

The Introduction

Establishes a framework for the entire manuscript

Sets up the research question

Confirms the author's knowledge of the subject matter

Clearly describes the specific issues that will be addressed in the remainder of the manuscript

Provides background information

In the case of a thesis, it convinces your advisor that you have a clear grasp of WHY you are doing this research

Two general rules for a successful introduction

- 1. Every topic that appears in later sections of your report should be anticipated clearly in the introduction**
- and**
- 2. The introduction should only present information that is relevant to the rest of the report**

The worst introduction is one that has no definite direction.

The introduction should contain your Research Question/Objective

Usually found at the end of the introduction, but is important to understand before you begin writing

In short, state the intent of countless lab hours in one or two sentences

Phrase in the past tense to describe studies that have already been performed

Answers the question “What is the point of the study?”

“In this study...”

“In this experiment...”

Do not be vague

Bad:

In this work, we have investigated the microbial communities of two glacial forefield successions.

Good:

In this work, we characterized the microbial communities of two glacial forefield successions with respect to bacteria abundance, overall microbial activity, and diversity of the bacterial community.

Bad:

The objective of the present study was to characterize the community structure of the endolithic cyanobacteria in the Piora Valley, Switzerland.

Good:

The objective of the present study was to combine direct microscopic examination, molecular-, and culture-dependent techniques to characterize the community structure of the endolithic cyanobacteria in the Piora Valley, Switzerland.

If hypotheses are stated, make the source of the hypotheses apparent

Prior to the statement of research questions/objectives, you must state why you expect what you expect?

Keywords: *since, because, due to, etc.*

Since it is apparent that both opportunistic growth and community structure can be useful indicators of the successional state of a bacterial population, we were interested in showing how microbial succession in the glacier forefield environment could serve as a model for the study of evolving bacterial assemblages. Specifically, we tested two hypotheses. Firstly, that the bacterial populations would exhibit a shift from r- to K-strategy as successional age increased. Secondly, that the species evenness of the most abundant bacteria would follow a trend similar to forefield plant populations, and increase as succession age increased.

Providing background information

Provides justification for the study and answers the question “Why were the studies performed?”

State the experiments of others that **justify** your experiments,

Chronologically

Didactically

Do not refer to experiments that explain your results.
This is done in the discussion.

Some rules to keep in mind

1. Support all statements of fact with a reference to a published source (Same as rule 8 from Lecture 1)

Don't use “data not shown” or “personal communication” in the introduction

No footnotes

2. Define specialized terminology

Convinces the reader that you know what you are talking about

Remember, write to illuminate, not to impress

3. Do not prove, verify, or demonstrate truth, but set out to test, document, or describe

Truths in environmental sciences are difficult to come by

Responses might differ with species, time of year, methodology, etc.

Keep an open mind concerning your research question/objective

4. Be brief

The introduction is second to the discussion as the reviewer's favorite target for "shortening"

Use only information that prepares the reader for the research question/objective

Do not use "discussion" information

5. Write an introduction for the study that you ended up doing

Important if the introduction is written before results are analyzed.

Account for changes in:

Results

Experimental objectives

Personal interests

Complications

6. The general flow of logic should be from a general statement to specific statements then to the research question

A. The King Road Landfill is contaminated with several organic compounds

B. Bacteria are present that might remediate polluted sites

- C. ...by degrading toxic compounds
- D. ...such as aromatic hydrocarbons
- E. ...in specific, toluene
- F. This process is facilitated by the 2,3-catechol dioxygenase gene

...all boils down to this:

Research question/objective: The purpose of this study was to determine the distribution of 2,3-catechol dioxygenase genes in the hydrocarbon-contaminated King Road landfill.

Your study organism and/or field site

In most cases general descriptions are left to the Materials and Methods

but...

If the organism or site was especially chosen as ideal for the study, then you may provide a brief explanation

Example:

...Several factors warrant that priority is given to develop methods to characterize the potential heavy metal exposure risk at the King Road Landfill (KRL). First, preliminary hydrogeological data indicates that **groundwater flows beneath KRL toward Ten-mile Creek**, a tributary of the Maumee River. The coarse sands comprising the landfill cap and subsurface are **permeable and can facilitate metal leaching**, rendering the landfill a likely source of toxicity for the river, a nearby barrow pit pond, and wells that provide drinking water for people

living near the site. Furthermore, KRL has been suggested as a **potential site for a recreational use facility** featuring walking paths, and natural- and constructed wetlands and ponds. However, little thought has addressed the possible impacts of the extensive metal contamination on human- and ecosystem health.

“Characterizations” versus “experiments”

Experiments involve manipulations of some type

Temperature

Nutrients

Inoculation

Descriptive activities are referred to as
“characterizations”

Collections

Enumerations

Observations

The Title

What are two important attributes of a title?

1. Needs to grab attention
2. Summarizes what lies in the Introduction and Results sections

Major decision point for a potential reader

Do not be too vague

Do not provide a flashy title just to lure readers

Some examples: what do you think?

Analysis of bacterial communities in the rhizosphere of *Crysanthemum* via denaturing gradient gel electrophoresis of PCR-amplified 16S rRNA as well as DNA fragments coding for 16S rRNA.

Duineveld, B.M., G.A. Kowalchuk, A. Keijzer, J.D. van Elsas, and J.A. van Veen. 2001. Appl. Environ. Microbiol. 67:172-178.

Maybe a little wordy?

An extraction method for measuring soil microbial biomass carbon.

Vance, E. D., P.C. Brookes, and D.S. Jenkinson. 1987. Soil Bio. Biochem. 19:703-708.

To the point.

Titles are easier for method papers than for experimental papers, but consider the following...

Nitrogen transformations in a range of tropical forest soils.

Vitousek, P.M. and P. Matson. 1988. *Soil Biol. Biochem.* 20:361-367.

Molecular characterization of endolithic cyanobacteria inhabiting exposed dolomite in central Switzerland.

Sigler, W.V., R. Bachofen, and J. Zeyer. 2003. *Environ. Microbiol.* 5:618-627.

Quantifying global warming from the retreat of glaciers.

Oerlemans, J. 1994. *Science* 264:243-245.

Distribution of *uidA* gene sequences in *Escherichia coli* isolates in water sources and comparison with the expression of beta-glucuronidase activity in 4-methylumbelliferyl-beta-D-glucuronide media.

Martins, M.T., I.G. Rivera, D.L. Clark, M.H. Stewart, R.L. Wolfe, and B.H. Olson. 1993. *Appl. Environ. Microbiol.* 59:2271-2276.

At first seems wordy, but long words don't make a title wordy

Identification of and spatio-temporal differences between microbial assemblages from two neighboring sulfurous lakes: comparison by microscopy and denaturing gradient gel electrophoresis.

Casamayor, E.O., H. Schäfer, L. Baneras, C. Pedros-Alio, and G. Muyzer. 2000. *Appl. Environ. Microbiol.* 66:499-508.

Split titles not always preferred.

Keywords

Ensure that the keywords that best specify your work appear in the title

Avoid terminology that only specialists in the field understand

This helps to minimize the number of readers that you lose

List in order of descending priority