BIOME
UC SANTA BARBARA

Hitchhikers Guide to the (Galaxy of) Scientific Literature

"It is an important and popular fact that things are not always what they seem."

This workshop is designed to familiarize you with basic skills required to efficiently find and interpret information published in scientific papers. These skills can be applied regardless of your field of study; however, examples from topics in biology will frequently be used.

I. Organization of the Literature & Types of Papers

A. Primary research articles: Presentation of experimental data.

B. Narrative reviews: Summaries of primary research, great for background reading.

C. Meta-analyses & systematic reviews: Evaluate strength of evidence across many articles.

D. Collections & tools: Campus resources, special issues, search engines and citation trackers.

"Would it save you a lot of time if I just gave up and went mad now?"

II. Interpreting Evidence

A. Correlation & causality: Same place, same time ≠ cause & effect

B. Sufficiency & necessity: Evidence of causality. Can it act alone? Can it be omitted?

C. Theories & logical reasoning: How does the work fit into the larger picture?

D. Effect sizes & error bars: statistical significance ≠ practical significance

"We demand rigidly defined areas of doubt and uncertainty!"

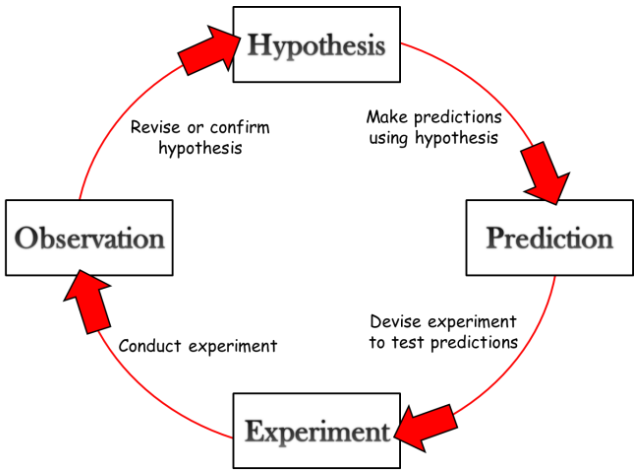
III. Tools for Understanding

A. The Scientific Method

What did they know at the start?
What are they testing?
How did they test it?
What were the results?
How did they interpret the results?

B. Flow charts & outlines

(whole article and/or each experiment)



Try different ways to break down each section of the article.

C. Skip the nitty-gritty: Don't worry about technical details until you understand the premise.

"I'd far rather be happy than right any day."

IV. Sections of Primary Research Articles

A. Abstract: A summary of the main findings and research significance.

B. Introduction: Includes relevant information about previous knowledge in the field.

C. Results: This is the core of a paper; it contains the figures and descriptions of experiments. It may also contain conclusions from each experiment, but should be mainly informative.

D. Discussion: This should include the authors' interpretation of their results, often in context of previous knowledge in the field. This is where the persuasive arguments should be.

E. Methods: Descriptions of the technical procedures of experiments. This section should contain enough information for another researcher in the field to reproduce the authors' results.

F. References: Very useful for going deeper into a topic. This should contain all precedents for the experiment design, methods and authors' interpretations.

"If you want to survive out here, you've got to know where your towel is."

V. Tips for Achieving Infinite Improbability

A. DON'T PANIC! Try to understand one section at a time, and then build up the larger picture.

"I think you ought to know I'm feeling very depressed."

B. Be persistent: Science writing can be very dense. Go slow, re-read tough sentences and look up definitions while you read.

"For a moment, nothing happened. Then, after a second or so, nothing continued to happen."

C. Summarize: Distill information into concise descriptions; work these into your flow charts.

"The Answer to the Great Question... Of Life, the Universe and Everything... is... forty-two."

D. Focus on pieces: Abstracts can be useful, but often confusing when loaded with jargon or acronyms. One option is to read the introduction and results first. Also, identify your learning goals to improve efficiency while searching for information (e.g. you can often gloss-over the methods section when you're reading for a lecture course).

"So long, and thanks for all the fish."