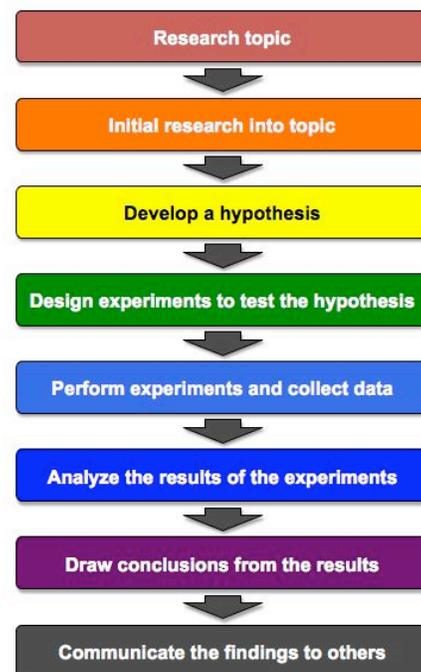


# THE SCIENTIFIC METHOD

**How science is performed:** Science is a process of asking questions and pursuing their answers with careful observation and/or controlled experimentation. In a typical lab, the research topic of interest is decided by the primary investigator and not open to much negotiation. Lab members usually begin a project by doing some background checking – reading previous studies and making some tentative observations. After some time and thought, a hypothesis (or research prediction) is formulated. An experiment – often a series of experiments – is then designed to test the veracity of the prediction. As these experiments are performed, data are collected and analyzed. One of three things then happens. 1) The data all agree with the hypothesis and a publication soon follows – though the experiments are repeated several more times to confirm that the findings are accurate. 2) The data all refute the hypothesis and the researcher gets really bummed out. After some time and thought, the hypothesis is either revised or replaced and the process loops back to experimentation. The data partially confirm the hypothesis, but do not quite fit. Once again, the hypothesis must be refined and the experiments tweaked to test the new research question. With data in hand, figures, tables, and other illustrations are produced to explain and summarize the findings. The final step in this method is to communicate the work to other researchers and the public. This can include giving talks, poster presentations, or writing a paper or a book chapter.



## The Research Poster Project

**Purpose:** This project will give you the opportunity to employ the scientific method while investigating a microbiology-related topic this semester. The design of this assignment will provide you with a chance to work as a member of a small group and offer frequent occasions to revise the organization, focus, and descriptions of your work. Your grade will reflect both your individual effort and your participation as a group member.

**Instructions:** The research poster will be a large-group project involving your entire laboratory section. However, the bulk of the work will be done individually and by six smaller sub-groups: References, Hypothesis, Protocols, Figures & Captions, Conclusions, and Introduction. On the first day of lab, you will be assigned to one of these groups. You will receive specific instructions for each portion of our research poster project. Every member of the lab will submit their own draft of each part of the poster by its corresponding due date. These will be graded using scoring guides (rubrics) found in your instruction sheets. I will then make a copy of all submissions and give this to the respective sub-group. For instance, I would copy all 24 individual protocol submissions and give them to the protocols sub-group. The sub-group will use this as a starting place to create the final protocol section for our poster on a Google document (online). The class and your instructor will give constructive feedback to help to refine that draft version until assembly day. On that day, your group will copy and paste

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your portion of the poster into a final template (PowerPoint). All instructions, due dates, rubrics, and collaborative draft documents can be found on the Google site for our poster. If you have trouble finding or accessing these materials, please contact your instructor right away.

**Grading and Due dates:** Due to the size and complexity of this project, there will be multiple due dates for this assignment. These dates are listed in the table below.

You should note that the order that the poster sections are performed is *different* from the order they normally appear in a scientific publication. References are usually the last part of a paper – yet we are doing them first. This actually better reflects the way that science is done rather than reported. We all need some background in order to rationally plan any experiments. Note also that our data collection precedes the writing of the protocols section. It is easier (and it is common practice) to write up what you did and how you did it after the data have already been collected. Finally, the introduction – which is typically first in a paper – is written last. Once again, this is typical in science. It is easiest to write the introduction last and make the project look like it achieved some predefined goal in an intentional way. This is often not the case in science. Many times, people stumble across and unexpected and interesting result by accident. They then follow it up with a few more experiments to figure out what is going and then write it up to sound like they were trying to figure this problem all along.

The total poster grade is 100 points – as much as a lecture exam. Your individual contributions will be worth a total of 60 points. Your degree of participation and teamwork will be worth an additional 20 points (10 from your teammates and 10 from your instructor). The final 20 points will be an overall summative score for the completed poster. Rubrics will be provided for all graded materials.

Due Date	Topic	Points
	↓	
Sept. 8, 2010	References	10 pts
	↓	
Sept. 15, 2010	Hypothesis	5 pts
	↓	
DATA COLLECTION		
	↓	
Oct. 13, 2010	Protocol	5 pts
	↓	
Oct. 20, 2010	Figures and Captions	15 pts
	↓	
Oct. 27, 2010	Summary and Title	10 pts
	↓	
Nov. 3, 2010	Introduction	10 pts
	↓	
Nov. 15, 2010	Assembly	5 pts
	↓	
Nov. 22, 2010	Participation	20 pts
Nov. 29, 2010	Overall Score	20 pts
<b>Total</b>		<b>100 pts</b>