What is a research abstract and what is its purpose?

- Short summary of the research being presented
  - In a paper
  - At a conference
- Provides the reader with insight as to whether the paper will fulfill their expectations
- In the case of a conference, the abstract will determine whether it is accepted or not for presentation to colleagues
How should a *good* abstract be written?

Structure of an abstract:

- Introduction/Background
- Gap in knowledge
- Results
- Overall significance/general context
Structure of an abstract:

**General introduction**
- More detailed background
  - 1-2 sentences
- Gap in knowledge
  - 1 sentence

**Your main conclusion**
- (Here we…)
  - Finding
  - Finding
  - Finding
  - 2-3 sentences
  - Put into context of literature
  - can incorporate some methods

**General conclusions**
- Overall significance
- Broader perspective
  - 1-2 sentences
Structure of an abstract:

General introduction
More detailed background
Gap in knowledge

Your main conclusion
(Here we…)
Finding
Finding
Finding

General conclusions
Overall significance
Broader perspective

Language should allow even outsiders to appreciate the study’s significance

Example from Nature

Annotated example taken from Nature 435, 114–118 (5 May 2005).

During cell division, mitotic spindles are assembled by microtubule-based motor proteins.1 The bipolar organization of spindles is essential for proper segregation of chromosomes, and requires plus-end-directed homotetrameric motor proteins of the widely conserved kinesin-5 (BimC) family.2 Hypotheses for bipolar spindle formation include the ‘push-pull mitotic muscle’ model, in which kinesin-5 and opposing motor proteins act between overlapping microtubules.3,4 However, the precise roles of kinesin-5 during this process are unknown. Here we show that the vertebrate kinesin-5 Eg5 drives the sliding of microtubules depending on their relative orientation. We found that Eg5 can tether microtubule plus-ends, suggesting an additional microtubule-binding mode for Eg5. Our results demonstrate how members of the kinesin-5 family are likely to function in mitosis, pushing apart interpolar microtubules as well as recruiting microtubules into bundles that are subsequently polarized by relative sliding. We anticipate our assay to be a starting point for more sophisticated in vitro models of mitotic spindles. For example, the individual and combined action of multiple mitotic motors could be tested, including minus-end-directed motors opposing Eg5 motility. Furthermore, Eg5 inhibition is a major target of anti-cancer drug development, and a well-defined and quantitative assay for motor function will be relevant for such developments.

https://www.nature.com/documents/nature-summary-paragraph.pdf
Consult guidelines before writing

- May require labeled sections
  - Introduction, Objectives, Methods, Results, Conclusions
- Some journals tend to require more methodology or statistics.
- There may be specifications on:
  - Length
  - Content
  - Use of references

Example from *New England Journal of Medicine*

**Background**
Assessment of the safety and efficacy of vaccines against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in different populations is essential, as is investigation of the efficacy of the vaccines against emerging SARS-CoV-2 variants of concern, including the B.1.351 (501Y.V2) variant first identified in South Africa.

**Methods**
We conducted a multicenter, double-blind, randomized, controlled trial to assess the safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) in people not infected with the human immunodeficiency virus (HIV) in South Africa. Participants 18 to less than 65 years of age were assigned in a 1:1 ratio to receive two doses of vaccine containing 5·10⁹ viral particles or placebo (0.5% sodium chloride solution) 21 to 35 days apart. Serum samples obtained from 29 participants after the second dose were tested by pseudovirus and live-virus neutralization assays against the original D614G virus and the B.1.351 variant. The primary end point was safety and efficacy of the vaccine against laboratory-confirmed symptomatic coronavirus 2019 illness (COVID-19) more than 14 days after the second dose.

**Results**
Between June 24 and November 9, 2020, we enrolled 10,260 HIV-negative adults (median age, 30 years). 9930 and 9911 participants received at least one dose of placebo or vaccine, respectively. Both the pseudovirus and the live-virus neutralization assays showed greater recognition of the B.1.351 variant in serum samples obtained from vaccine recipients than in samples from placebo recipients. In the primary and secondary analyses, the B.1.351 variant developed in 23 of 717 placebo recipients (3.2%) and in 13 of 716 vaccine recipients (2.7%) for an efficacy of 21.9% (95% confidence interval [CI], 0.3% to 40.9; p = 0.13). Among the 42 participants with COVID-19, 30 cases (69.0% of 44, with incomplete data) were caused by the B.1.351 variant; vaccine efficacy against this variant, defined as a secondary end point, was 10.0% (95% CI, −9.8 to 54.5; p < 0.001). Evidence of neutralization was seen and balanced between the vaccine and placebo groups.

**Conclusions**
A two-dose regimen of the ChAdOx1 nCoV-19 vaccine did not show protection against mild-to-moderate COVID-19 due to the B.1.351 variant. (Funded by the Bill and Melinda Gates Foundation and others; ClinicalTrials.gov number, NCT04444674; Pan African Clinical Trials Registry number, PACTR20200802561332.)
When asked to describe academic writing in their fields, scholars and scientists use many of the terms defined below:

**Key Words**

- **Orienting information:** Defined as “bits of information, explanation, and summary that orient the reader”

**Motive:** the “intellectual context” that’s established at the beginning of a paper to suggest why the thesis is original or worthwhile

**Thesis:** A paper’s central claim or promise

**Methodology:** The methods and strategies used to make an argument or conduct an investigation

**Evidence or Data:** Interpreted primary sources, empirical observations, or factual information

**Analysis:** Interpretation of sources

**Sources:** The various materials used to develop an argument, including articles, information, and graphs

Primary sources are uninterpreted documents, artifacts, data, or information that, when analyzed function as evidence. Secondary sources, discussions as the “introduction” or “the secondary literature,” are texts that make direct claims about the topic and may be used to establish a problem or question worth addressing, the standard approach on the topic, the standard way in which the problem or question is approached, or the current status of knowledge in the field. Other secondary sources focus on trends that connect indirectly to the topic and are used to contextualize, compare, or contrast parts of the argument or the research of others.

**Orienting information** is the introductory content that’s established at the beginning of a paper. It’s useful for suggesting why the thesis is original or worthwhile.

In scientific disciplines, the structure of the introduction typically includes an overview of the primary sources or data; and analysis, interpretation, or assessment of the evidence in the secondary literature. All good scientific papers have a well-defined motive, which, according to Harvey, is “usually defined by a form of the complicating word but.”

A paper’s motive is logical, coherent, and easy to follow. In humanistic disciplines, the motive typically includes an overview of the primary or secondary literature, a recent trend, a research question, or affiliation with a larger body of thought. In scientific disciplines, the secondary literature is typically updated with methodology, such as data analysis and interpretation, and methodology, which, according to Harvey, should be defined by a form of the complicating word but. In scientific disciplines, sources are usually referenced or summarized, almost never quoted or paraphrased.

**Motive** is defined by Harvey as “bits of information, explanation, and summary that orient the reader.”

The amount of orienting, or context, a writer provides depends on readers’ prior experience in the subject: from experts to novice students. Those with less experience require more context.

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- General introduction
- More detailed background
- Gap in knowledge

Your main conclusion
(Here we…)
- Finding
- Finding
- Finding

General conclusions
- Overall significance
- Broader perspective

Orienting information
- Motive
- Thesis

Methodology
- Evidence/data
- Analysis

Thesis
- Expanded analysis

Other manuscript sections can be built on a similar modular structure

Abstract (sentences as unit)
- General introduction
- More detailed background
- Gap in knowledge

Your overall finding
(Here we…)
- Finding
- Finding
- Finding

General conclusions
- Overall significance
- Broader perspective

Research Article (section as unit)
- Introduction
- General introduction
- More detailed background
- Gap in knowledge

Results
- Result 1
- Result 2
- Result 3
- …

Discussion
- Incorporate findings with those in literature
- Significance/general context
- Broader perspective
“The present letter is a very long one, simply because I had no leisure to make it shorter.”

Blaise Pascal (1623-1662)

French scientist, mathematician, physicist, philosopher, moralist & writer

Writing an abstract

Abstract exercise

• Pause the presentation on the next slide and read through the abstract
• See if you can identify each of the features we discussed
  • Background information
  • Knowledge gap
  • Central finding/claim
  • Methods and analysis
  • Supporting data
  • Broader significance
Abstract example

**Antimicrobial Peptides Keep Insect Endosymbionts Under Control**

Vertically transmitted endosymbionts persist for millions of years in invertebrates and play an important role in animal evolution. However, the functional basis underlying the maintenance of these long-term resident bacteria is unknown. We report that the weevil coleoptericin-A (ColA) antimicrobial peptide selectively targets endosymbionts within the bacteriocytes and regulates their growth through the inhibition of cell division. Silencing the colA gene with RNA interference resulted in a decrease in size of the giant filamentous endosymbionts, which escaped from the bacteriocytes and spread into insect tissues. Although this family of peptides is commonly linked with microbe clearance, this work shows that endosymbiosis benefits from ColA, suggesting that long-term host-symbiont coevolution might have shaped immune effectors for symbiont maintenance.

Example 1

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- Provides some background (orienting) information
- more would be better constrained by character limits of journal
- Gap in the literature they wanted to fill (motive)
- Major finding (thesis)
- Methodology, woven in with data and their analysis.
- Summary of findings (expanded thesis)
- Broader significance of the finding.

Thank you!

Questions or comments: jennifer-barr@uiowa.edu