Scientific papers: Tips for writing the introduction

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Main function of the introduction
To present your research problem (an "intricate unsettled question," a "source of perplexity") and its significance. If readers don't grasp the problem, they aren't going to care about the solution: your study.

Components of the introduction

1. Background that places your research in a broader context and tells why it's important (*what is known*)
2. Description of the knowledge gap your study fills (*what is not known*)
3. Statement of your specific problem/question/hypothesis
4. Description of your approach and why you chose it (if needed)
5. Brief summary of your major findings*
6. Statement of the major implication of your work – the take-home message, or bottom line*

**These last two items aren't always included, but I think it's generally a good idea not to make your audience wait for the main message*

A simpler approach: The introduction as an answer to three questions (Cetin and Hackam, 2005)

What do we know about this topic?
What don't we know?
What are we now showing?

Common pitfalls
Not stating clearly your specific research problem or purpose. In a study by Bordage (2001), "insufficient problem statement" was one of the top reasons reviewers gave for rejecting manuscripts.

Treating your introduction like an exhaustive literature review. The background you include should be just enough for readers to understand why your research question matters and the logic of your approach.

Failing to express the bigger question or problem behind your research. As Wells (2004) says, "With any luck, it was more than the idea that proteins X and Y might bind to each other – there was probably a bigger idea that motivated and intrigued you." In other words, why should anyone beyond your immediate colleagues care about your work?

Underestimating the importance of the introduction. Although your findings and conclusions are the core of your paper, the introduction is where you set the stage for them. Do this well and you'll hook people into reading further. Do this poorly and even the most important results may go unread.

Making an outline and writing the introduction using topic sentences and transitions

Adapted from the UCSF scientific writing program

1. Make an **outline** using the **funnel shape**, with the "big question" at the top and your question/hypothesis at the bottleneck (followed by the experimental approach, summary of results, and take-home message of your paper).

2. Fill the funnel with the steps that lead from the big picture to your specific question. Try summarizing the topic of each step in a simple statement. From Lauro, et al. (*PNAS*), for example:
   - The marine habitat is the largest on earth and bacteria play a big role it.
   - Nutrient levels aren't uniform in this habitat; examples.
   - That's why bacteria have adopted two basic life strategies. Explain them. *(Big picture/what is known ends here)*
   - However, studies of marine bacteria have been hampered by a lack of understanding of the molecular basis of these two lifestyles. *(knowledge gap)*
   - Here we show that trophic strategy is strongly reflected in genomic sequences…*(their specific purpose/problem; also their take-home message)*

3. Eventually, these shorthand statements will become **topic sentences** for the various sections/paragraphs of your introduction.

4. A **topic sentence** is like a flag or a title that announces what the paragraph is about. All sentences in a paragraph should be related to the topic announced by the topic sentence. In some cases, they will be illustrations of the principle summarized in the topic sentence. In others, they will be steps in an argument that began with the topic sentence. Sometimes the paragraph doesn't start with a topic sentence; the topic sentence concludes the paragraph.

5. Some paragraphs may also need a "wrap-up" statement, especially if they're long or contain complex information. The wrap-up sentence gives the reader the take-home message of the paragraph. It can also serve as a nice springboard to the next paragraph.

6. Whenever possible, link paragraphs with transition words or sentences.

References

- Bordage, G (2001) Reasons reviewers reject and accept manuscripts: The strengths and weaknesses in medical education reports. *Academic Medicine* 76(9): 889-893
- Cetin, SA and DJ Hackam (2005) An approach to writing a scientific manuscript. *J. Surgical Research* 128: 165-167.
- Wells, W (2004) Me write pretty one day: How to write a good scientific paper. *J. Cell Biol.* 165(6): 757-758.

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