Science is writing

- The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them. ~William Lawrence Bragg
- Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house. ~Henri Poincaré, *Science and Hypothesis*, 1905
- The scientist is not a person who gives the right answers, he's one who asks the right questions. ~Claude Lévi-Strauss, *Le Cru et le cuit*, 1964
Science is more than data

- Science is an idea of how the natural world works
- Ideas have to be explained in words that frame hypotheses
- What you must learn and accomplish as a graduate student:
  1. The ability to formulate a question by constructing a testable hypothesis
  2. The appropriate technical skills to obtain data that will address the questions
  3. The insight to interpret the data without bias to determine if it supports or rejects the hypothesis
  4. The foresight to predict the next step

The David Deutsch cycle

Problems are inevitable
Problems are solvable
Components of your thesis

1. Overall introduction
2. Chapter 1 (Introduction/background, results, conclusions)
3. Other Chapters......
4. Overall summary
Writing an Introduction

- Overall goal is to explain why you are asking this particular question
- Provide the reader with the information necessary to understand the question, the data and the conclusions to follow
- However – do not give results or conclusions
- State the question in a manner that anticipates the answer; use present tense
- Successful Introduction Sections awaken interest in the reader, not put them to sleep

Structure of the Introduction

1. What is known
2. What is unknown
3. The question/hypothesis
4. Approach
5. Overall goal/ restatement of the main question
Use the Introduction to focus on a single important question

1. Known (many items)
2. Unknown (select few)
3. Possible hypotheses
4. Approach
5. Overall goal

Writing techniques

1. CLARITY (Can I read it?)
2. Interesting (Do I want to read it?)
3. Tell a story (Do I get lost?)
4. Most important items listed first (What is the take-home message?)
5. Establish transitions to maintain a logical flow (Does this make sense?)
6. Use linking words (Does it fit together?)
Editing teaches good writing

1. Identify steps in the story (structure: known, unknown, question, approach)
2. List strengths and weaknesses of each step:
   - CLARITY (Can I read it?)
   - Interesting (Do I want to read it?)
   - Tell a story (Do I get lost?)
   - Most important items listed first (What is the take-home message?)
   - Establish transitions to maintain a logical flow (Does this make sense?)
   - Use linking words (Does it fit together?)

Writing is re-writing

- Plan to write first draft in time to revise
- Put the draft aside for at a while, then review with fresh eyes
- Ask others to review the draft: an expert as well as someone outside the field
- Better yet, establish a peer editing group