WRITING AN INTRODUCTION FOR A SCIENTIFIC PAPER

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This section provides guidelines on how to construct a solid introduction to a scientific paper including **background** information, **study question**, **biological rationale, hypothesis**, and general **approach**. If the Introduction is done well, there should be no question in the reader's mind why and on what basis you have posed a specific hypothesis.

Broad Question: based on an **initial observation** (e.g., "I see a lot of guppies close to the shore. Do guppies like living in shallow water?"). This observation of the natural world may inspire you to investigate background literature or your observation could be based on previous research by others or your own pilot study. Broad questions are not always included in your written text, but are essential for establishing the direction of your research.

Background Information: key issues, concepts, terminology, and definitions needed to understand the biological rationale for the experiment. It often includes a summary of findings from previous, relevant studies. Remember to cite references, be concise, and only include relevant information given your audience and your experimental design. Concisely summarized background information leads to the identification of specific scientific knowledge gaps that still exist. (e.g., "No studies to date have examined whether guppies do indeed spend more time in shallow water.")

Testable Question: these questions are much more focused than the initial broad question, are specific to the knowledge gap identified, and can be addressed with data. (e.g., "Do guppies spend different amounts of time in water <1 meter deep as compared to their time in water that is >1 meter deep?")

Biological Rationale: describes the purpose of your experiment distilling what is known and what is not known that defines the knowledge gap that you are addressing. The "BR" provides the logic for your hypothesis and experimental approach, describing the biological mechanism and assumptions that explain **why your hypothesis should be true.**

The biological rationale is based on your interpretation of the scientific literature, your personal observations, and the underlying assumptions you are making about how you think the system works. If you have written your biological rationale, your reader should see your hypothesis in your introduction section and say to themselves, "Of course, this hypothesis seems very logical based on the rationale presented."

- A thorough rationale defines your ***assumptions*** about the system that have not been revealed in scientific literature or from previous systematic observation. These assumptions drive the direction of your specific hypothesis or general predictions.
- **Defining the rationale** is probably the most critical task for a writer, as it tells your reader why your research is biologically meaningful. It may help to think about the *rationale* as an answer to the questions—*how is this investigation related to what we know, what assumptions am I making about what we don't yet know, AND how will this experiment add to our knowledge? *There may or may not be broader implications for your study; be careful not to overstate these (see note on social justifications below).*
- Expect to spend time and mental effort on this. You may have to do considerable digging into the scientific literature to define how your experiment fits into what is already known and why it is relevant to pursue.
- Be open to the possibility that as you work with and think about your data, you may develop a deeper, more accurate understanding of the experimental system. You may find the original rationale needs to be revised to reflect your new, more sophisticated understanding.
- As you progress through Biocore and upper level biology courses, **your rationale should become more focused and matched with the level of study** *e.*, cellular, biochemical, or physiological mechanisms that underlie the rationale. Achieving this type of understanding takes effort, but it will lead to better communication of your science.

*****Special note on avoiding social justifications:** You should **not** overemphasize the relevance of your experiment and the possible connections to large-scale processes. **Be realistic and logical**—do not overgeneralize or state grand implications that are not sensible given the structure of your experimental system. Not all science is easily applied to improving the human condition. Performing an investigation just for the sake of adding to our scientific knowledge ("pure or basic science") is just as important as applied science. In fact, basic science often provides the foundation for applied studies.