READING JOURNAL ARTICLES

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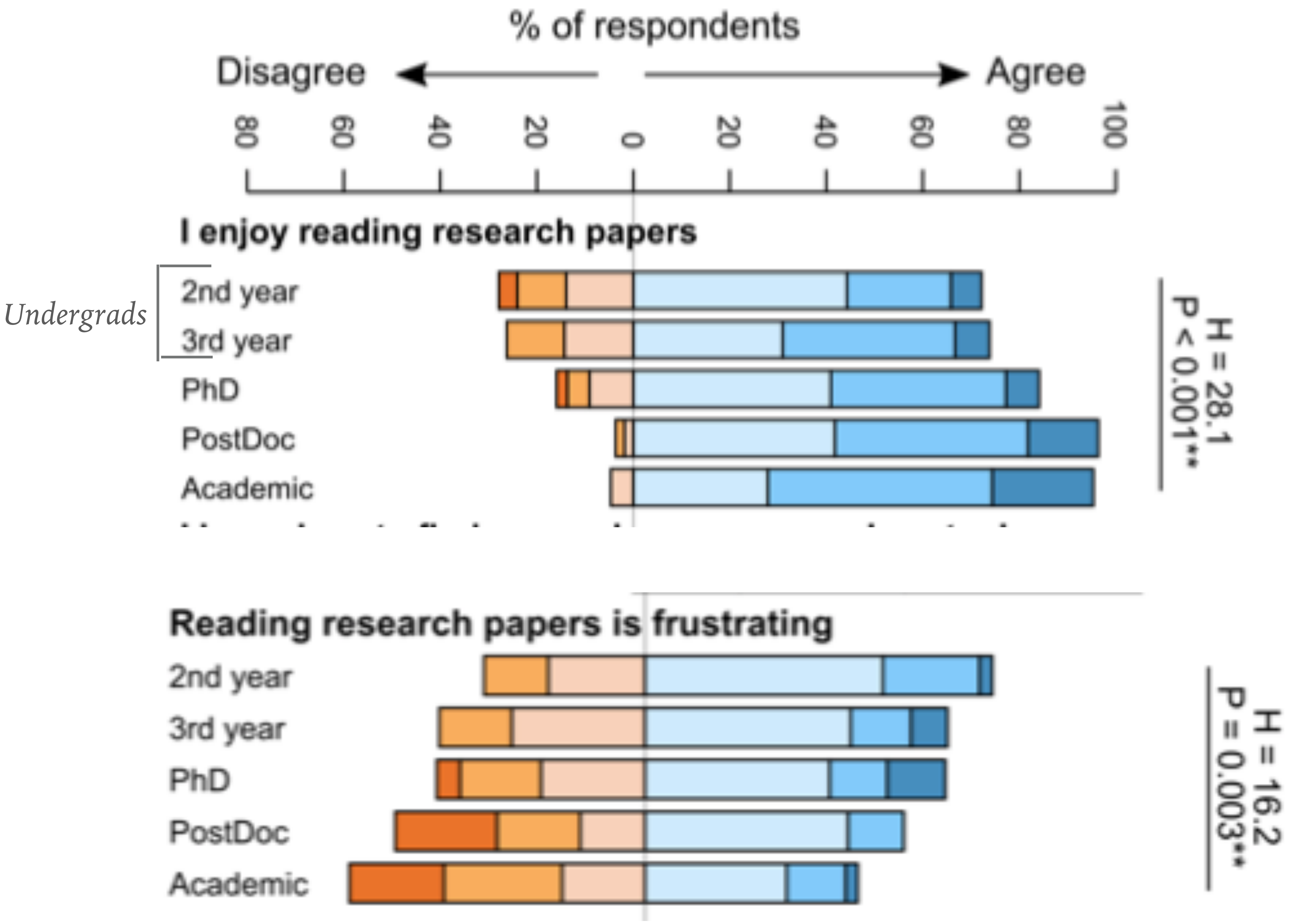
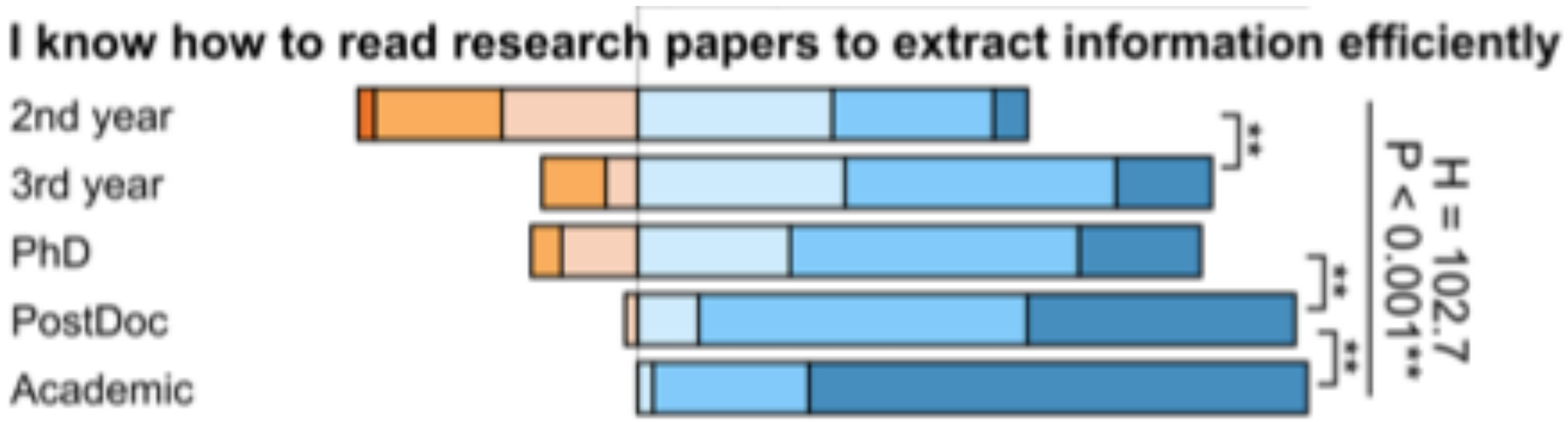
MENTI POLLS

- Go to www.menti.com and use code 1395 9938

PERCEPTIONS OF SCIENTIFIC RESEARCH LITERATURE AND STRATEGIES FOR READING PAPERS DEPEND ON ACADEMIC CAREER STAGE (HUBBARD AND DUNBAR 2017)





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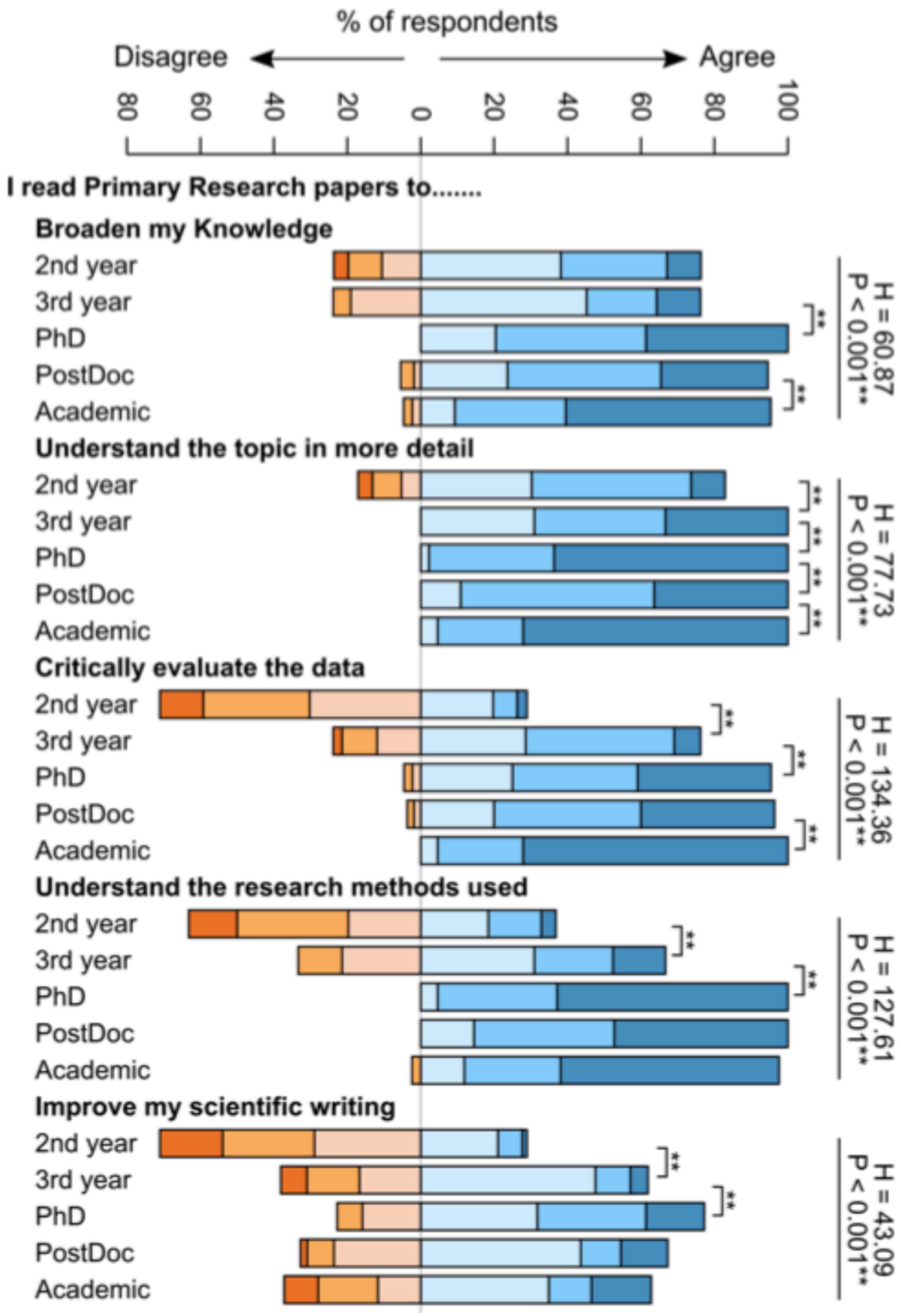


Form your own opinion

Learn about the rigor of the scientific method

Improve critical thinking skills

Improve analytical skills

By reading journal articles you can gain skills that aren't just important for research jobs

SCIENTIFIC PROCESSING SKILLS

Acclimation

↓

Competency

↓

Proficiency

- Takes place over an extended period spanning multiple career stages!
- Familiarity with scientific language and the wider research context
- Degree of intrinsic motivation for reading

Research supervisors should also be mindful that saying “go and read a paper” may be interpreted differently by individuals at different career stages, so should be clear in their instructions and expectations.

READING SCIENTIFIC LITERATURE: A GUIDE

1. Determine WHY you are reading this paper

Before you read the paper, consider what you want to get from. Is this essential background material? Are you most interested in the dataset or model setup? Do you want to apply the method to your research? Are the results important to compare to yours or a starting point for your research? This will help you to focus when reading the paper.

2. Skim the article and identify its structure

Most journals use a conventional IMRD structure: An abstract followed by Introduction, Methods, Results, and Discussion. Each of these sections normally contains easily recognized conventional features, and if you read with an anticipation of these features, you will read an article more quickly and comprehend more.

Features of Abstracts

Abstracts usually contain four kinds of information:
- purpose or rationale of study (why they did it)
- methodology (how they did it)
- results (what they found)
- conclusion (what it means)

Most scientists read the abstract first. You should usually begin reading a paper by reading the abstract carefully and noting the four kinds of information outlined above. Then move first to the visuals and then to the rest of the paper.

Features of Introductions

Introductions serve two purposes: creating readers' interest in the subject and providing them with enough information to understand the article. Generally, introductions accomplish this by leading readers from broad information (what is known about the topic) to more specific information (what is not known) to a focal point (what question the authors asked and answered).

1. DETERMINE WHY YOU ARE READING THE PAPER

What you want to get out of an article should influence your approach to reading it. This will help you to focus when reading the paper.

You are entering a new field and want to learn what is important in that field
Is this essential background material?
Are you most interested in the dataset or model setup?
Do you want to apply the method to your research?
Are the results important to compare to yours or a starting point for your research?

ARTICLE STRUCTURE – SKIMMING!

- Skim (look over) to identify structure
- MOST COMMON = AIMRD
  - Abstract — *Paragraph: why it matters, how they did it, what they found, what it means*
  - Introduction — *Describe current understanding and situate the current work*
  - Methods — *What was done to answer the research question*
  - Results — *Statements of what was found and visual data representations*
  - Discussion — *Placing the results in context of the broader field - answering the research question!*

1. SKIM

Get the "big picture" by reading the title, key words and abstract carefully; this will tell you the major findings and why they matter

- Quickly scan the article without taking notes; focus on headings and subheadings
- Note the publishing date; current research is more relevant
- Note any terms and parts you don't understand for further reading

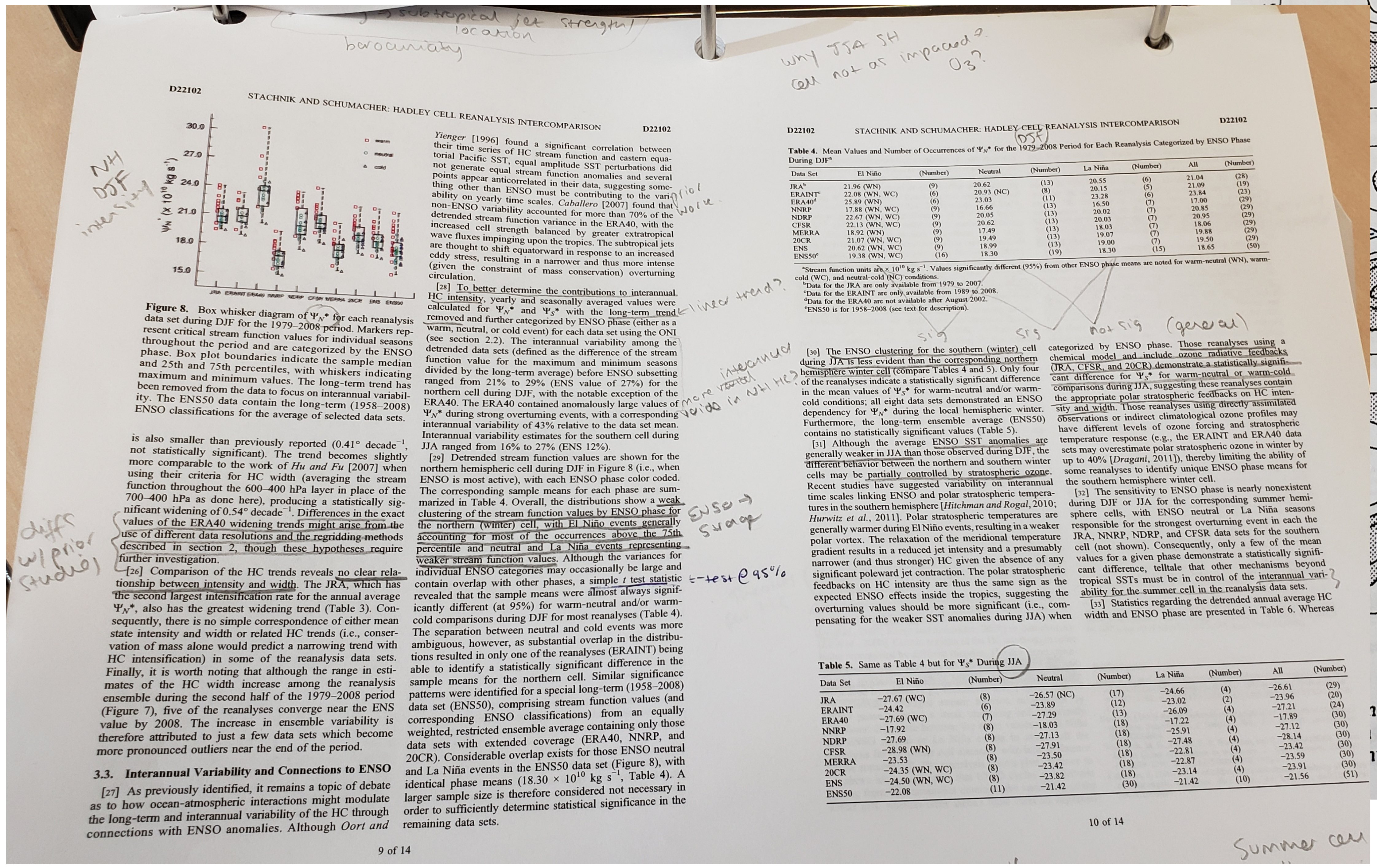
ACTIVE READING

- Being engaged with the text!
  - Read with a specific focus
  - Break the text into portions
  - Questioning the text
  - Take notes as you read

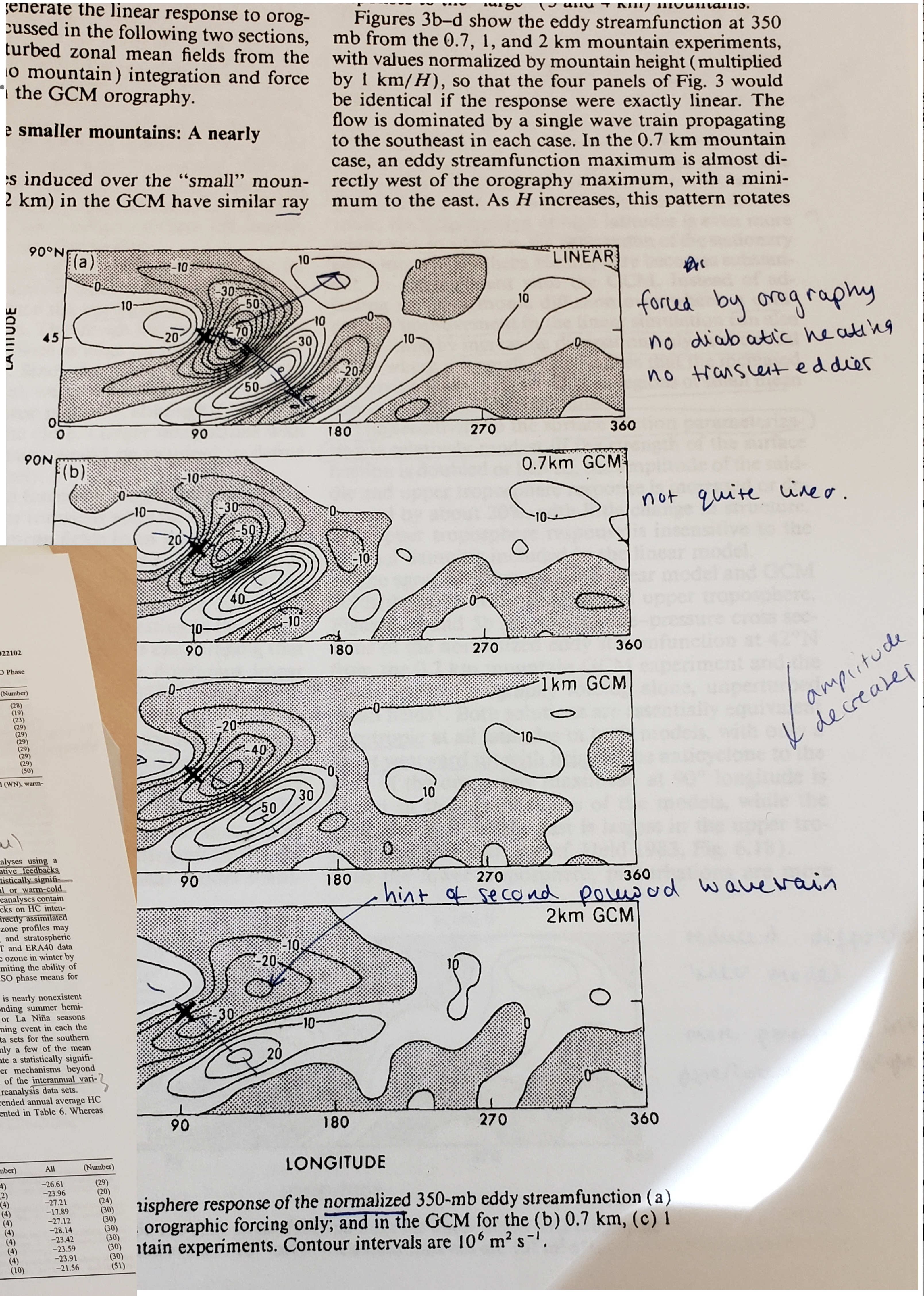
ANNOTATION & NOTE TAKING

- There are many ways to take notes but this is a personal style choice
- Try different ways, but use the one that fits you best and engages you in active reading
- MY ADVICE: NO HIGHLIGHTERS FOR THE FIRST READ!!
- Only highlight very important quotes or terms.
- Methods - mapping, outlining, 2-column
- Taking notes helps recall and comprehension
- Note taking is not the same as summarizing!

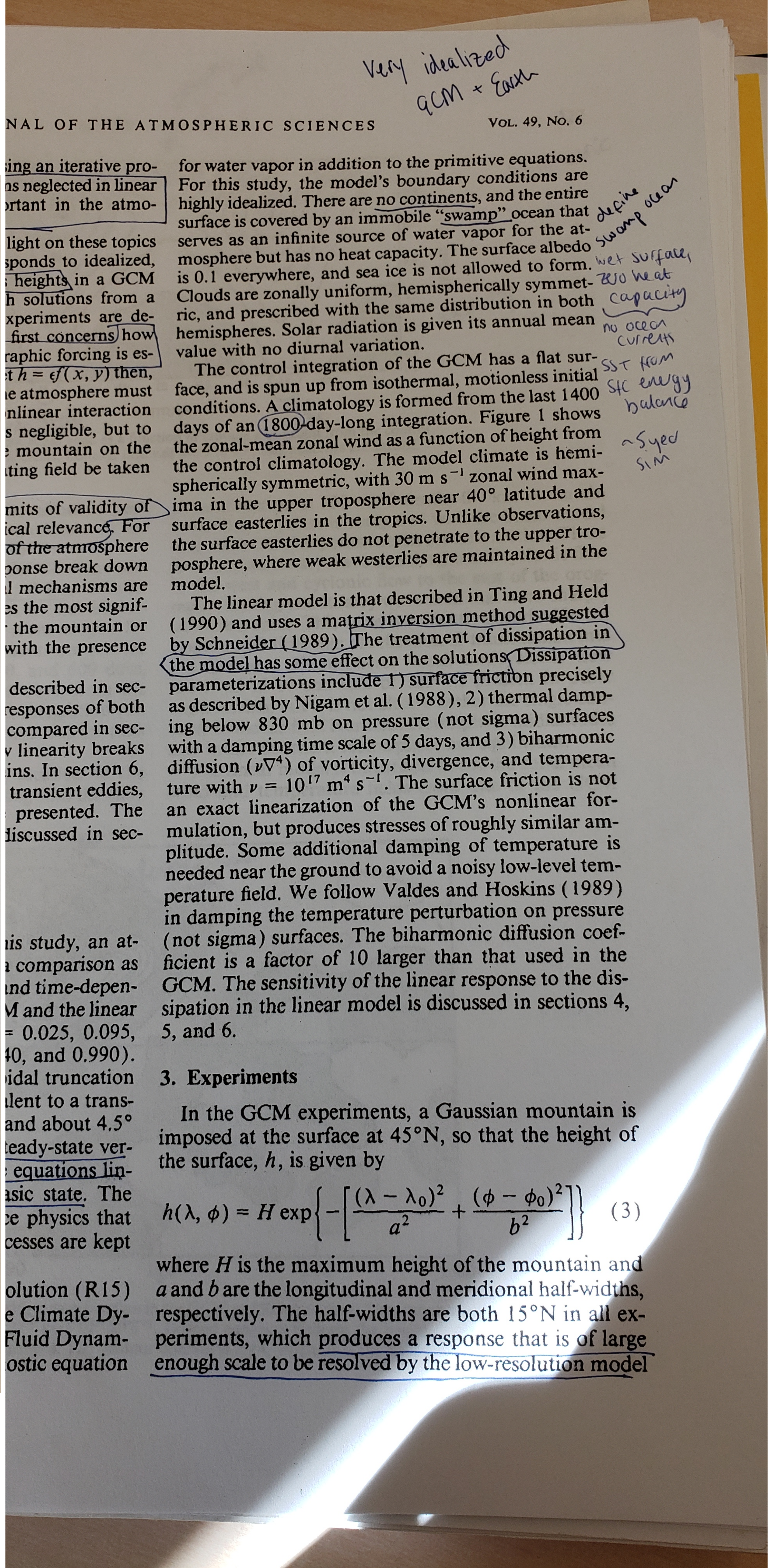
ANNOTATION



subtropical jet strength / location
baroclinicity
why JJA SH cell not as impacted? O3?
D22102 STACHNIK AND SCHUMACHER: HADLEY CELL REANALYSIS INTERCOMPARISON D22102
NH DJF intensity
prior work
linear trend?
more integrated vertically in NH HC?
t-test @ 95%
diff w/ prior studies
sig
not sig (general)
9 of 14
10 of 14
Summer cell



enerate the linear response to orog-
cussed in the following two sections,
turbed zonal mean fields from the
o mountain) integration and force
the GCM orography.
e smaller mountains: A nearly
s induced over the "small" moun-
2 km) in the GCM have similar ray
Figures 3b–d show the eddy streamfunction at 350 mb from the 0.7, 1, and 2 km mountain experiments, with values normalized by mountain height (multiplied by 1 km/H), so that the four panels of Fig. 3 would be identical if the response were exactly linear. The flow is dominated by a single wave train propagating to the southeast in each case. In the 0.7 km mountain case, an eddy streamfunction maximum is almost directly west of the orography maximum, with a minimum to the east. As H increases, this pattern rotates
LINEAR
0.7km GCM
1km GCM
2km GCM
LATITUDE
LONGITUDE
forced by orography
no diabatic heating
no transient eddies
not quite linear.
amplitude decrease
hint of second poleward wavetrain
nisphere response of the normalized 350-mb eddy streamfunction (a) orographic forcing only; and in the GCM for the (b) 0.7 km, (c) 1 ntain experiments. Contour intervals are 10^6 m^2 s^{-1}.



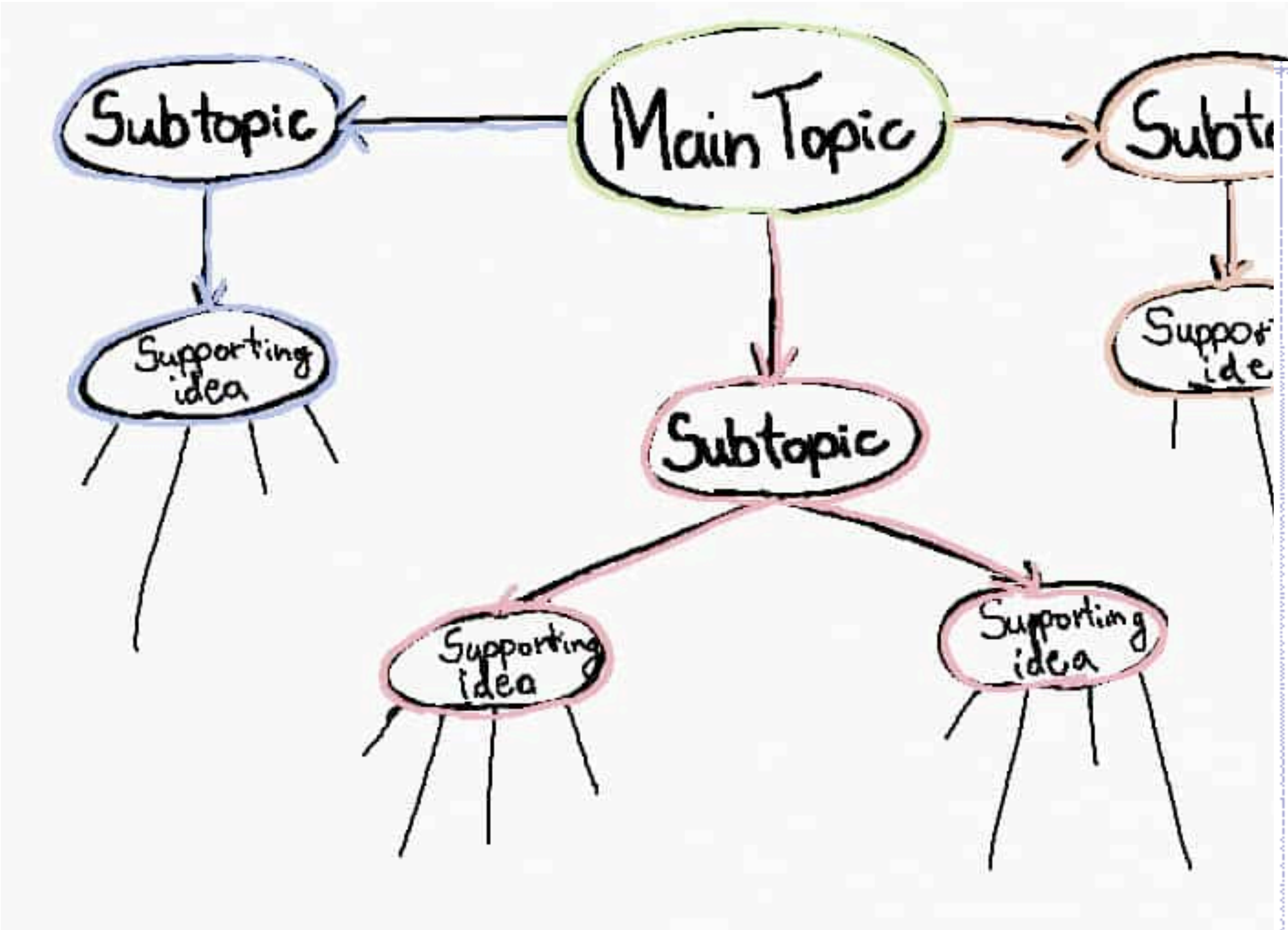
Very idealized GCM + Earth
NAL OF THE ATMOSPHERIC SCIENCES
VOL. 49, NO. 6
for water vapor in addition to the primitive equations. For this study, the model's boundary conditions are highly idealized. There are no continents, and the entire surface is covered by an immobile "swamp" ocean that serves as an infinite source of water vapor for the atmosphere but has no heat capacity. The surface albedo is 0.1 everywhere, and sea ice is not allowed to form. Clouds are zonally uniform, hemispherically symmetric, and prescribed with the same distribution in both hemispheres. Solar radiation is given its annual mean value with no diurnal variation.
The control integration of the GCM has a flat surface, and is spun up from isothermal, motionless initial conditions. A climatology is formed from the last 1400 days of an 1800-day-long integration. Figure 1 shows the zonal-mean zonal wind as a function of height from the control climatology. The model climate is hemispherically symmetric, with 30 m s^{-1} zonal wind maxima in the upper troposphere near 40° latitude and surface easterlies in the tropics. Unlike observations, the surface easterlies do not penetrate to the upper troposphere, where weak westerlies are maintained in the model.
The linear model is that described in Ting and Held (1990) and uses a matrix inversion method suggested by Schneider (1989). The treatment of dissipation in the model has some effect on the solutions. Dissipation parameterizations include 1) surface friction precisely as described by Nigam et al. (1988), 2) thermal damping below 830 mb on pressure (not sigma) surfaces with a damping time scale of 5 days, and 3) biharmonic diffusion ($\nu\nabla^4$) of vorticity, divergence, and temperature with $\nu = 10^{17}$ m^4 s^{-1}. The surface friction is not an exact linearization of the GCM's nonlinear formulation, but produces stresses of roughly similar amplitude. Some additional damping of temperature is needed near the ground to avoid a noisy low-level temperature field. We follow Valdes and Hoskins (1989) in damping the temperature perturbation on pressure (not sigma) surfaces. The biharmonic diffusion coefficient is a factor of 10 larger than that used in the GCM. The sensitivity of the linear response to the dissipation in the linear model is discussed in sections 4, 5, and 6.
3. Experiments
In the GCM experiments, a Gaussian mountain is imposed at the surface at 45°N, so that the height of the surface, h, is given by
$h(\lambda, \phi) = H \exp\left\{-\left[\frac{(\lambda-\lambda_0)^2}{a^2} + \frac{(\phi-\phi_0)^2}{b^2}\right]\right\}$ (3)
where H is the maximum height of the mountain and a and b are the longitudinal and meridional half-widths, respectively. The half-widths are both 15°N in all experiments, which produces a response that is of large enough scale to be resolved by the low-resolution model
define swamp ocean
wet surface, zero heat capacity
no ocean currents
SST from sfc energy balance
~5yrs sim

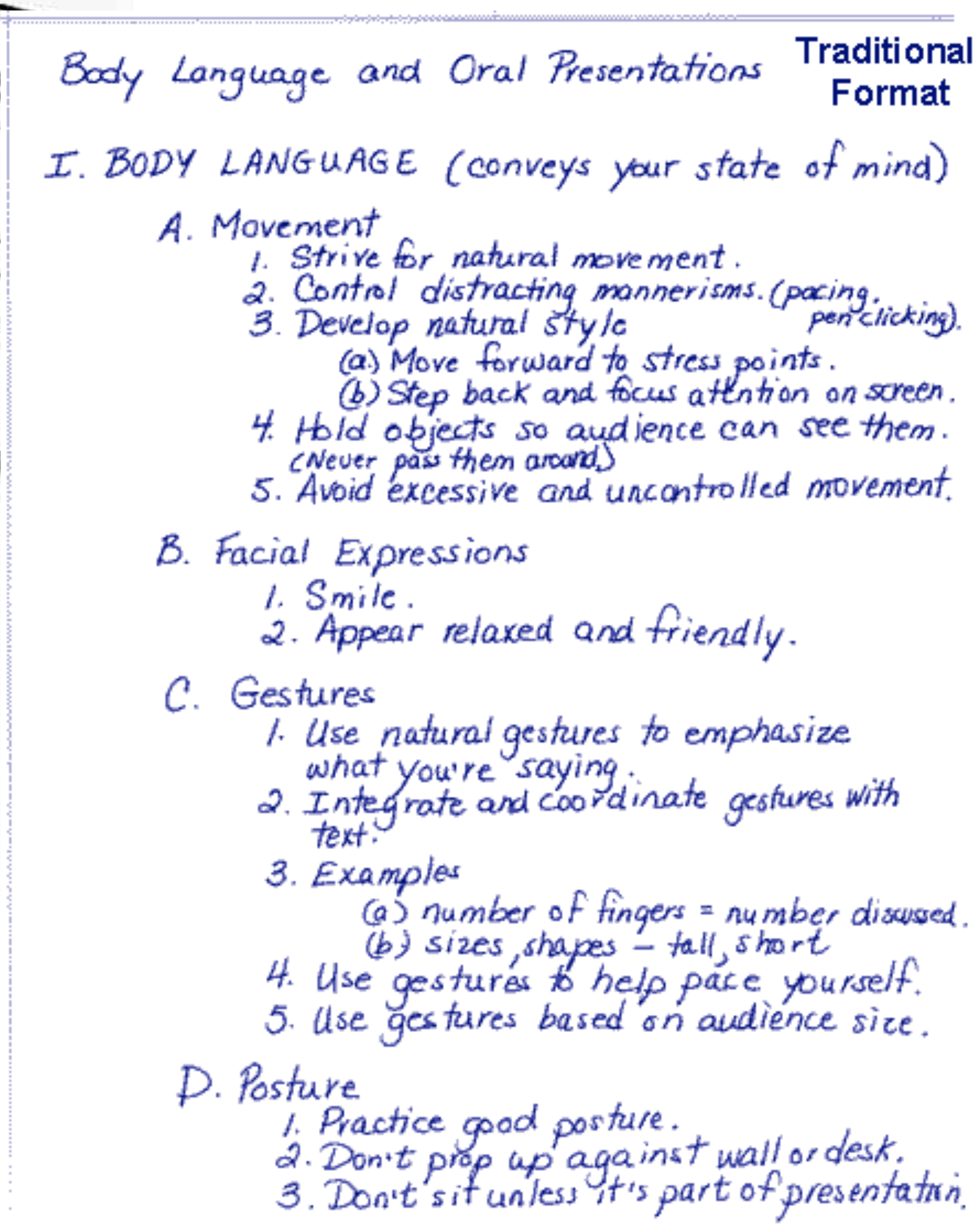
NOTE TAKING


Title
(broad topic)

Main Idea	Details
• Slide titles • Cues • Diagrams • Prompts to help you study	• Record details for each main idea • Concise sentences/thoughts • Short hand symbols (&, -->, =, etc.) • Abbreviations (w/, b/c, etc.) • Lists • Draw a line across the page when you change main ideas
WHEN: During note taking and/ or during review	WHEN: During note taking

Summary
• Biggest ideas
• Quick reference info
WHEN:
During review




Body Language and Oral Presentations
Traditional Format

I. BODY LANGUAGE (conveys your state of mind)
A. Movement
1. Strive for natural movement.
2. Control distracting mannerisms. (pacing, pen clicking).
3. Develop natural style
(a) Move forward to stress points.
(b) Step back and focus attention on screen.
4. Hold objects so audience can see them. (Never pass them around.)
5. Avoid excessive and uncontrolled movement.
B. Facial Expressions
1. Smile.
2. Appear relaxed and friendly.
C. Gestures
1. Use natural gestures to emphasize what you're saying.
2. Integrate and coordinate gestures with text.
3. Examples
(a) number of fingers = number discussed.
(b) sizes, shapes – tall, short
4. Use gestures to help pace yourself.
5. Use gestures based on audience size.
D. Posture
1. Practice good posture.
2. Don't prop up against wall or desk.
3. Don't sit unless it's part of presentation.

BEFORE AND DURING READING

- Who are the authors? What journal is this? Might I question the credibility of the work?
- Is there terminology I don't understand?
- Have I gone back to read an article or review that would help me understand this better?
- Am I spending too much time reading the less important parts of this article?
- Who can I talk to about the confusing parts?

DURING AND AFTER READING

- What specific problem does this research address? Why is it important?
- Is the method used a good one? Were there others?
- What are the specific findings? Could I summarize them in two tweets?
- Are the findings supported by persuasive evidence?
- Is there an alternative interpretation that wasn't addressed?
- How are the results unique/new or supportive of other work?
- How do these results relate to the work I'm interested in or have read about?
- What are some of the applications? What next?

DISTINGUISHING THE MAIN POINTS

- Words or phrases to look for…
  - In contrast with previous work
  - Has seldom been addressed
  - Surprising
  - Unexpected
  - We hypothesize that
  - We develop
  - We propose
  - The data suggest
  - We introduce

I'M STUCK AND FRUSTRATED

- That's okay - everyone experiences it
- You will not understand everything in every paper
- Tips:
  - Jot down the parts you don't understand as you read - sometimes something is clearer by the end
  - Use google or class notes to help with jargon or methods (but avoid the rabbit hole of doom - stick to your reading purpose)
  - Read the article more than once
  - Ask your advisor or mentor or instructor for help
  - Break it into chunks to read over a few days
  - Ask yourself if the non-understandable part is essential for your purpose
  - Confusion is not a threat - it's an opportunity!

2. RE-READ

Read the article again, asking yourself questions such as:

- What problem is the study trying to solve?
- Are the findings well supported by evidence? Were assumptions made?
- Are the findings unique and supported by other work in the field?
- Is the study repeatable?
- What factors might affect the results?
- What questions are still unanswered? What were the limitations?
- Draw influences based on your own experience and knowledge.

If you are unfamiliar with key concepts, look for them in the literature

DRAWING INFERENCES

- Not everything you might learn is stated explicitly
- Critical analysis
- Questioning is good!

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Rainfall variability and predictability issues for North America

B. G. Hunt[1]

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Abstract A multi-millennial simulation with a coupled global climatic model has been used to investigate extreme rainfall events, mainly droughts, over North America. A rainfall index, based on the US Dust Bowl region, was used to generate a time series from which the extreme events could be identified. A very wide range of drought and pluvial multiyear sequences was obtained, all attributable to internal climatic variability. This time series reproduced the basic characteristics of the corresponding observed time series. Composites of years with negative rainfall anomalies over North America from the simulation replicated the observed rainfall composite for the Dust Bowl era, both in spatial character and intensity. Examination of individual years of a simulated composite revealed not only a wide range of rainfall anomaly patterns, dominated by drought conditions, but also ENSO distributions that included El Niño events as well as the expected La Niña events. Composites for pluvial conditions over North America were associated with composited El Niño events, as expected. Correlation of the simulated Dust Bowl rainfall with global surface temperatures identified a principal connection with the ENSO region. No systematic relationship was obtained in the simulation between the Atlantic multidecadal oscillation and Dust Bowl region rainfall, with the simulated oscillation having a much more variable periodicity than that found in the limited observations. However, a marked connection was found for SST anomalies adjacent to the northeast coast of North America, but this appears to be forced by ENSO events. A scatter diagram of NINO3.4 SST anomalies with the Dust Bowl region rainfall anomalies, for observations and the simulation, revealed inconsistencies between the occurrence of an ENSO event and the "expected" rainfall anomaly. This, and other analysis, resulted in the conclusion that annual or longer term rainfall predictions over North America, with any systematic confidence, are unlikely because of stochastic influences inherent in the climatic system associated with internal climatic variability.

Keywords North American rainfall · Dust Bowl simulation · Predictability of North American rainfall · Multi-millennial simulation

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1 Introduction

Megadroughts in the USA are a recurring feature of its climatology (Woodhouse and Overpeck 1998). They report that a decadal length drought occurred about every 500 years. Systematic studies of the causes of such droughts have been made using atmospheric climatic models forced with observed sea surface temperature (SST) anomalies. Thus, Schubert et al. (2004a, b) were able to replicate the major features of the famous Dust Bowl region drought, 1932 to 1939. They conducted a number of idealised experiments which identified that tropical (primarily ENSO-related) SST anomalies were the principal cause of this Dust Bowl megadrought. Seager et al. (2005) similarly used an atmospheric model to investigate the causes of North American droughts between 1856 and 2000. They also noted the dominance of tropical Pacific SST anomalies associated with La Niña events in generating such droughts, but also found that SST variations outside of the tropical Pacific Ocean strengthened such droughts.

EXAMPLE FROM AN ARTICLE

Megadroughts in the USA are a recurring feature of its climatology (Woodhouse and Overpeck 1998).

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They also noted the dominance of tropical Pacific SST anomalies associated with La Niña events in generating such droughts, but also found that SST variations outside of the tropical Pacific Ocean strengthened such droughts.

UNPACK EACH FIGURE AND TABLE

- The data is the key!
- One approach: scrutinize the figures and tables (including captions and legends) before reading the article -> there is no best way, try different methods!
- For each figure
  - Work to understand the axes, color scheme, statistical approach, labels etc.
- For each table
  - Identify which experimental groups and variables are presented
  - What is shown and how were the data collected?
- Refer back to the methods section if and when needed
- Ask the same questions for each figure/table as for the entire article (motivation, methods, context, what do they show, interpretation etc.)

BE CRITICAL

- Published papers are not truths etched in stone!
- Science is a never-ending work in progress
- Critically evaluate interpretations and conclusions - different people may interpret data different ways
- Critical Thinking: evaluate data while minimizing bias
  - Are there other, equally likely, explanations for what is observed?
  - Do I find this paper compelling (or not) because it affirms something I already think (or wish) is true?
  - Am I discounting their findings because it differs from what I expect?
- Individuals with different life, academic, and work experiences may think of several alternative hypotheses, all equally supported by the data

3. INTERPRET

- Examine figures and tables carefully
- Try to interpret data first before looking at captions
- When reading the discussion and results, look for key issues and new findings
- Make sure you have distinguished the main points. If not, go over the text again.

SUMMARIZE

- ➤ Summarize the paper by synthesizing your notes
- ➤ Use these notes for writing introductions and literature reviews
- ➤ Keep the documents organized and accessible
- ➤ Follow a template for consistency
- ➤ Put quotation marks around exact wording from the paper so you don't accidentally plagiarize

4. SUMMARISE

- Take notes on the key findings, methods and issues; it improves reading comprehension, helps you remember key points and prepares you for thesis/dissertation/paper writing
- If you have a printed version, highlight key point and write on the article. If it's on screen, make use of markers and comments. Do this AFTER reading and interpreting the article.

Complete citation. Author(s), Date of publication, Title (book or article), Journal, Volume #, Issue #, pages:

If web access: url; date accessed:

Key Words:

General subject:

Specific subject:

Hypothesis/Outstanding problem to solve:

Methodology:

Result(s):

Summary of key points:

Context (how this article relates to other work in the field; how it ties in with key issues and findings by others, including yourself):

Significance (to the field; in relation to your own work):

Important Figures and/or Tables (brief description; page number)**:**