NOAA FISHERIES

Writing for Scientists:
Your goal is to be read & remembered, hopefully convincing & influential.

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Woods Hole Laboratory

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Acknowledgements

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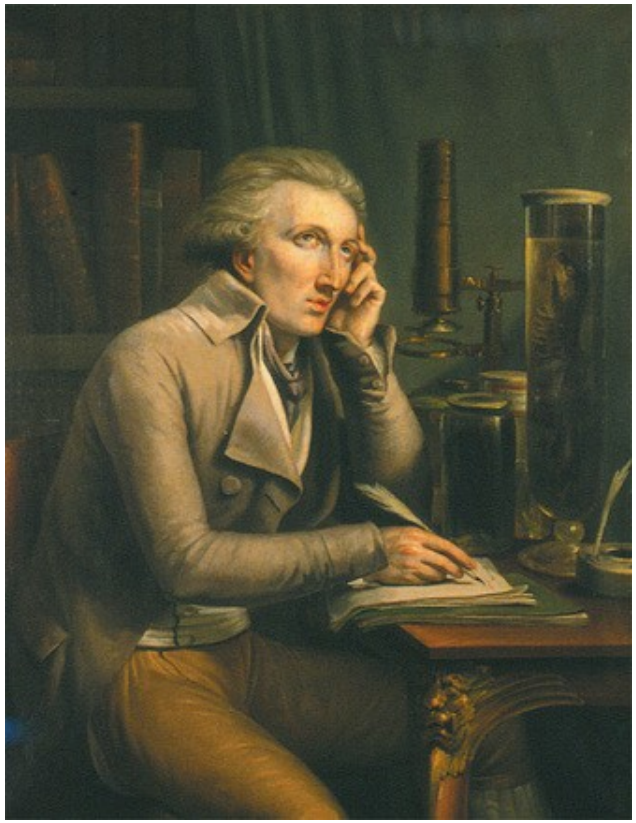
Bulletin of Marine Science (2012-current)
Environmental Biology of Fish (2016)
Fishery Bulletin (2008-current)
Transactions of the American Fisheries Society (2005-2010)

Outline

- The author-reader relationship
- Advice from others
- Elements of scientific writing & reading
- Red flags to reviewers & editors



Scope of this presentation

Scientific writing

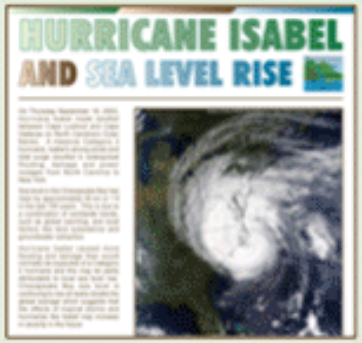

COASTAL MARINE EUTROPHICATION:
A DEFINITION, SOCIAL CAUSES,
AND FUTURE CONCERNS

ABSTRACT


Coastal eutrophication: recent developments in definitions and implications for monitoring strategies

- Providing scientific context (references)
- Text > graphics
- Authorship exclusive
- Focus on results & interpretation

Science communication

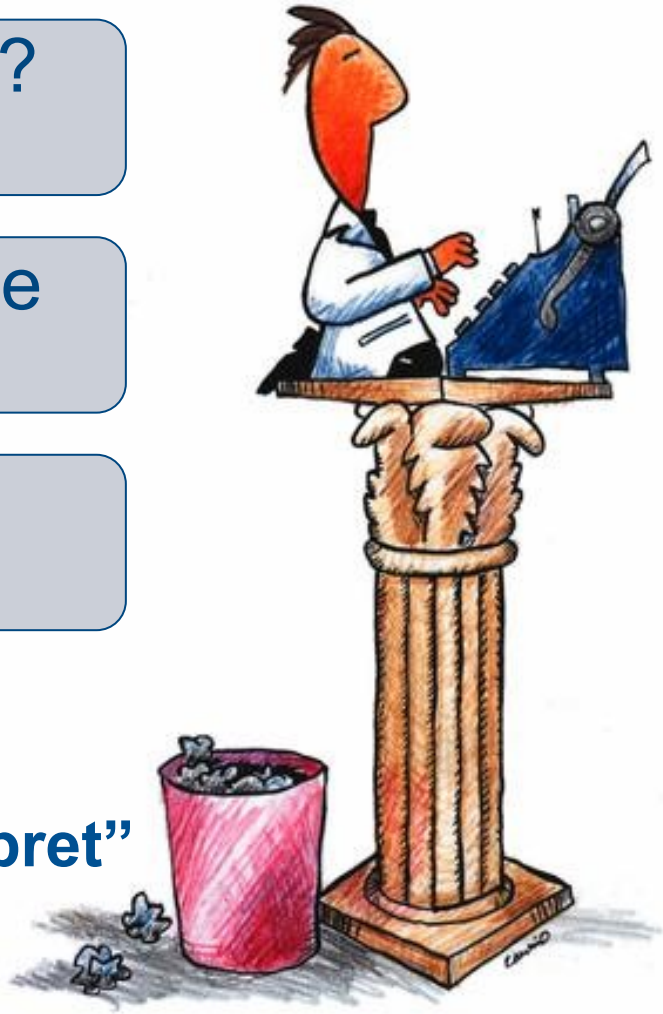


- Providing societal context (examples)
- Text ≈ graphics
- Authorship inclusive
- Focus on conclusions & recommendations

Authors write for an unmet reader

Alley (1996) asks:

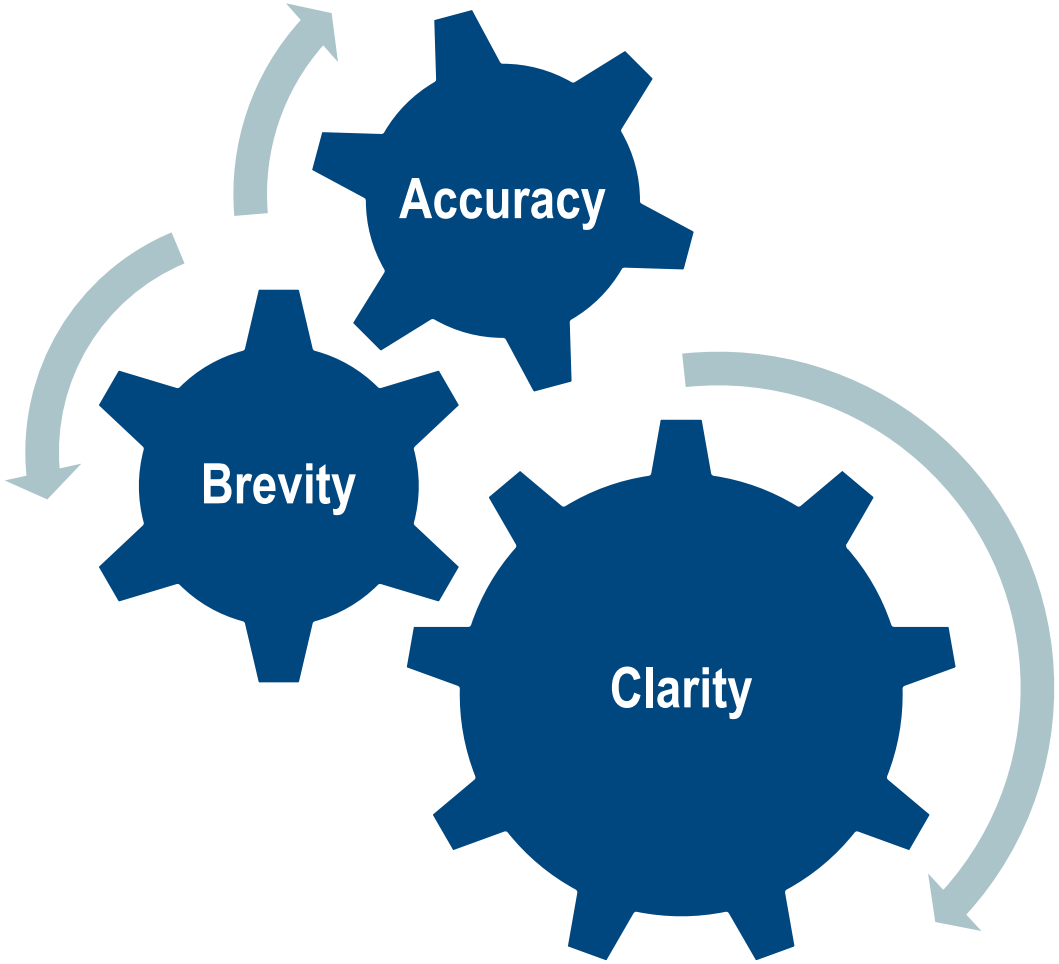
- Who will read the document?
- What do they know about the subject?
- Why – and how – will they read the document?



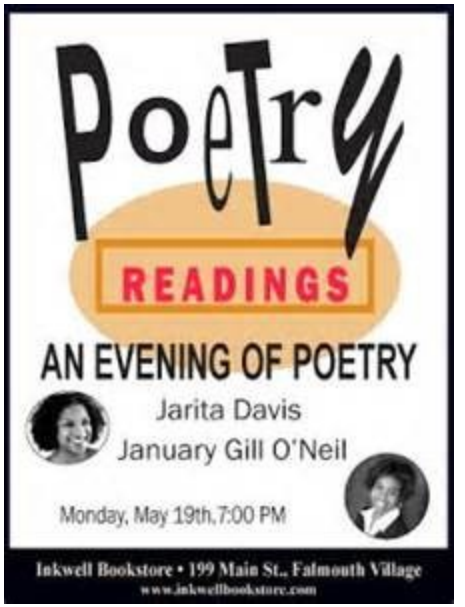
“Readers do not simply read; they interpret”

(Gopen and Swan, 1990)

Fred Serchuk's ABCs

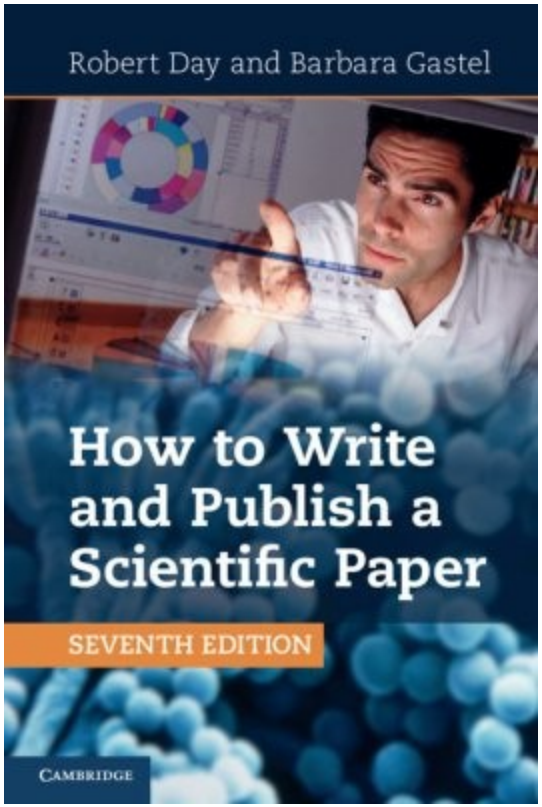


Jarita Davis' 7 layers of Editing



You can't edit a blank page. - Jodi Picoult

Day & Gastel's "cookbook"



Part II. Preparing the Text

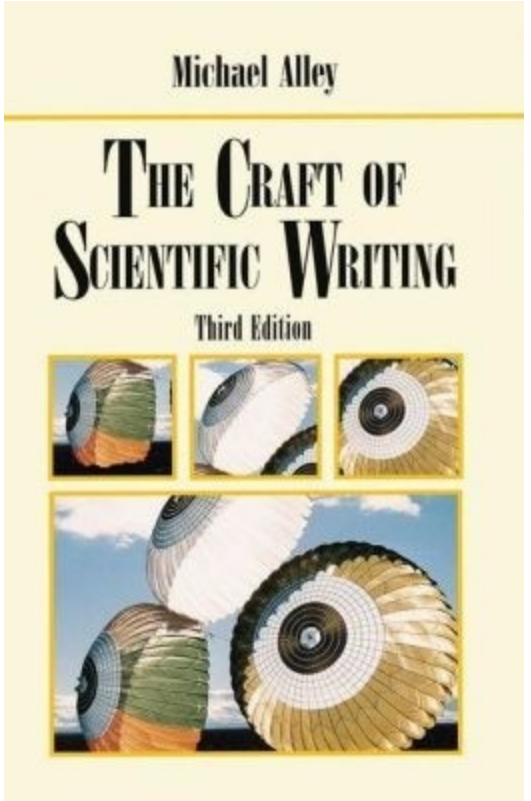
7. How to prepare the title
8. How to list the authors and addresses
9. How to prepare the abstract
10. How to write the introduction
11. How to write the materials and methods section
12. How to write the results
13. How to write the discussion
14. How to state the acknowledgements
15. How to cite the references

Part III. Preparing the Tables and Figures

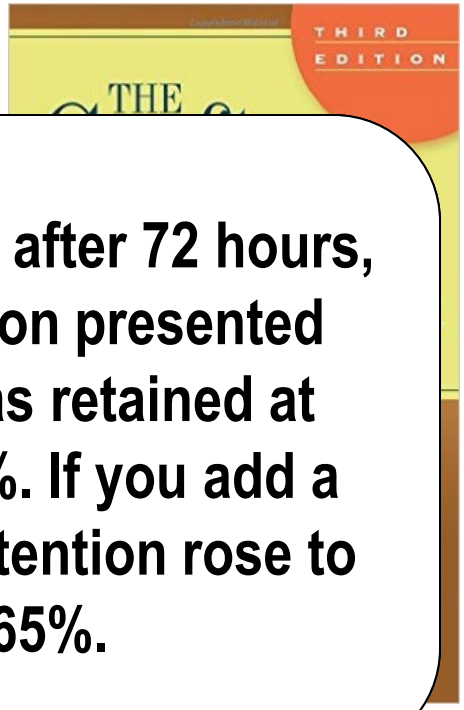
16. How to design effective tables
17. How to prepare effective graphs
18. How to prepare effective photographs

Alley's "craft" approach

Structure	• Not about the I-M-R-D structure per se • Begin-Middle-End; transitions
Language	• Precision, clarity, forth-rightness, familiarity, conciseness, fluidity
Illustrations	• How you should build your text from your tables & figures
Readers	• How they decode a page, a paragraph, a sentence, a word



Booth et al.'s craft



The Assertion-Evic
approach is more
convincing to – an
remembered by – y
audience than reac
list of bullet statem

Compared to wor
people can proces
image faster and re
memory longe

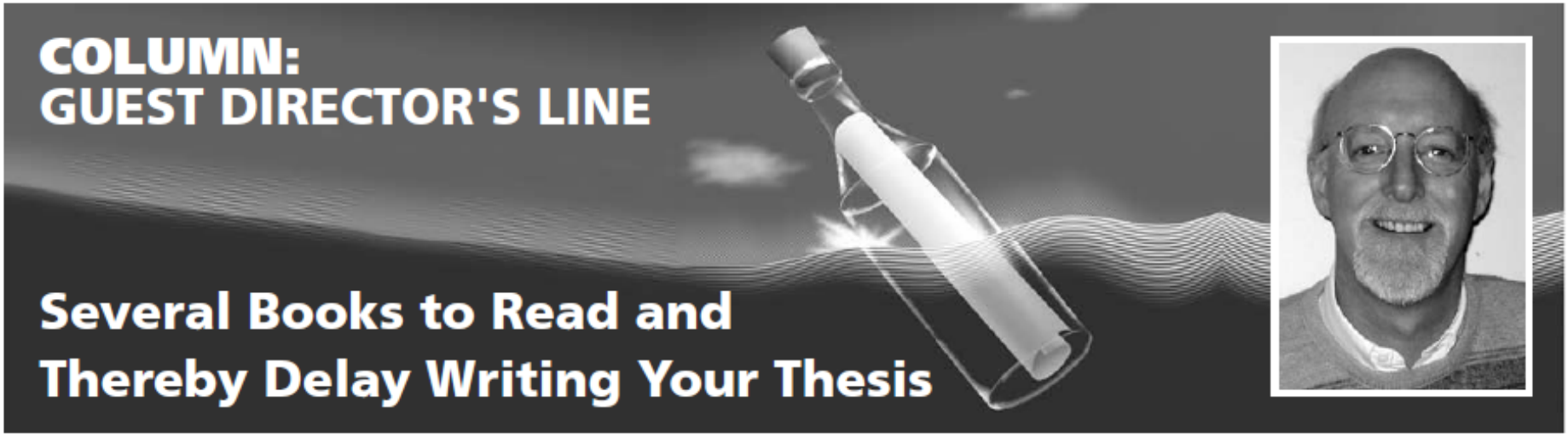
Warrant: A picture is
a 1000 words.

In one test, after 72 hours, information presented orally was retained at about 10%. If you add a picture, retention rose to 65%.

CLAIM *because of* REASON *based on* EVIDENCE

ACKNOWLEDGMENT AND RESPONSE

Don’t just take their or my advice



Before “The Simpsons” appeared on television, Matt Groening produced some offbeat cartoons that I followed in the *Chicago Reader*. In one cartoon, an anthropomorphic rabbit, who was struggling to complete graduate school, arrived at a clever delay tactic: “Read another book!”

At the risk of sounding like Groening’s rabb
about a dozen
websites on the
communication
ing, and, yes, reading them will

of your own. One chapter promotes the proper usage of the English—and fishery—language using examples of (all too) common writing problems, and another chapter offers advice to assuage the trauma of negative critiques or editorial rejection. The chapter on graphic display of data illustrates 21 different figure types, and 2 chapters introduce the topic of

(1990), tentatively titled *Scientific*

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is an excellent index that is indis-
fer back to the

Writing about
06) covers
the basics of preparing an IMRD

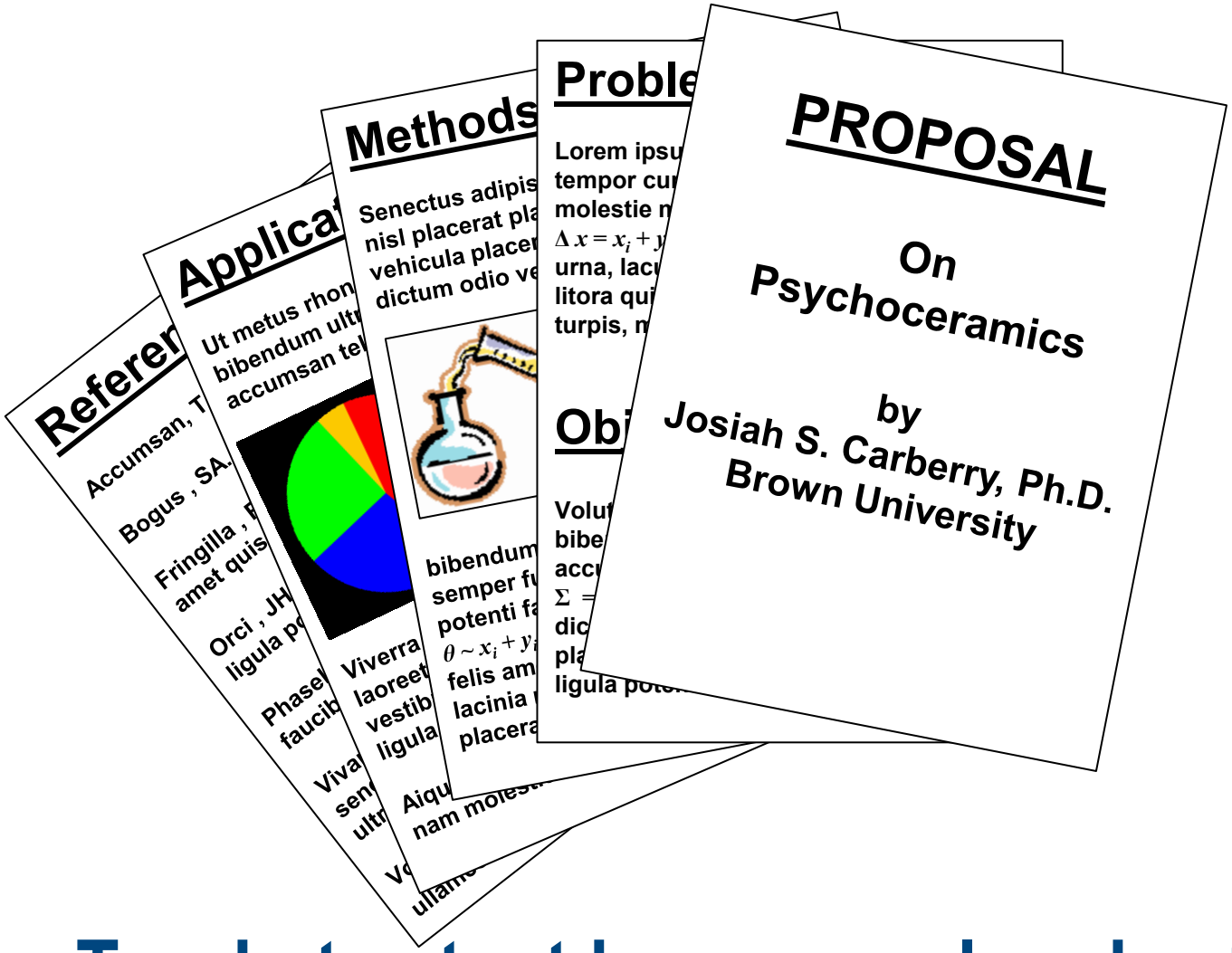
There are lots of resources out there. Use them.

Fisheries. 34(2): 80-82.

Elements of Scientific Writing

- Your proposal
- An outline
- How writers write
- How readers read
- Style and format
- Revision

Don’t forget your proposal



- Title
- Thesis
- Methods
- Literature

To what extent have you already started?

Time saver tip: outline then write

Introduction

> 3 paragraphs?

Materials and Methods

Include "Study Area" section?

Skip details and cite other papers?

Results

1. Begin with 'introductory' experiment results
2. Report results as you plan to discuss them
3. Save most interesting for last
4. Or, list the most speculative or least solid result last

.
.
.

How writers (should) write

- Title
  - Summary
    - Abstract
    - Conclusion
  - Text
    - Introduction/ Discussion
    - Methods/ Results
  - Illustrations
    - Tables
    - Figures

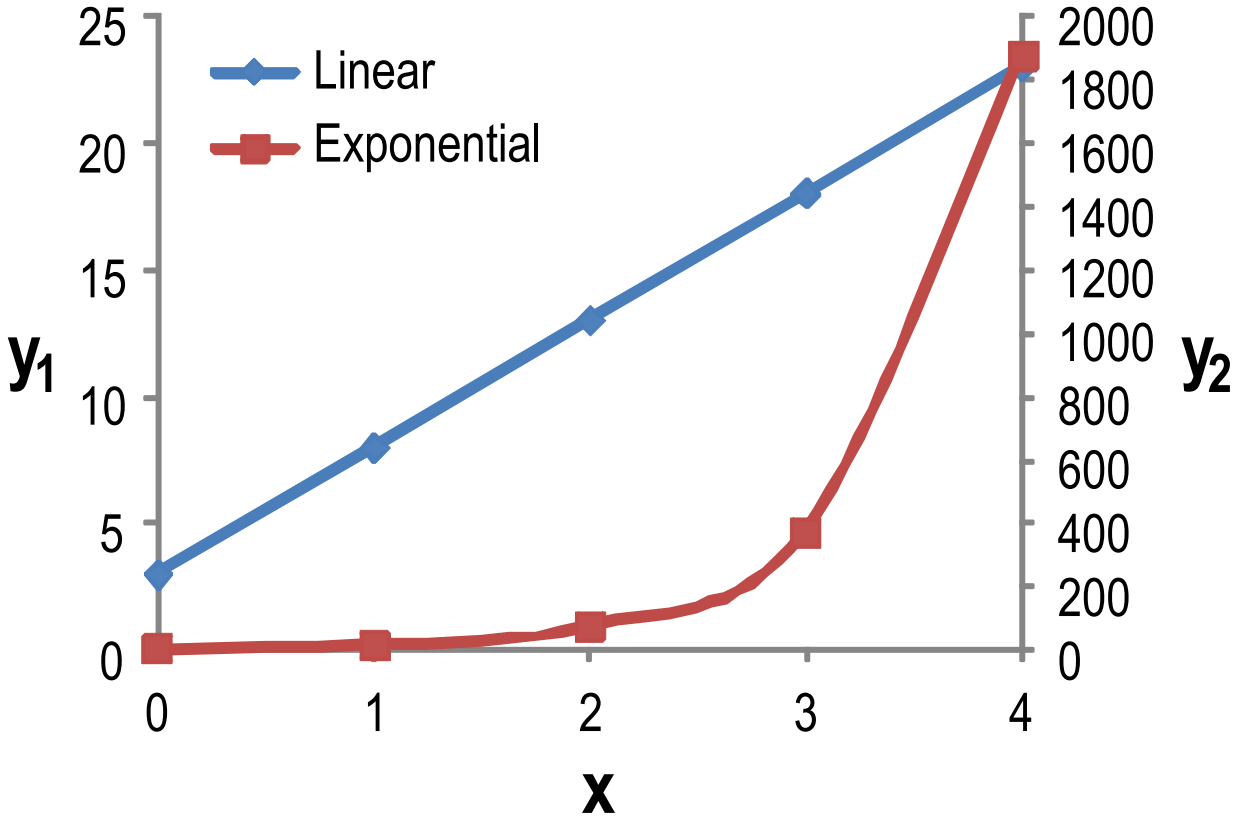
If it does not relate to the title, it is probably a tangent.

How writers (should) write

Write your methods while they are as fresh as possible.

How writers (should) write

x	y_1	y_2
0	3	3
1	8	15
2	13	75
3	18	375
4	23	1875



Assemble your illustrations (tables, figures, photos, video) to help you write the results.

How writers (should) write

Introduction

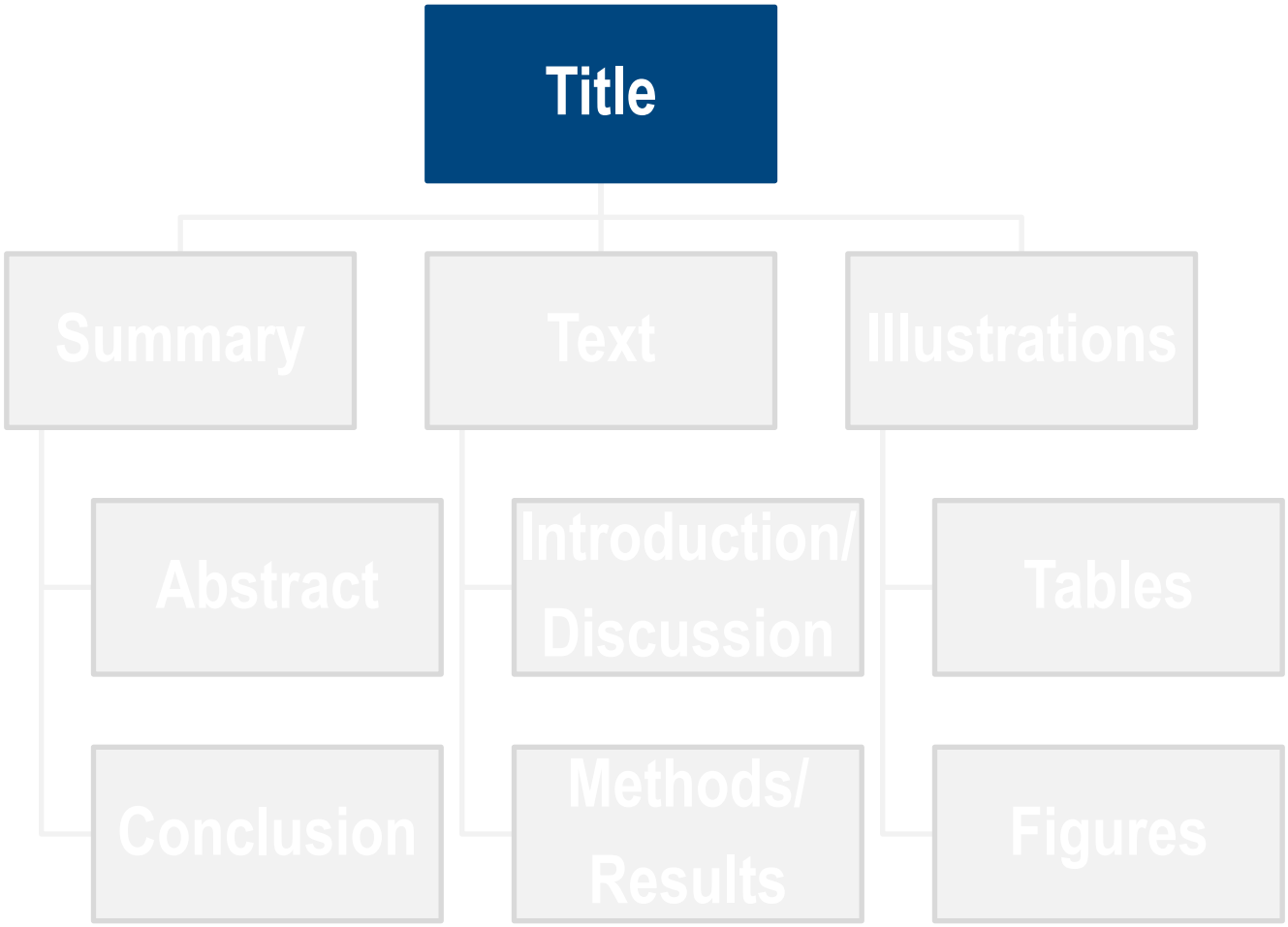
Begin broadly,
end with a focused
thesis statement.

Discussion

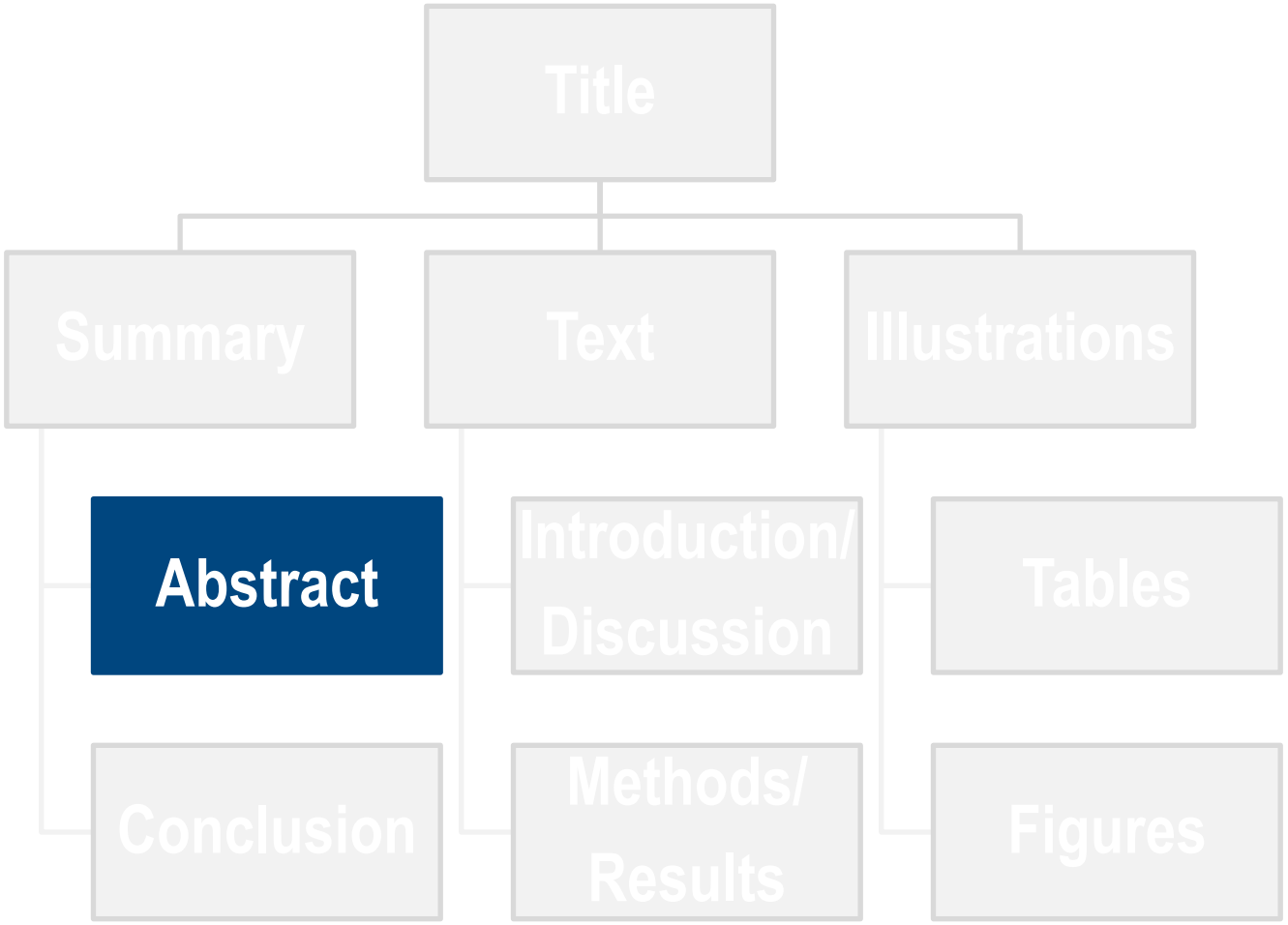
Begin with
the most
significant
finding.
End broadly.

Consider the Introduction and Discussion as bookends.

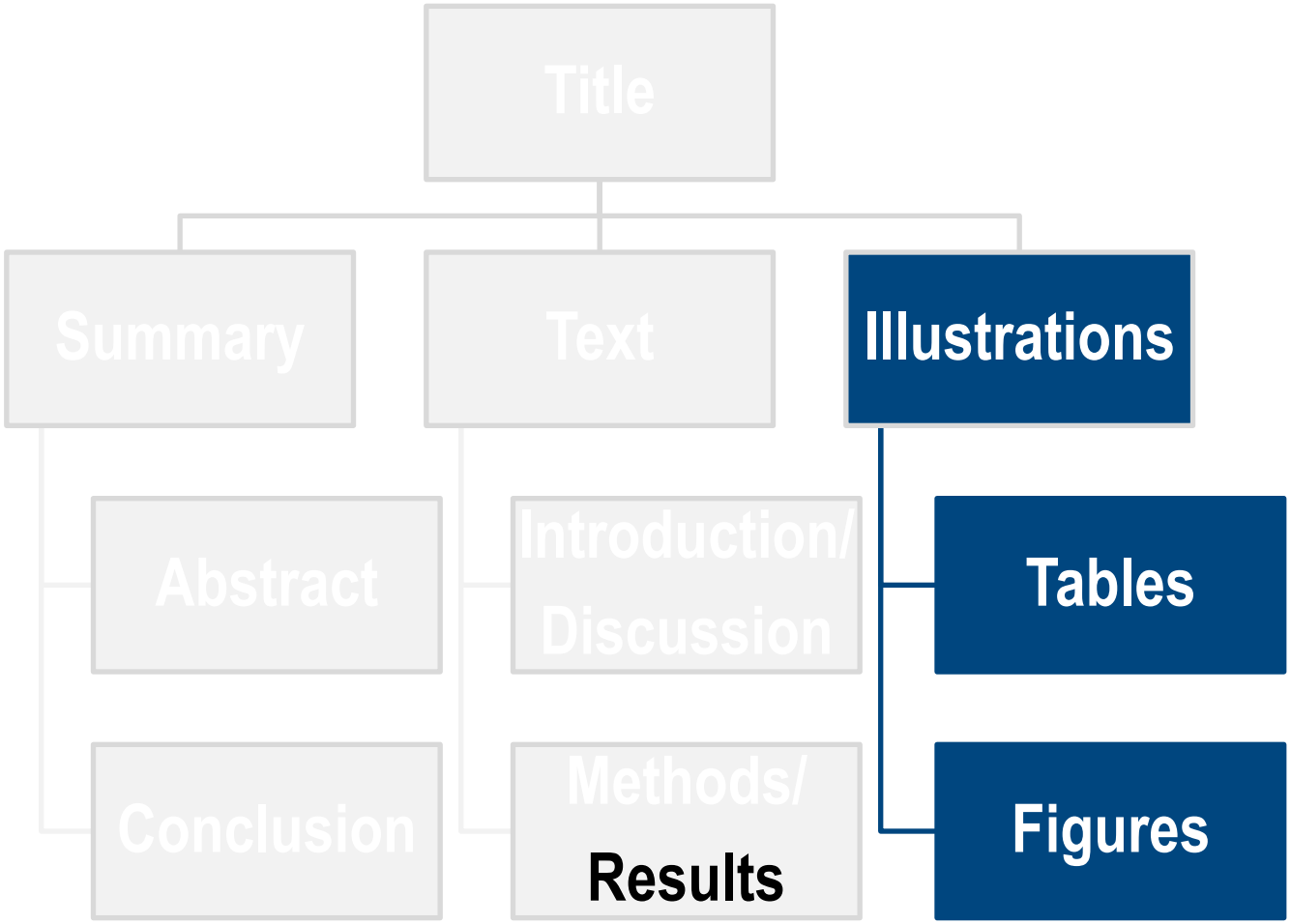
How readers (likely) read



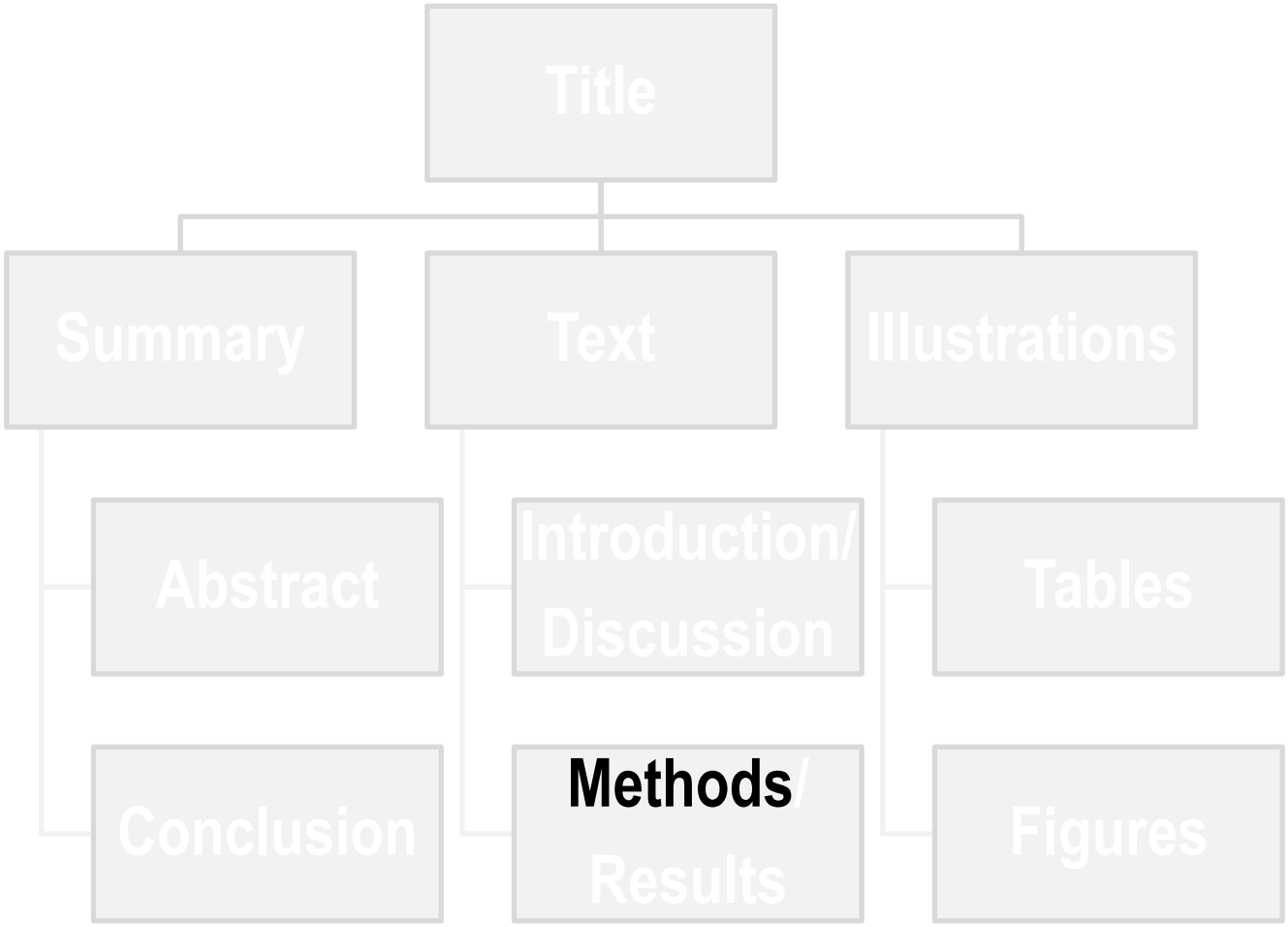
How readers (likely) read



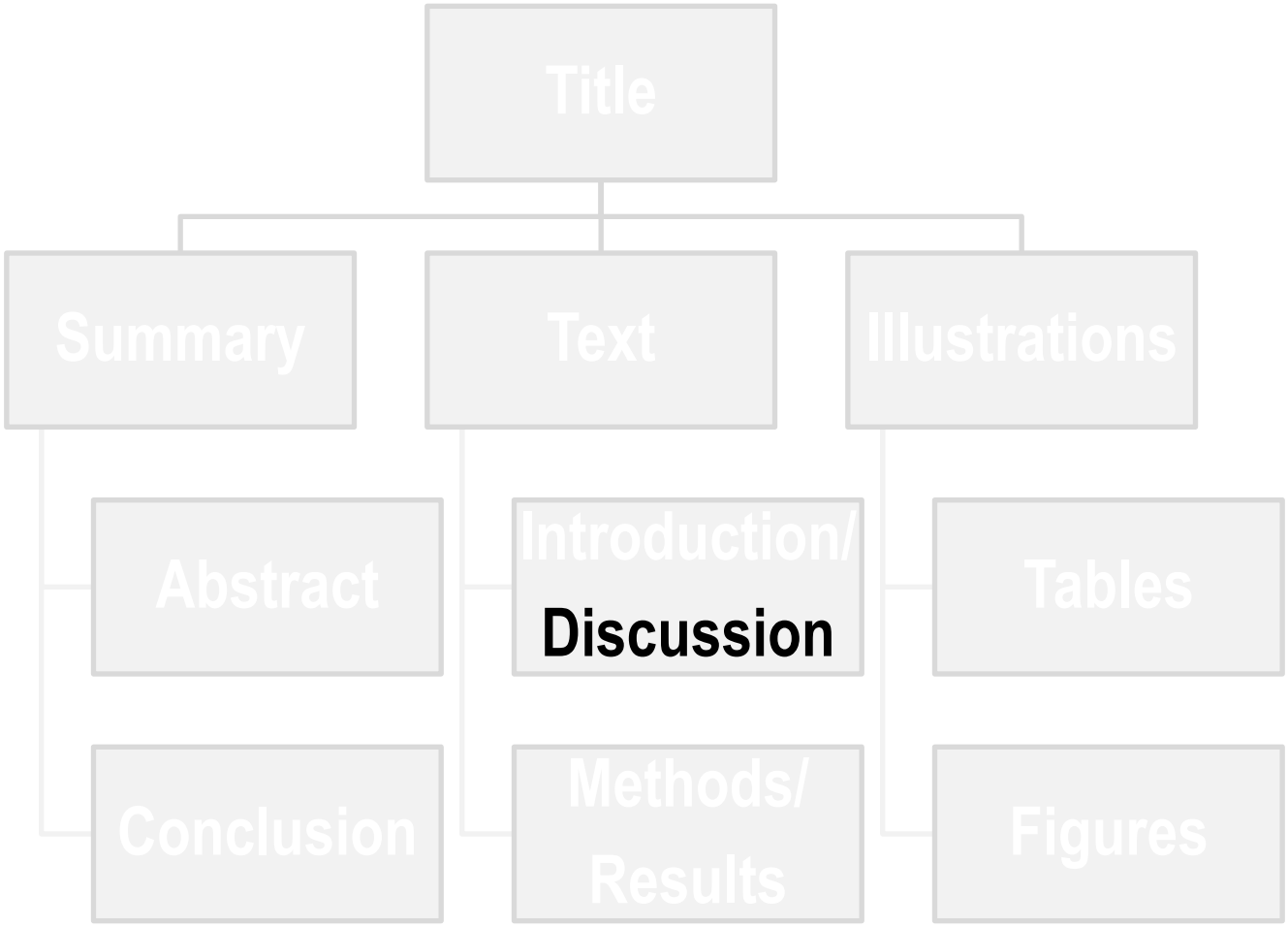
How readers (likely) read



How readers (likely) read



How readers (likely) read



Style and Format

A Guide to AFS Publications Style
American Fisheries Society 2013

1. Abbreviations and Acronyms
2. Capitalization
3. Italics
4. Mathematics and Statistics
5. Numbers and Measurements
6. Punctuation
7. Quotations
8. References
9. Species Names
10. Spelling and Compound Words
11. Symbols
12. Tables and Figures
13. Vendors and Commercial Products
14. Word Usage

<u>Appendices</u>

A. Spelling List
B. Symbols, Abbreviations, and Acronyms
C. Plurals of Fish Names
D. Geographic and Geological Terms

Style and Format

Read these too!

Fishery Bulletin

Guidelines for authors

Contributions published in *Fishery Bulletin* describe original research in marine fishery science, fishery engineering and economics, as well as the areas of marine environmental and ecological sciences (including modeling). Preference will be given to manuscripts that examine processes and underlying patterns. Descriptive reports, surveys, and observational papers may occasionally be published but should appeal to an audience outside the locale in which the study was conducted.

Although all contributions are subject to peer review, responsibility for the contents of papers rests upon the authors and not on the editor or publisher. *Submission of an article implies that the article is original and is not being considered for publication elsewhere.*

Plagiarism and double publication are considered serious breaches of publication ethics. To verify the originality of the research in papers and to identify

expands our knowledge of fisheries science, engineering or economics—and do not require a lengthy discussion.

Companion articles

Companion articles are published together and are documents that together stand as a scientific contribution and address a closely related topic. They may be articles that result from a workshop or conference on a particular topic. They must be submitted to the journal at the same time.

Review articles

Review articles generally range from 40 to 60 double-spaced typed pages (12-point font) and address a timely topic that is relevant to all aspects of fisheries science. They should be forward thinking and address novel views or interpretations of information that encourage new avenues of research. They can be reviews based on the outcome from thematic workshops, or contributions by groups of authors who want to focus on a particular topic, or a contribution by an individual who chooses to review a research theme of broad interest to the fisher-

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http://fishbull.noaa.gov/guidelines.pdf

Style and Format

These are journal specific.

Revise, revise, revise

“Vision plays an important role in notifying animals of imminent danger, such as an impending collision with a predator or an environmental surface.“
Appeared in Science (1995), written by 3 Caltech PhDs

Flesch Reading Ease: college graduate level
Fog Scale Level: very difficult

“Without eyes, you'd soon crash into a tiger or a cliff.”
Suggested revision by Nicholas Wade, New York Times

Flesch Reading Ease: plain English
Fog Scale Level: readable

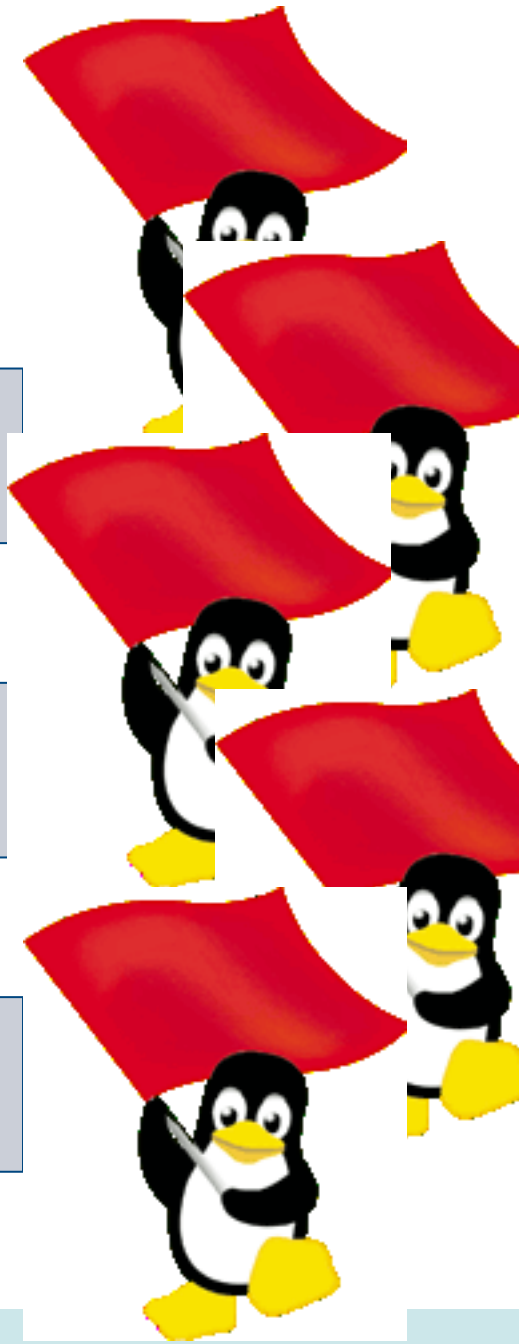
Science is complex enough, don’t make it more so.

Rich's Red Flags

Claim – hypothesis – thesis statement

Section → Paragraph → Sentence → Word

Confusing statistics, models, and processes

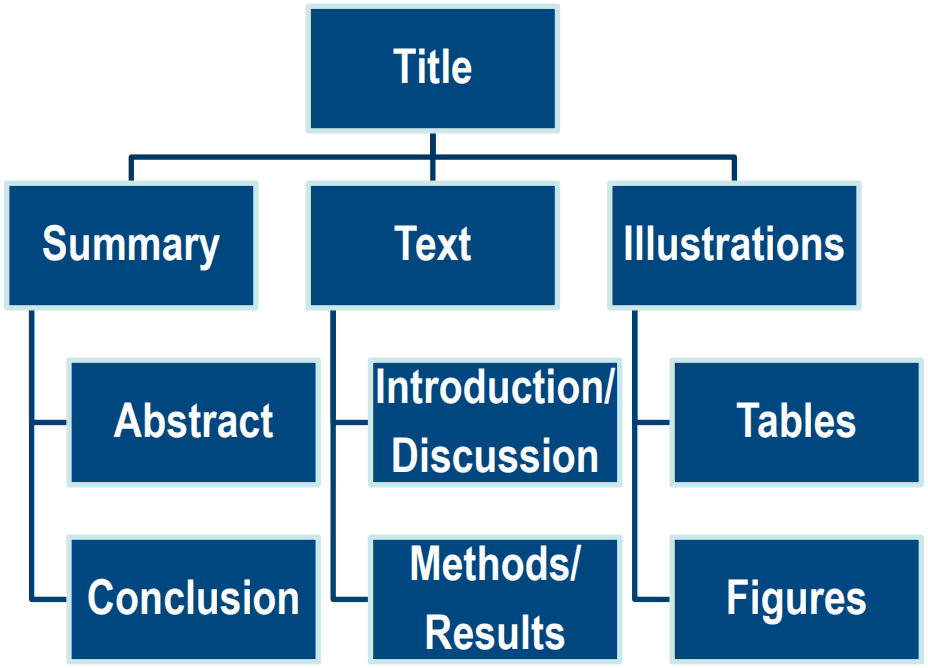


Weak Thesis Statement

Instead, it should:

- be debatable and demonstrate discovery
- exist in a relevant context
- lead to an evidence-based conclusion

Sections should be coherent

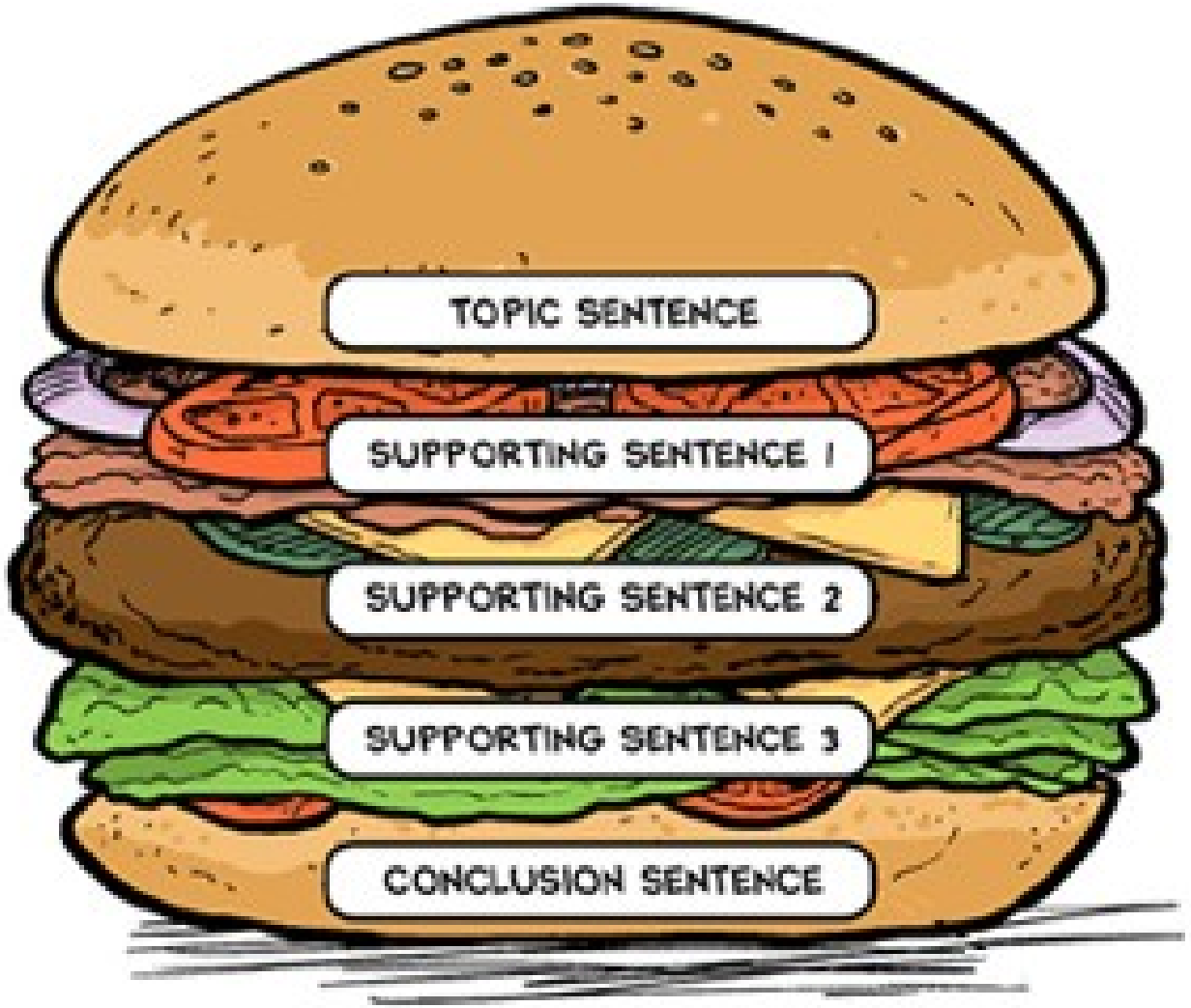


Title and thesis rule!

Results in ‘Results,’ etc.

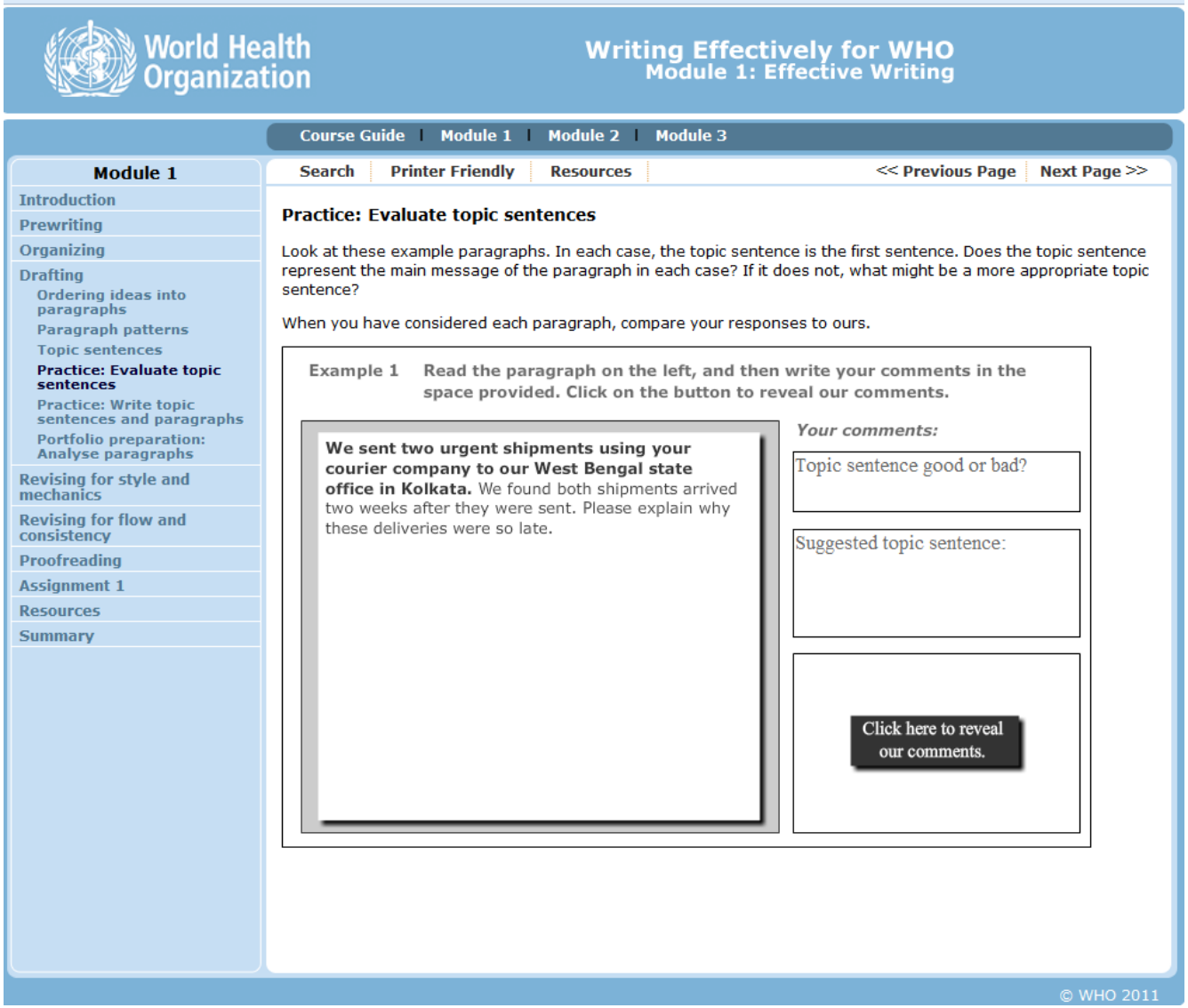
Coordinate text & Illustrations

Build strong topic sentences: Theory



1 paragraph

Build strong topic sentences: Practice



There is a science to scientific writing.

The seven principles of scientific writing

(1) Place the "new information" you want the reader to emphasize in the *stress position* at the end of the sentence. Save the best for last.

(2) Place the person or thing whose "story" a sentence is telling at the beginning of the sentence, in the topic position.

(3) Place "old information" (material already stated) in the topic position, to link reader backwards.

(4) Follow a subject as soon as possible with its verb.

(5) Provide context for your reader before asking that reader to consider anything new.

(6) Articulate the action of every clause or sentence in its verb.

We have directly measured the enthalpy of hydrogen bond formation between the nucleoside bases 2'deoxyguanosine (dG) and 2'deoxycytidine (dC). dG and dC were derivatized at the 5' and 3' hydroxyls with triisopropylsiyl groups; these groups serve both to solubilize the nucleosides in non-aqueous solvents and to prevent the ribose hydroxyls from forming hydrogen bonds. Consequently, when the derivatized nucleosides are dissolved in non-aqueous solvents, hydrogen bonds form almost exclusively between the bases. Since the interbase hydrogen bonds are the only bonds to form upon mixing, their enthalpy of formation can be determined directly by measuring the enthalpy of mixing. From our isoperibolic titration measurements, the enthalpy of dG:dC base pair formation is -6.65±0.32 kcal/mol.

(7) In general, ensure that the emphasis of the *substance* coincides with the expectations for emphasis raised by the *structure*.

From "The Science of Scientific Writing" by George Gopen and Judith Swan.

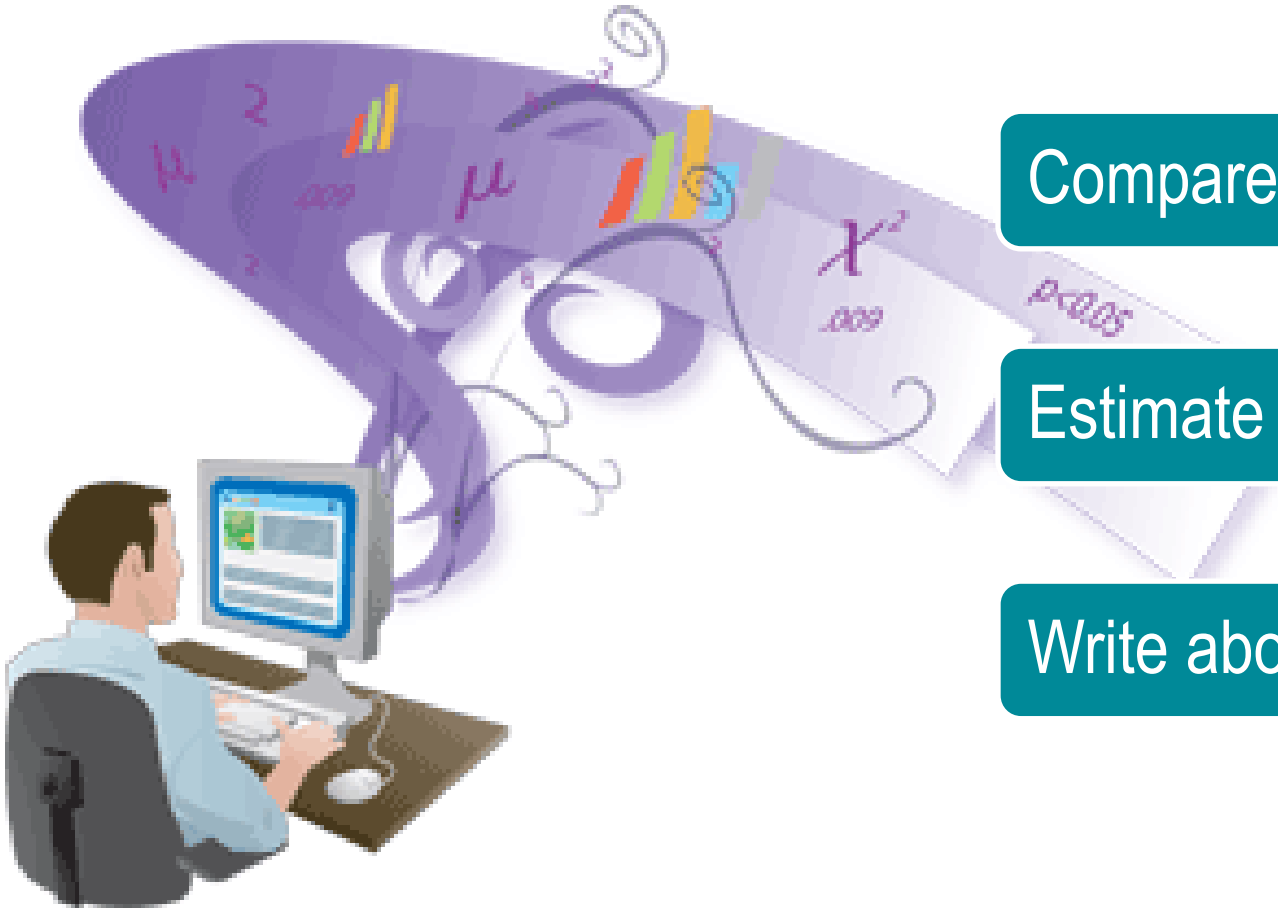
http://rebeccaholmes.net/public/img/the-seven-principles-of-scientific-writing.png

Master the language

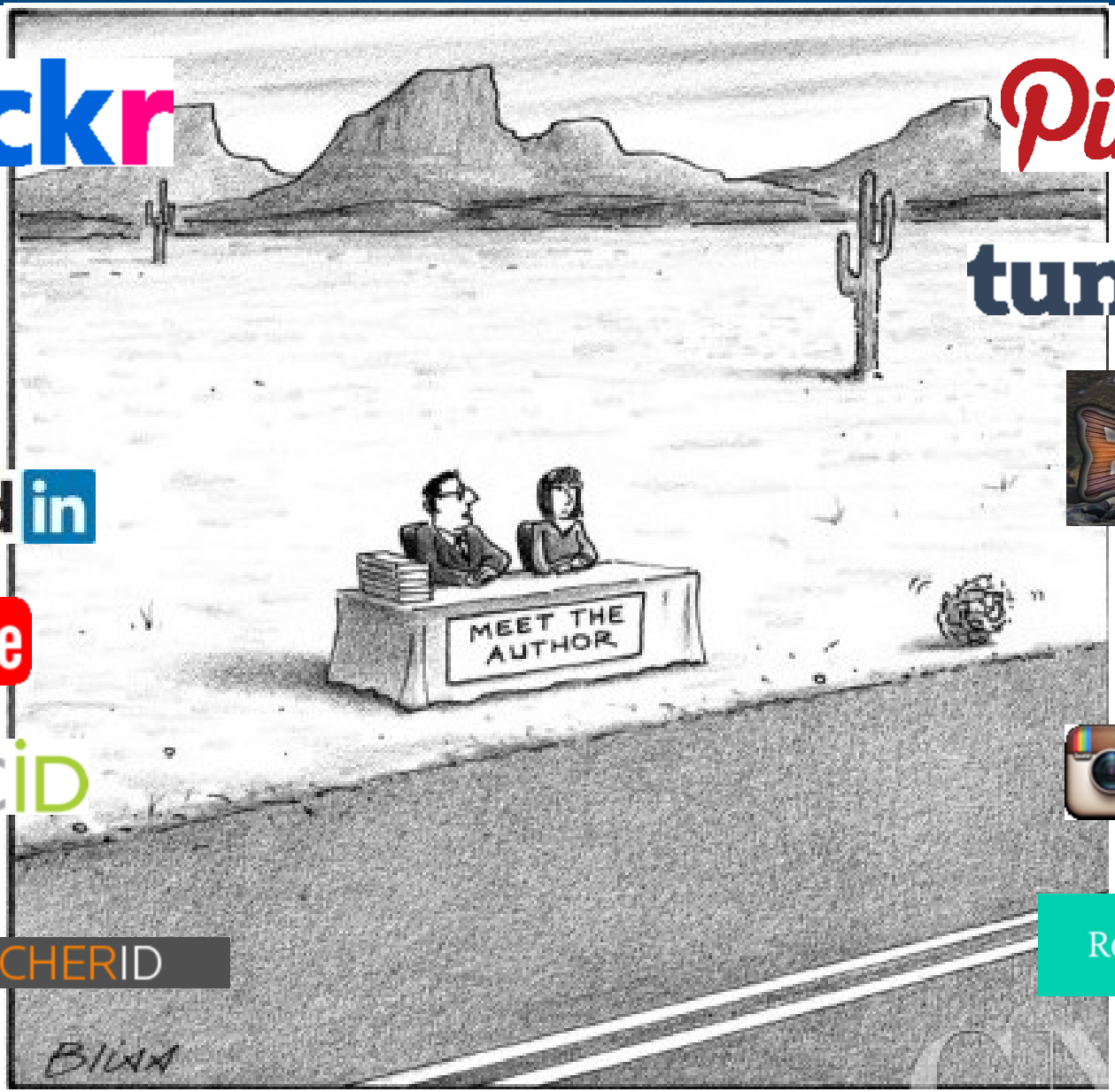
- Define – or avoid – jargon, slang, or idioms
- Define (or avoid) abbreviations & acronyms
- Choose terms and stick with them

Use words that work.

Don’t confuse the math or model and the biological processes



- Compare models
- Estimate effect size
- Write about mechanisms



You are, without a doubt, the worst publicist I've ever had.

Conclusions

"I am so clever that sometimes I don't understand a single word of what I am saying."

Oscar Wilde

You write for a reader whom you may never meet

- You want to engage and persuade the reader

The reader has expectations

- About style and format.

Meet those expectations

- With the science and craft of scientific writing