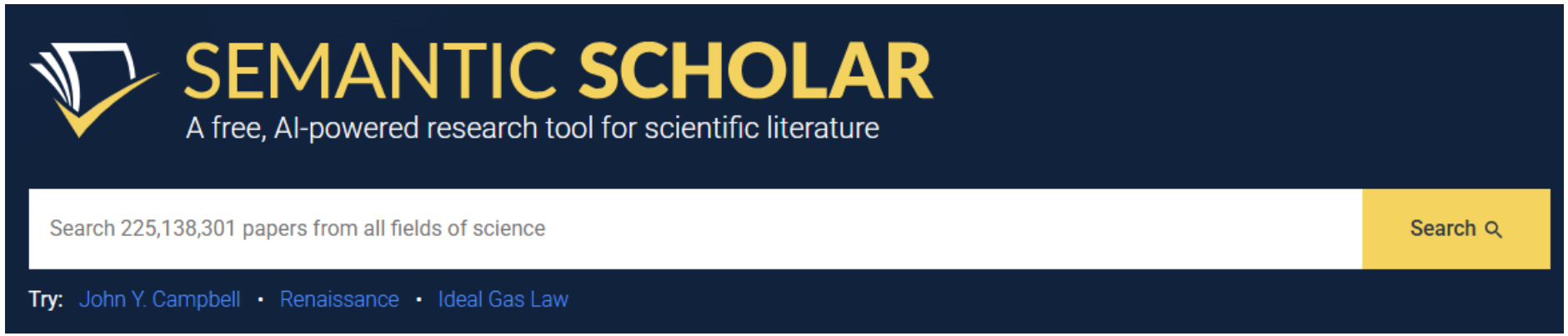
- Choose a database that is related to your subject of interest.
- Search the database using keywords and phrases (important words and concepts) that describe your topic.
- Look through the resulting citations and determine which of the articles most closely match your topic. Note: Typically, many but not all articles will be available in full-text in the database.

Scholarly search engines

Google Scholar







Organizing and citing articles: Library resources

Citation management

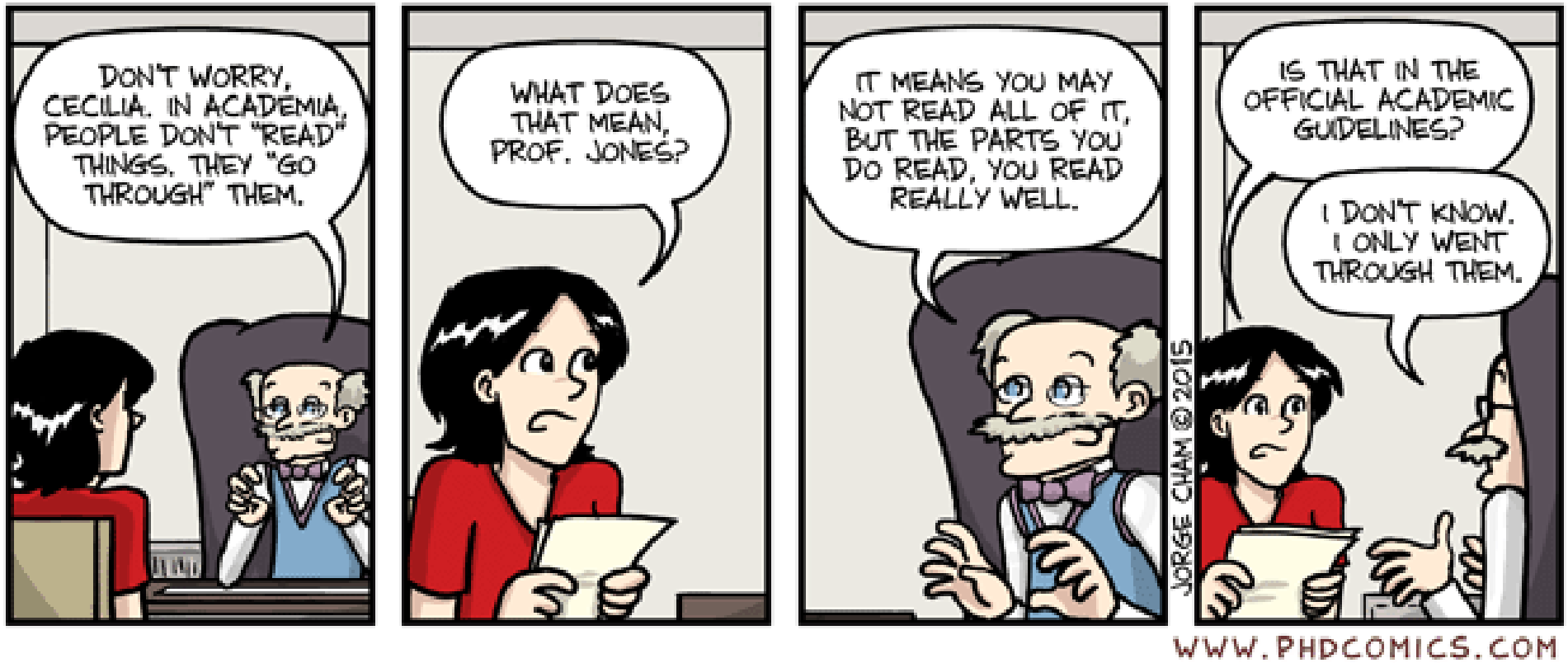
CITATION MANAGERS

	endnote	zotero	mendeley	refworks
primary user base	academic clincial government	anyone	academic professional informational	academic corporate government
upload & annotate	✗	✓	✗	✓
word processor integration	microsoft word + apple pages	microsoft word + libreoffice	microsoft word + libreoffice	microsoft word + google docs
installation required	✓*	✗	✗	✗
collaborate features	✓	✓	✓	✓
price for students	free	free up to 300 MB	free up to 2 GB	free
post-grad access	✗	✓	✗	✓**
database integration	export from databases or upload RIS file	add-on installation required	export from databases as RIS file	export from databases or "save to" button
best feature	microsoft word integration	free for anyone	suggests related documents	user friendly

*there is a web version as well but it has restricted functionality

**only available post-graduation if BYU maintains subscription to Refworks

II. Reading Papers Critically



Why is it important to read the literature?

Papers provide a current understanding of the field

Articles include enough information for you to repeat the study

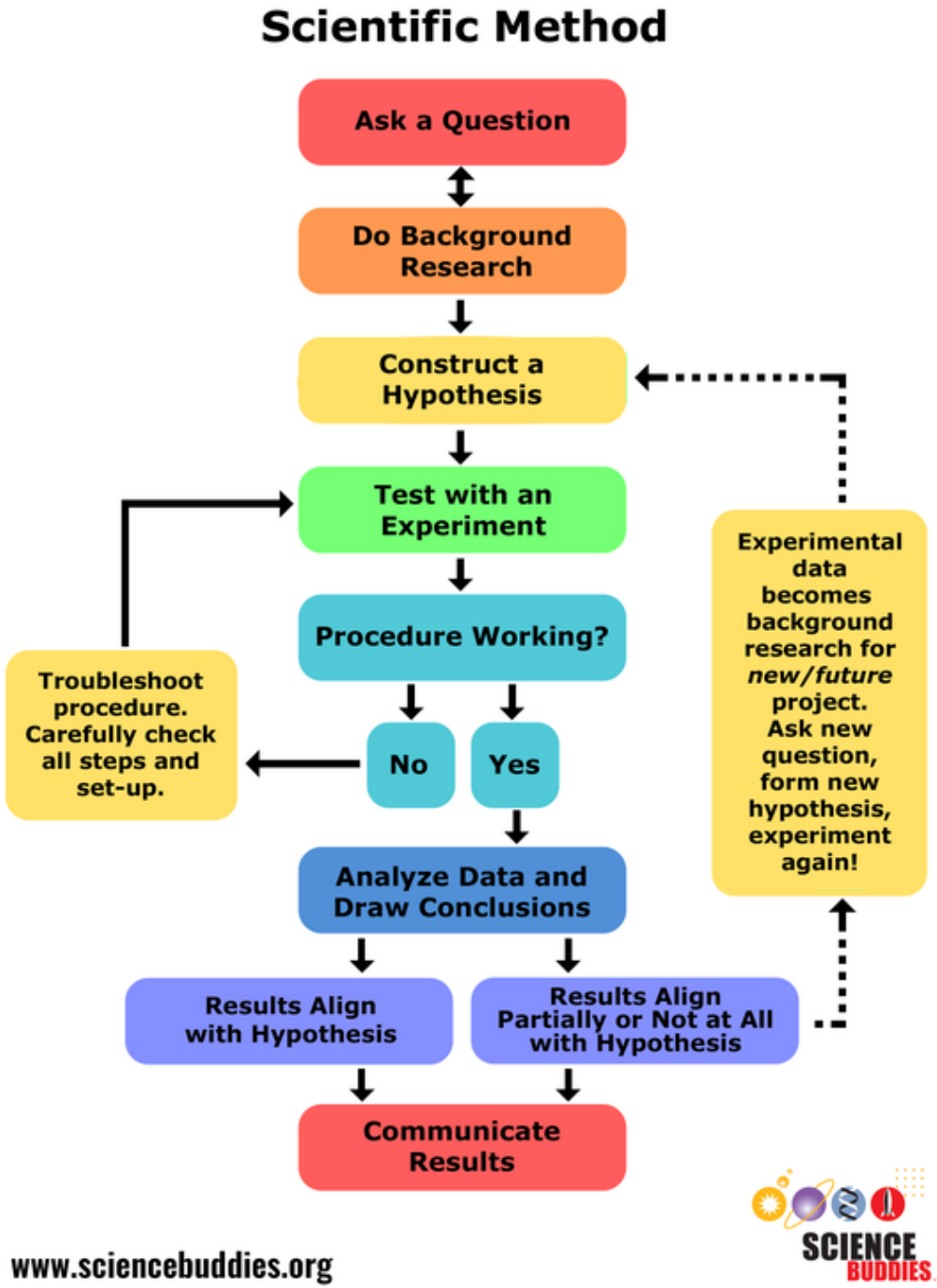
The results, figures, and tables present actual data

Papers show the reasoning behind conclusions, which you can judge for yourself

Typical paper sections

- Abstract
- Introduction
- Materials and methods
- Results
- Discussion
- Acknowledgements
- References

What steps of the scientific method belong in each paper section?



1

Read your 1st PAPER?

Steps 2 to 7 are about reading scientific paper 101.

ADVANCED reader?

Scite_ is a great tool to show you how research has been cited.

Going to a journal club is a great way to discuss papers with peers.

When you find a good paper, think about its strengths and weaknesses and why it is good enough to be published by the journal.

2

Start with TITLE

The title has key info of the paper. Skim it for key words you are interested in. If you find any, move to 3; if not, restart from another paper.

3

Move to ABSTRACT

The abstract highlights key messages of the paper. Look for summaries of methods and key findings. Use the abstract to make sure that the paper is relevant for you.

4

Then INTRO-DUCTION

The introduction summarizes relevant and up-to-date background knowledge, and provides the rationale of the work. Read carefully if you are new to the field and look for useful references (numbers or names with year number in "()"), which are linked to the reference section.

5

Next is RESULTS

The result has several sections and all the figures and tables showing the key findings of the work. When you encounter "(Fig.1)" in the text, you should look at figure 1 while continuing to read the text.

6

Now DISCUSSION

The discussion tells you what's new in the work, connects it with other findings and provides future directions. It may not be easy to read if you are new to the field. You can re-read it if it's important to you.

7

Jump to METHODS

The methods describe how the authors did experiments to get the results in the paper. Important if you will DIY; if not, you can skim it.

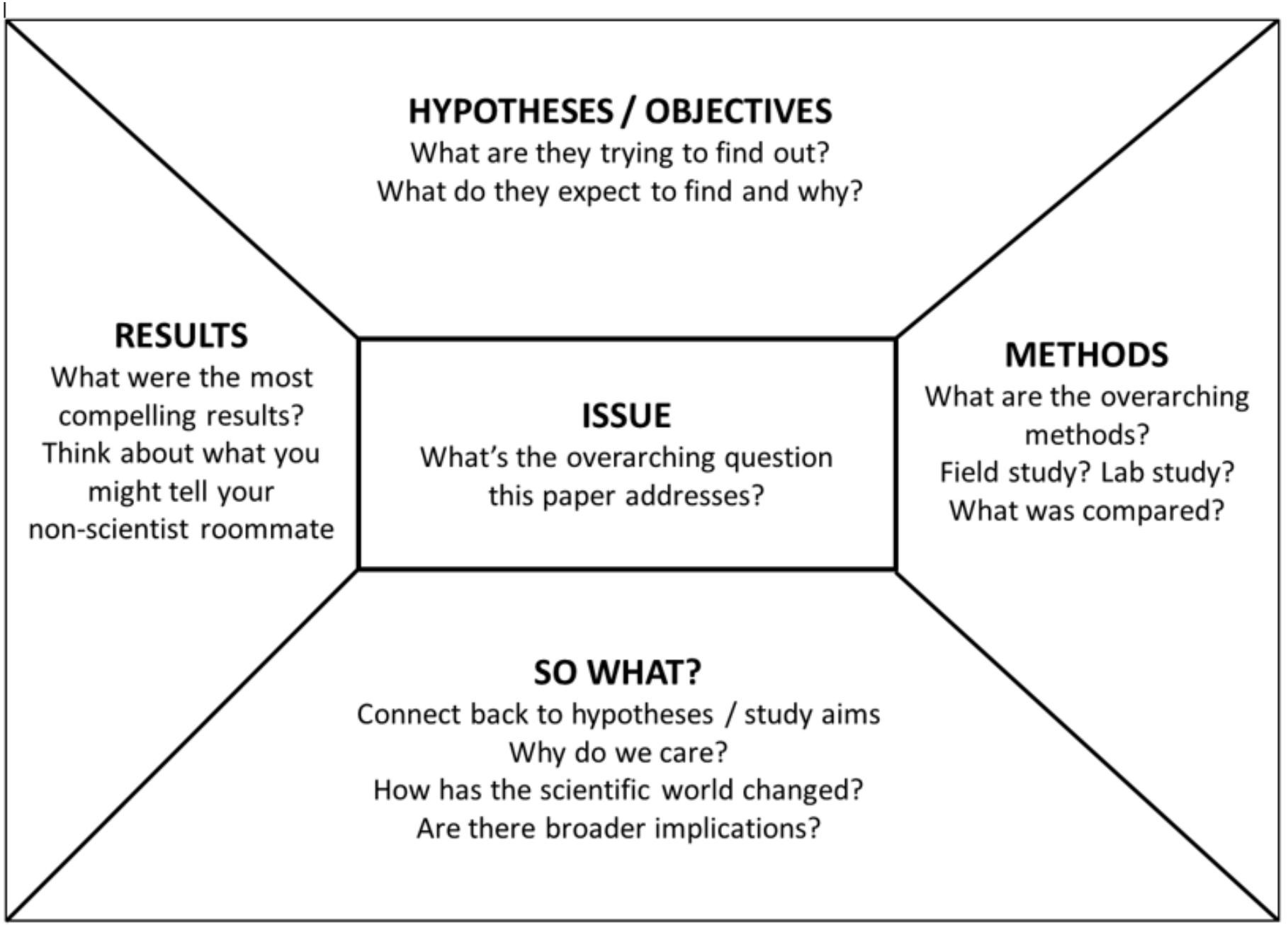
8

REFERENCES last

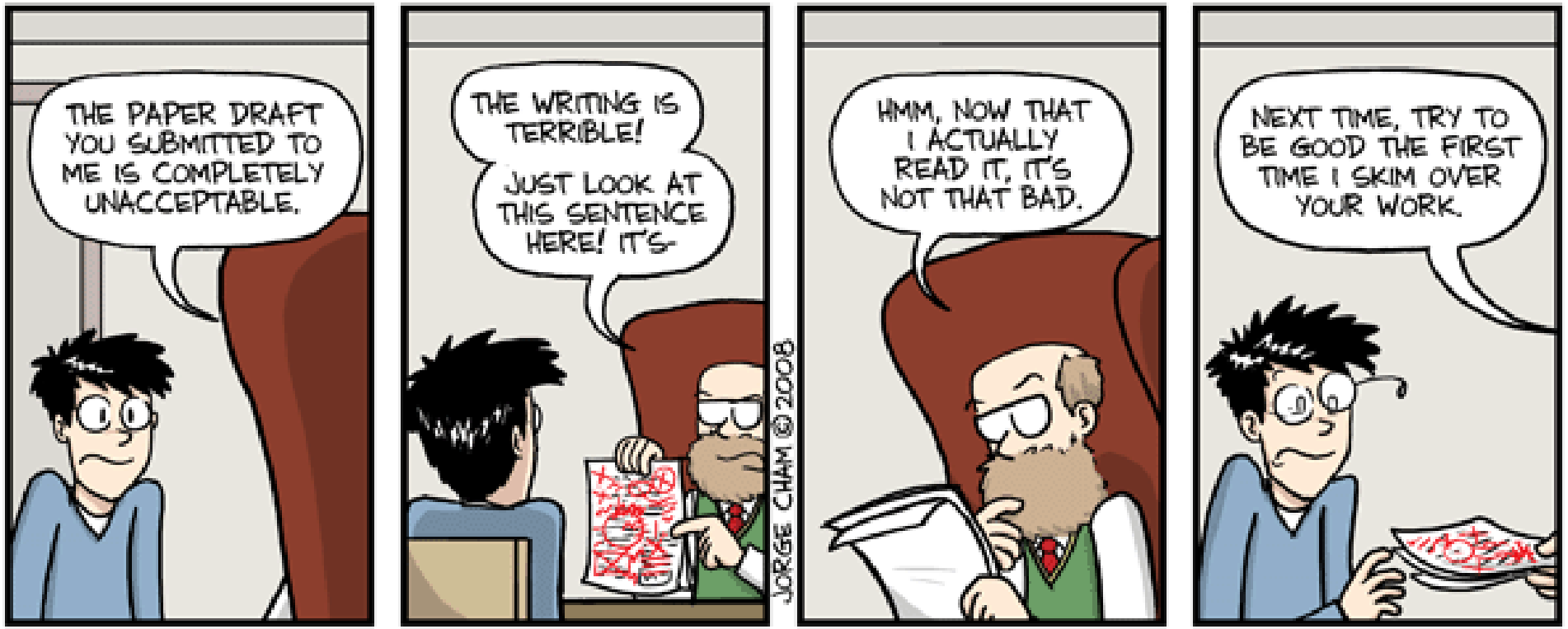
It's a list of papers referred by this paper. Each entry has authors, title, journal (publisher), date and an unique "ID". You can search for the ID to find full content of any paper.

Questions to ask yourself while reading

- Is the organization of the article satisfactory?
- Does the introduction set the manuscript in an appropriate context and show how it builds on previous work on the subject?
- Are the methods correctly described and sufficiently informative to allow replication of the research?
- Are the data analyzed using the appropriate statistical methods?
- Are the authors' claims supported by the evidence provided?
- Are the interpretations and conclusions sound, justified by the data and consistent with the paper's objectives?

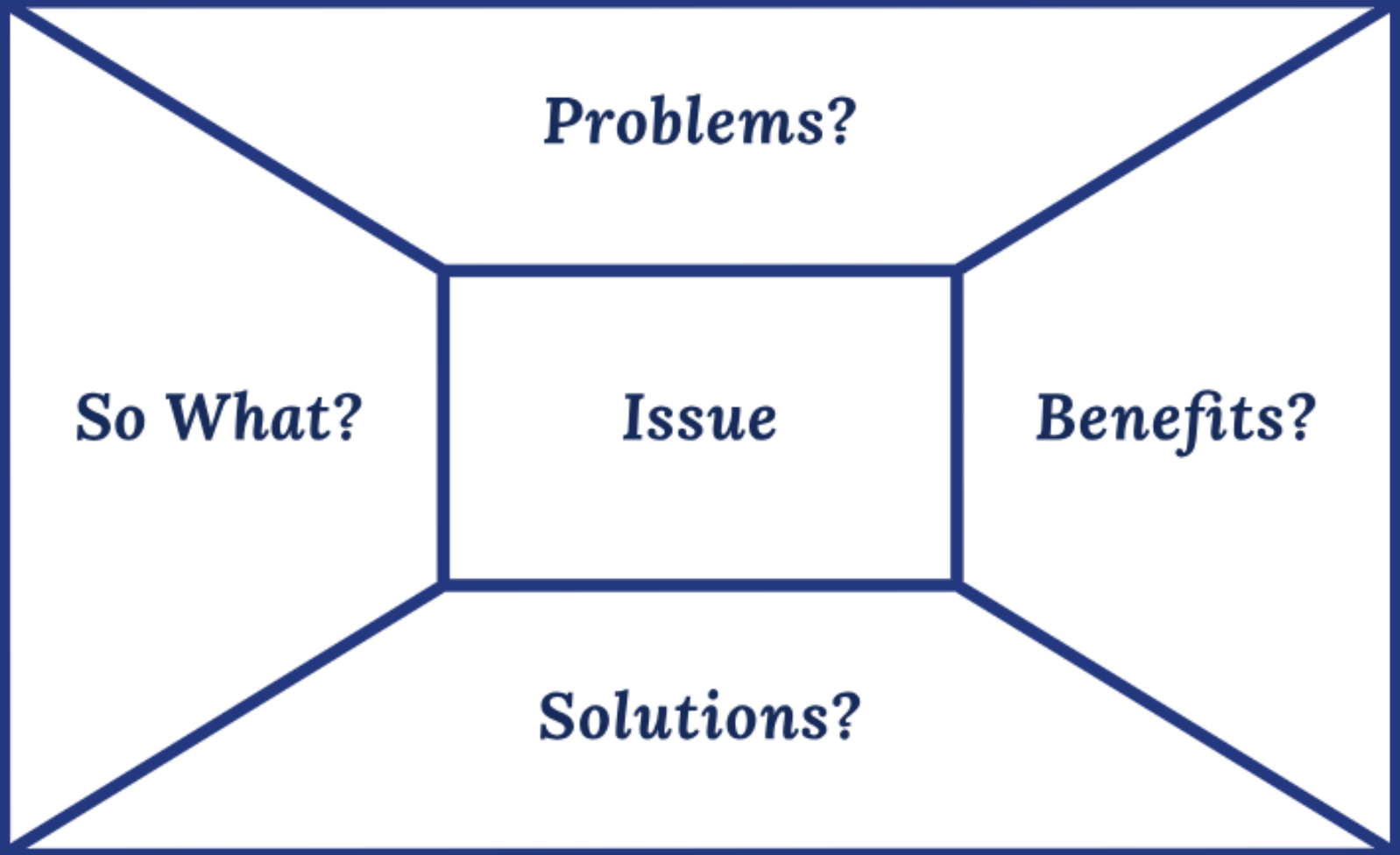

HYPOTHESES / OBJECTIVES
What are they trying to find out?
What do they expect to find and why?
RESULTS
What were the most compelling results?
Think about what you might tell your non-scientist roommate
ISSUE
What's the overarching question this paper addresses?
METHODS
What are the overarching methods?
Field study? Lab study?
What was compared?
SO WHAT?
Connect back to hypotheses / study aims
Why do we care?
How has the scientific world changed?
Are there broader implications?

III. Scientific Writing



The Message Box

After you've identified your audience, you're ready to start drafting your Message Box! You can begin anywhere. Click on the sections below to learn more about each, and **download a blank Message Box** to print and fill out as you go.

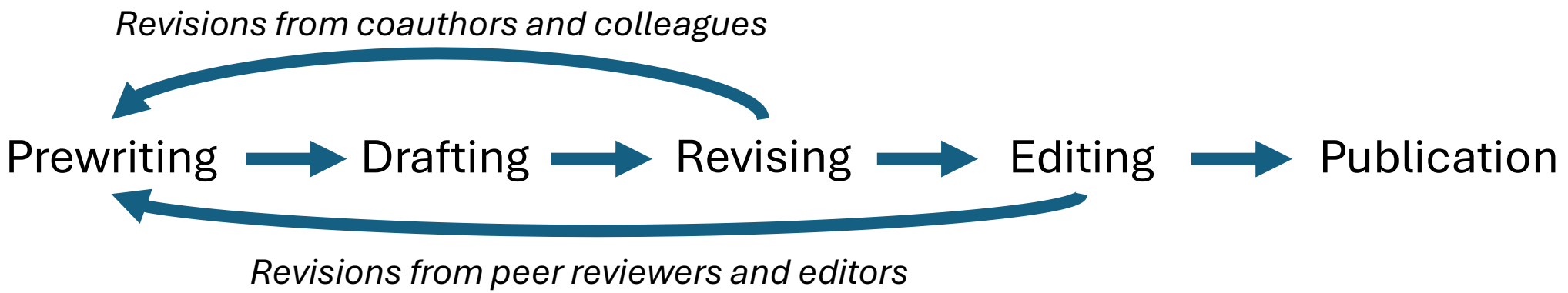


Scientific writing process

What we think the writing process should be: **linear.**

Prewriting → Drafting → Revising → Editing → Publication

What the writing process actually is: **iterative**.



Sentence styles

- Past tense, active voice, personal
  - “We conducted an experiment to measure the effects of ultraviolet radiation on the productivity of marine phytoplankton.”

- Present tense, active voice, personal
  - “We conduct an experiment to measure the effects of ultraviolet radiation on the productivity of marine phytoplankton.”

- Past tense, passive voice, personal
  - “An experiment was conducted by us to measure the effects of ultraviolet radiation on the productivity of marine phytoplankton.”

- Past tense, passive voice, impersonal
  - “An experiment was conducted to measure the effects of ultraviolet radiation on the productivity of marine phytoplankton.”

Latin phrases

- *et al.* = *et alia* = and others
  - Used to replace multiple names, especially in bibliographic information
- *i.e.* = *id est* = that is/in essence/in other words
  - Used to provide a further definition or clarification
- *e.g.* = *exempli gratia* = for example
  - Used to provide supporting examples that are not exhaustive
- *sensu* = in the sense of
  - Used to denote intended meaning or refer to an authority
- *a priori* = from what is earlier
  - Used to describe knowledge that comes from the power of reasoning based on self-evident truths
- *a posteriori* = from what is later
  - Used to describe knowledge based solely on personal experience, experimentation, or observation

e.g.

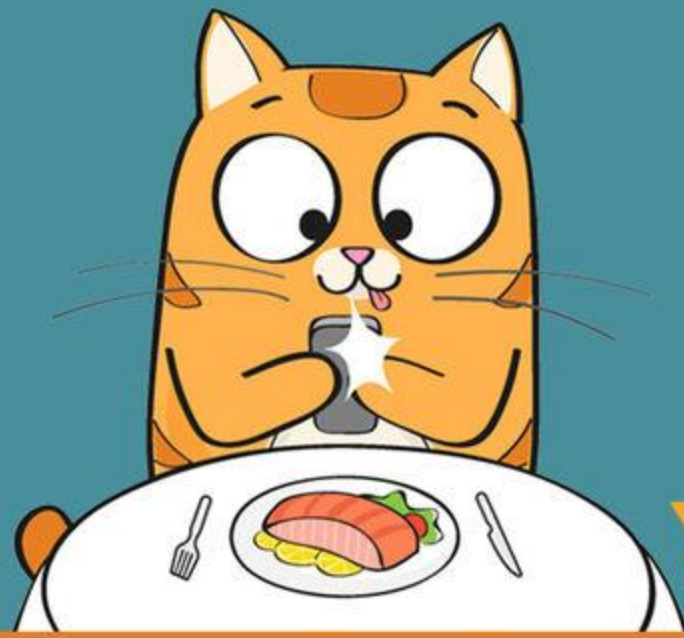
(for example)

Kirby likes to eat Italian food (e.g., pizza, spaghetti, and lasagna).

VS.

i.e.

(in other words)

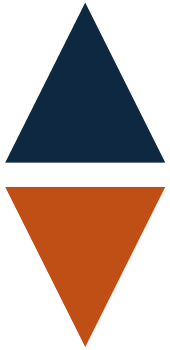


Kirby posted a photo on his social media page (i.e., his food blog).

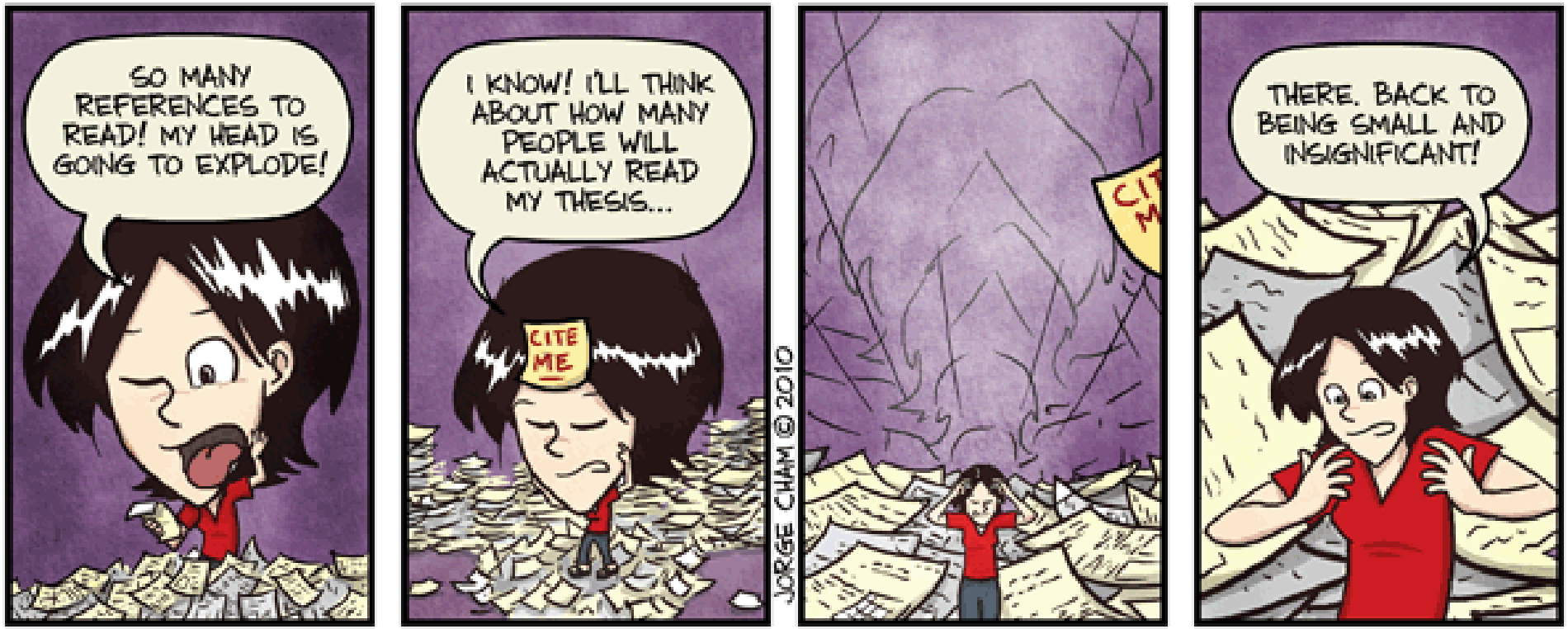
YOUR DICTIONARY

Recommended writing order

1) Methods – easiest to write, some citations
   - Grandma Meunier: “The hardest part of any job is getting started!”
2) Results – next easiest to write, minimal citations
   - Dedicate about 1 paragraph to each figure and table
3) Discussion – second hardest to write, considerable citations
   - Start narrow and end broad
4) Introduction – hardest to write, maximum citations
   - Start broad and end narrow
5) Abstract – summarize everything, no citations



IV. White Papers



What is a white paper?

Purpose

- Document that describes a problem, proposes solutions, and makes recommendations for a **specific audience**
  - Informative
  - Authoritative
  - Persuasive

Audience

- In our case, these will be real stakeholders of **your choosing**
  - Resource users
  - Legislators
  - Agency employees
  - Non-governmental organizations
  - Environmental scientists

What is a white paper?

Tone and Style

- Although you're advocating for a specific position, you should write **objectively**
  - No opinions or perspectives
  - Present facts substantiated by evidence, figures, tables, and citations

Format

- Eight component sections
- 12-15 pages in length
  - Single-spaced
  - Not including references

Cover Page

Section	Criteria	Points Possible
1. Cover Page	1 page maximum	2
a. Title	Title describes the problem.	1
b. Authors and affiliations	Authors and affiliations are listed.	1

Executive Summary

Section	Criteria	Points Possible
2. Executive Summary	1 page maximum	15
a. Background overview	The most important points from the background section are described concisely.	3
b. Problem overview	The most important points from the problem description section are described concisely.	4
c. Solution overview	The most important points from the solution description section are described concisely.	4
d. Recommendation overview	The most important points from the recommendations section are described concisely.	4

Write this section last!

Background

Section	Criteria	Points Possible
3. Background		15
a. State of the science	Current scientific understanding is thoroughly discussed with supporting references.	6
b. Relevant policies	Relevant policies at the local, state, and federal levels are described in the context of the problem.	6
c. Audience consideration	The intended audience for the white paper and affected stakeholders are described.	3

Problem Description

Section	Criteria	Points Possible
4. Problem Description		17
a. Overview of the problem	The problem, its causes, and its impacts are thoroughly described with supporting evidence. At least one figure or table is provided to document the spatiotemporal patterns, causes, or impacts of the problem.	9
b. Stakeholder values	The values of each stakeholder group are defined, and the impacts are related to these values.	4
c. Status quo consequences	The consequences of maintaining the status quo (i.e., doing nothing) are weighed for each stakeholder group.	4

Solution Description

Section	Criteria	Points Possible
5. Solution Description		18
a. Acceptable solution criteria	All criteria that must be fulfilled by the proposed solutions are described. Criteria must be both necessary (i.e., essential to solve the problem) and sufficient (i.e., all-encompassing for solving the problem).	3
b. First solution	Solution 1 is presented, along with its strengths and weaknesses for the stakeholders. At least one figure or table is provided to document how it would mitigate the problem. Sources are cited in support of the solution.	6
c. Second solution	Solution 2 is presented, along with its strengths and weaknesses for the stakeholders. At least one figure or table is provided to document how it would mitigate the problem. Sources are cited in support of the solution.	6
d. Reasoning	Solutions are logical, pertinent, and well-explained.	3

Recommendations

Section	Criteria	Points Possible
6. Recommendations		16
a. Plan of action	Recommendations are made from the available solutions, and intended impacts on stakeholders are described. At least one figure or table is provided to support this recommendation. A timeline or workplan is included if relevant.	10
b. Objective tone	Tone is objective, neutral, and formal throughout.	3
c. Feasibility and efficacy	Recommendation is actionable and effectively addresses the stated problem.	3

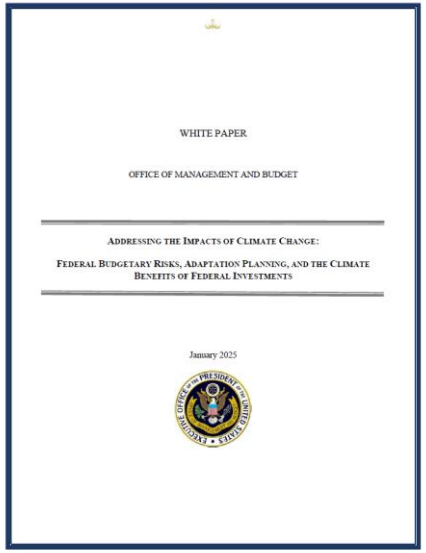
Conclusions

Section	Criteria	Points Possible
7. Conclusions		9
a. Summary of problem	The case for addressing the problem is restated.	3
b. Summary of solutions	The possible solutions and their impacts on stakeholders are summarized.	3
c. Summary of recommendations	The recommendations made to address the problem are summarized with a look ahead toward follow-up efforts.	3

References

Section	Criteria	Points Possible
8. References		8
a. Reference number	At least 30 appropriate sources are cited.	4
b. Citation style	Correct and consistent citation style is used.	4

5 examples on GitHub



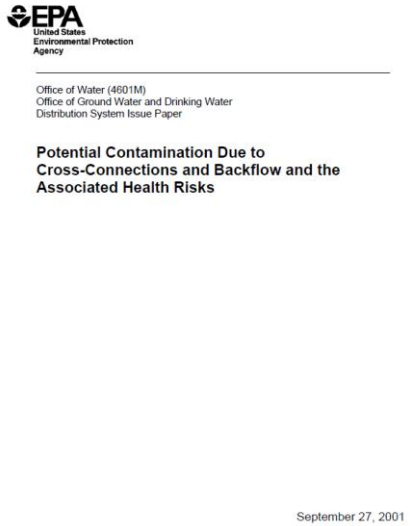
WHITE PAPER

OFFICE OF MANAGEMENT AND BUDGET

ADDRESSING THE IMPACTS OF CLIMATE CHANGE:

FEDERAL BUDGETARY RISKS, ADAPTATION PLANNING, AND THE CLIMATE BENEFITS OF FEDERAL INVESTMENTS

January 2025



EPA United States Environmental Protection Agency

Office of Water (4601M)
Office of Ground Water and Drinking Water
Distribution System Issue Paper

Potential Contamination Due to Cross-Connections and Backflow and the Associated Health Risks

September 27, 2001

November 2023

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THE SCIENTIFIC RATIONALE FOR DEPLOYMENT OF A LONG-LIVED GEOPHYSICAL NETWORK ON THE MOON

A White Paper to be Submitted to the 2023 Planetary Science Decadal Survey

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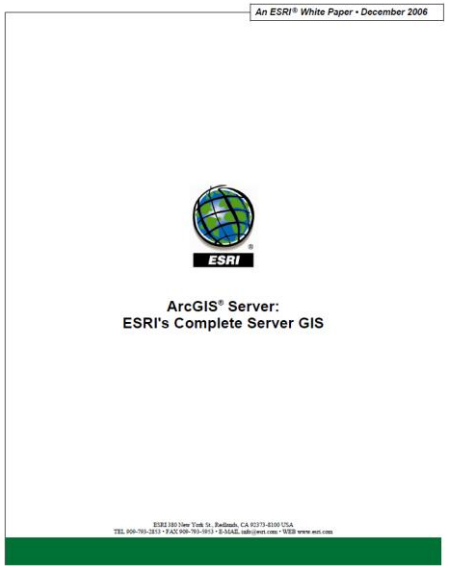

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2 governmental examples

2 academic examples

1 industry example