Writing a Scientific Abstract
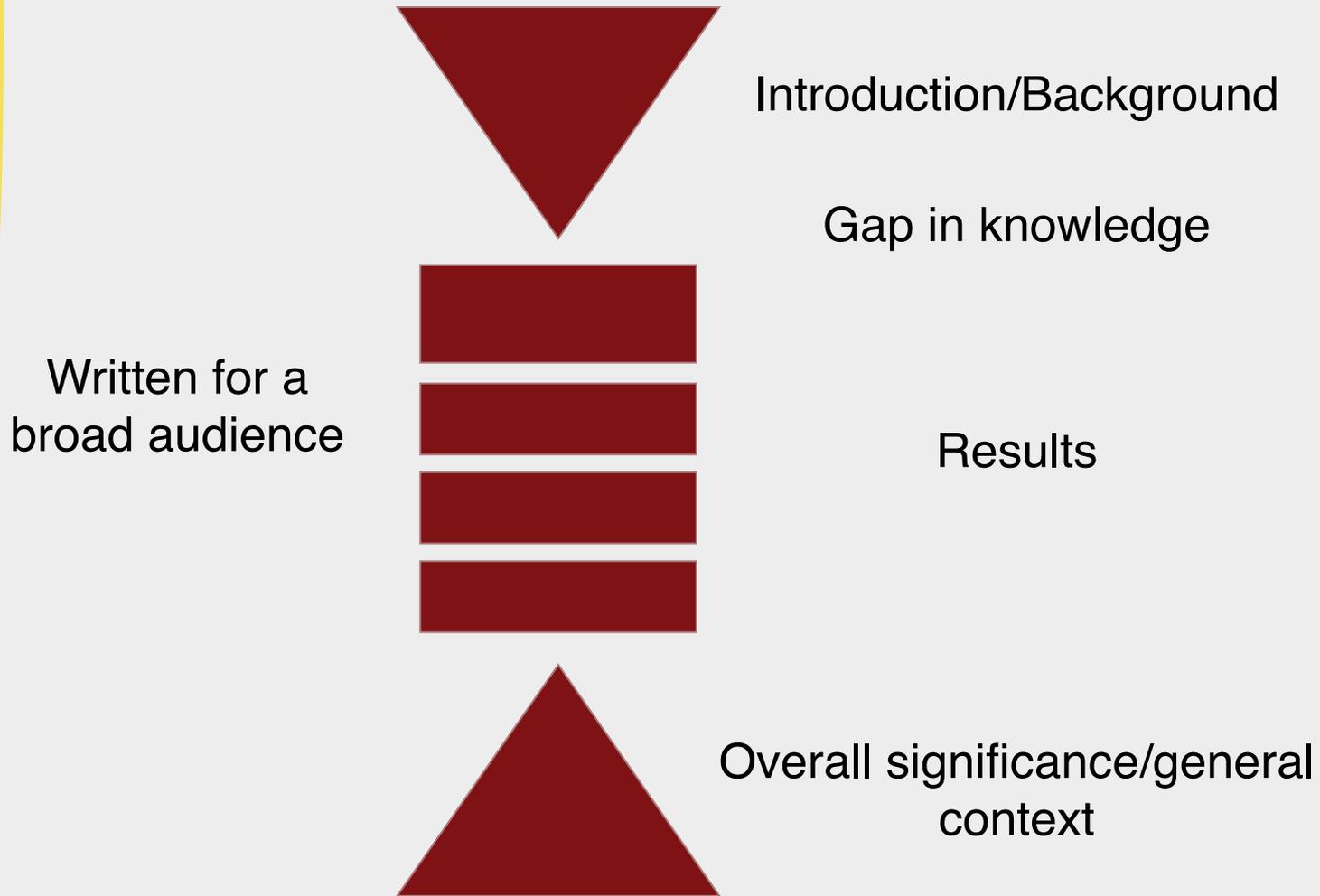
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Scientific Editor and Writing Consultant
Scientific Editing and Research Communication Core
UI Carver College of Medicine

What is the purpose of a scientific abstract?

Structuring an abstract:

How should a *good* abstract should be structured?

Structuring an abstract:

Introduction/Background

Gap in knowledge

Written for a
broad audience

Results

Overall significance/general
context

Structuring an abstract:

#3

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.

Provides some background, but I would have liked to know more (problem with character limits of Science).

Here is the gap in the literature that the authors wanted to fill.

This is their major finding.

Here is their methodology.

Here is the broader significance of the findings.

Structuring an abstract:

#4

Predictability of El Niño over the past 148 years

Forecasts of El Niño climate events are routinely provided and distributed, but the limits of El Niño predictability are still the subject of debate. Some recent studies suggest that the predictability is largely limited by the effects of high-frequency atmospheric 'noise', whereas others emphasize limitations arising from the growth of initial errors in model simulations. Here we present retrospective forecasts of the interannual climate fluctuations in the tropical Pacific Ocean for the period 1857 to 2003, using a coupled ocean-atmosphere model. The model successfully predicts all prominent El Niño events within this period at lead times of up to two years. Our analysis suggests that the evolution of El Niño is controlled to a larger degree by self-sustaining internal dynamics than by stochastic forcing. Model-based prediction of El Niño therefore depends more on the initial conditions than on unpredictable atmospheric noise. We conclude that throughout the past century, El Niño has been more predictable than previously envisaged.

The topic is clearly relevant (general information that everyone knows about)

This is the problem/gap information that needs to be filled.
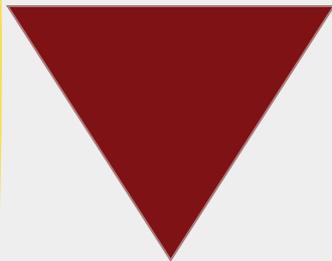
This is what they did.

We can all understand this conclusion.

They include a broader conclusion with obvious relevance.

Is this their model? Are they applying someone else's?

Could have been more explicit about this being the issue they wanted to resolve (i.e., the model).

Structuring an abstract:

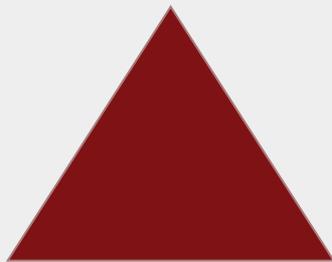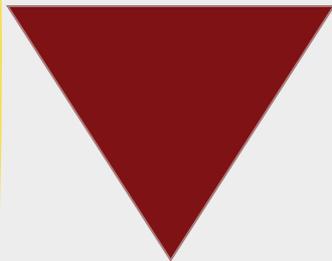|		
	General introduction	1-2 sentences
	More detailed background	2-3 sentences
	Gap in knowledge	1 sentence
	Your main conclusion (Here we…)	1 sentence
	Finding Finding Finding	2-3 sentences - Put into context of literature - can incorporate some methods
	General conclusions Overall significance Broader perspective	1-2 sentences

Structuring an abstract:

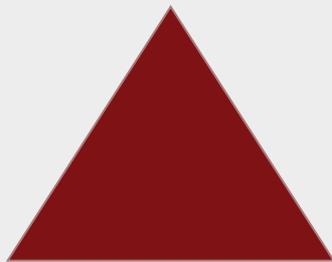General introduction
More detailed background

Gap in knowledge

Your main conclusion
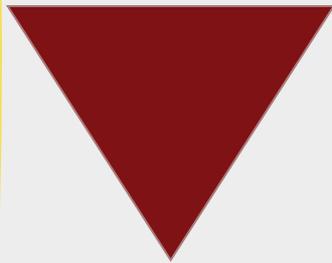(Here we…)
Finding
Finding
Finding

It's often easier to follow an argument if the conclusion is presented first and the supporting information follows.

General conclusions
Overall significance
Broader perspective

Structuring an abstract:

General introduction
More detailed background
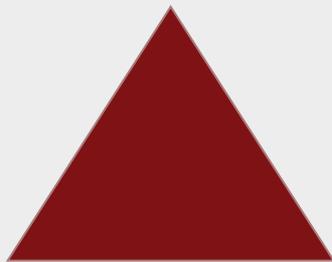
Gap in knowledge

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

nature

How to construct a *Nature* summary paragraph

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

One or two sentences providing a **basic introduction** to the field, comprehensible to a scientist in any discipline.

Two to three sentences of **more detailed background**, comprehensible to scientists in related disciplines.

One sentence clearly stating the **general problem** being addressed by this particular study.

One sentence summarising the main result (with the words "**here we show**" or their equivalent).

Two or three sentences explaining what the **main result** reveals in direct comparison to what was thought to be the case previously, or how the main result adds to previous knowledge.

One or two sentences to put the results into a more **general context**.

Two or three sentences to provide a **broader perspective**, readily comprehensible to a scientist in any discipline, may be included in the first paragraph if the editor considers that the accessibility of the paper is significantly enhanced by their inclusion. Under these circumstances, the length of the paragraph can be up to 300 words. (The above example is 190 words without the final section, and 250 words with it).

During cell division, mitotic spindles are assembled by microtubule-based motor proteins[1,2]. 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[3]. Hypotheses for bipolar spindle formation include the 'push–pull mitotic muscle' model, in which kinesin-5 and opposing motor proteins act between overlapping microtubules[2,4,5]. 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 in controlled *in vitro* assays that Eg5 has the remarkable capability of simultaneously moving at ~20 nm s^{-1} towards the plus-ends of each of the two microtubules it crosslinks. For anti-parallel microtubules, this results in relative sliding at ~40 nm s^{-1}, comparable to spindle pole separation rates *in vivo*[6]. Furthermore, 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.

nature
How to construct a *Nature* summary paragraph

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

*One or two sentences providing a **basic introduction** to the field, comprehensible to a scientist in*

> During cell division, mitotic spindles are assembled by microtubule-based motor proteins[1,2]. The bipolar organization

But, you may have to write your abstract differently:

- *Dental journals tend to have more prescriptive formats*

- *Dental journals tend to require more methodology.*

*One or two sentences to put the results into a more **general context**.*

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Structuring an abstract — prescribed by journal

Objectives: *This study describes associations among caries experience and meal, snack and daily total exposures to beverages and foods in children.* **Methods:** *Subjects (n = 634) were members of the Iowa Fluoride Study. Beverage and food exposures were abstracted from 3-day diaries at **1,** 2, 3, **4** and **5** years and calculated for **1-5** years. Eating events were defined as 30-minute intervals and categorized as meals or snacks based on time of consumption and nature of the foods. Beverage and food exposures were categorized by carbohydrate content. Dental examinations were conducted at **4.5-6.8** years; caries experience was dichotomized (any vs. none). Logistic regression models were developed to determine if caries experience differed for the fourth vs. first quartile of exposure after adjustment for age at dental exam and fluoride intake.* **Results:** *Higher snack **(1,** 2, 3, **4, 1-5** years) and daily total (2, 3, **4, 1-5** years) eating events increased caries risk (P < **0.05**). Higher exposures to **100%** juice at snacks (2 years) and soda pop at meals (2, **1-5** years), snacks **(2,** 3, **4, 1-5** years) and daily total (2, 3, **4, 1-5** years) increased caries risk (P < **0.05**). Higher exposures to food sugars (3, **1-5** years) and starches **(4, 5, 1-5** years) at meals decreased caries risk, while higher exposures to sugars **(4, 1-5** years) at snacks increased caries risk (P < **0.05**).* **Conclusions:** *Dietary methods used to investigate diet-caries relationships can influence the outcome. The cariogenicity of food, but not beverages, is associated with the timing of exposure.*

Structuring an abstract

Thesis: _A paper's central claim or promise_

Motive: _the "intellectual context" that's established at the beginning of a paper to suggest why the thesis is original or worthwhile_
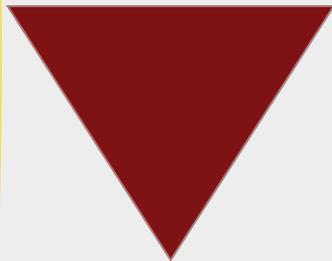
Methodology: _The methods and strategies used to make an argument or conduct an investigation_

Evidence or Data: _Interpreted primary sources, empirical observations, or factual information_

Analysis: _Interpretation of sources_

Orienting: _Defined as "bits of information, explanation, summary that orient the reader"_

Structuring an abstract:

General introduction
More detailed background

Gap in knowledge

Your main conclusion
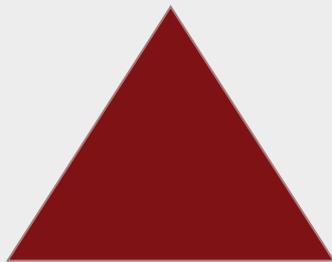(Here we…)   => thesis
Finding
Finding
Finding

General conclusions
Overall significance   => expanded thesis
Broader perspective

Structuring an abstract

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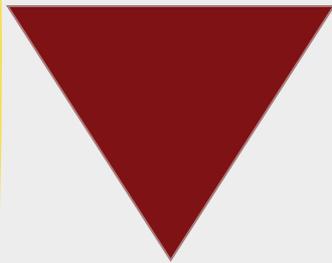
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Structuring an abstract:

General introduction
More detailed background

Gap in knowledge   => motive

Your main conclusion
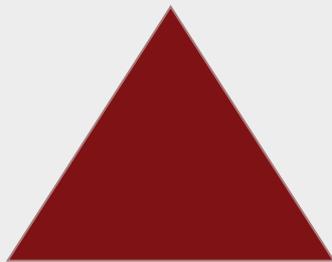(Here we…)   => thesis
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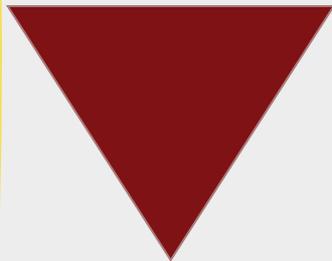
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Structuring an abstract:

General introduction
More detailed background

Gap in knowledge   => motive

Your main conclusion
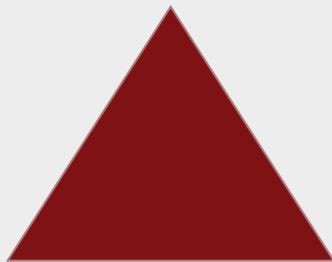(Here we…)   => thesis
Finding
Finding   => evidence / analysis /
Finding   methodology

General conclusions
Overall significance   ⇒ expanded thesis/
Broader perspective   expanded analysis

Structuring an abstract

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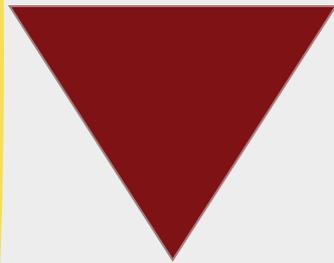
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Structuring an abstract:

General introduction
More detailed background => orienting information

Gap in knowledge => motive
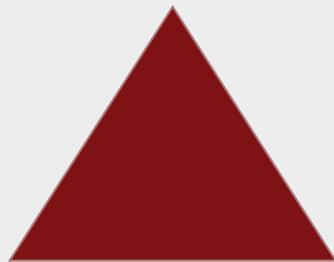
Your main conclusion
(Here we…) => thesis
Finding
Finding => evidence / analysis /
Finding methodology

General conclusions
Overall significance ⇒ expanded thesis/
Broader perspective expanded analysis

Structuring the rest of the paper…

Other sections can be built on similar modular structure

**Abstract
(sentences as unit)**

**Research Article
(section as unit)**

General introduction
More detailed background
Gap in knowledge
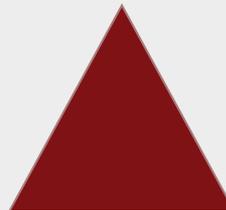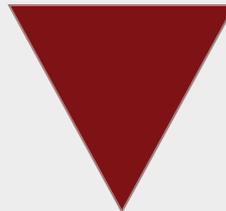
Your overall finding
(*Here we*…)

Finding

Finding

Finding

General conclusions
Overall significance
Broader perspective

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