

Lecture 4.4 – Written Communication in Science

Learning Objectives:

3.7 – Learn the most effective strategies for written and oral presentation of scientific ideas.

3.7.2 – Practice reading and understanding scientific papers and grant proposals.

Types of Written Communication in Science

- Two major types of written communication in science: **scientific papers** and **grant proposals**.

Scientific papers

- *What it is:* a report on work that's already been done
- *Goal:* communicate research
- *Peer-reviewed?* most of the time
- *Available publicly?* most of the time

Grant proposals

- *What it is:* a description of research you want to do
- *Goal:* get someone to give you money to do research
- *Peer-reviewed?* most of the time
- *Available publicly?* generally not

About Scientific Papers

- Additional characteristics of scientific papers:
 - Peer-reviewed
 - Cites other peer-reviewed works
 - Appears in a reputable journal or publisher
 - Appears in reputable search databases (Web of Science, Pubmed, etc)

About Scientific Papers

- Parts of a scientific paper:
 - **Abstract:** a 200-300 word summary of the paper. Briefly summarizes each section and highlights the main conclusions.
 - **Introduction:** provides background to help contextualize work. Asks the main questions and briefly explains how it will be answered.
 - **Materials and methods:** a detailed description of how the study was conducted, should report enough detail to reproduce the study and data analysis.
 - **Results:** Reports results of the study without interpretation.
 - **Discussion:** Interprets the results of the study in context of previous work.
 - **Conclusions:** often a bulleted list, reports the main conclusions of the work.

About Scientific Papers: Journals

- Scientific papers are generally published by reputable journals.
 - This form of communication dates back to the 1600's when people primarily communicated through letters. Modern scientific papers are a formalized version of letters.
 - Most journals have a well-established history of publishing quality work by scientists. Some are relatively newer (PLOS), but have solid peer-review processes.
 - All reputable journals publish regularly, not just once or twice.
 - Some journals hold copyrights to papers and charge access fees, and some allow authors to pay \$2k - \$10k per article to allow their work to be open access.



About Scientific Papers: Peer Review

- Scientific papers come in many forms, but almost all of them are **peer-reviewed**.
 - **Peer-review** is the process by which manuscripts are read and judged by fellow scientists with appropriate expertise before publication in a journal.
 - After a scientist submits a paper, a journal editor will pick 2-4 other scientists to read the manuscript on behalf of the journal and recommend whether or not it should be published and critique the work.
 - Generally, the editor will read these reviews, also give them to the authors, and decide whether or not the journal published the article, rejects it, or invites the authors to fix issues identified by the reviewers.
 - Peer review is considered the baseline hurdle for scientific research to be taken seriously. Plenty of stuff is wrong that's been peer-reviewed, but lots more is a complete and total mess without peer review!

Exceptions: Manuscripts posted to pre-print repositories have not been peer reviewed, but may be in the process or have been published in a revised form.

About Scientific Papers

– Resources for finding scientific papers:

- **Wikipedia:** <https://www.wikipedia.org/> 
- **Google Scholar:** <https://scholar.google.com/> 
- **Chapman Univ. Libraries:** <https://www.chapman.edu/library/index.aspx>
- **Chapman Univ. Digital Commons:** <https://digitalcommons.chapman.edu/>
- **World Cat:** <https://chapman.on.worldcat.org/>
- **Pubmed:** <https://pubmed.ncbi.nlm.nih.gov/>
- **Web of Science:** <https://www.webofscience.com/wos/woscc/basic-search>



– Warning! Results not always reputable.

About Grant Proposals

- Parts of a grant proposal:
 - **Objectives:** A short summary of the objectives of the planned work
 - **Background/Introduction:** provides context and motivation for the planned work, usually includes a broad justification for the methods that the planned work will employ.
 - **Aims:** specific goals of the planned research and the way each research goal will be carried out (including detailed methods).
 - **Organization-specific sections:** results from previous funding, statements on data transparency, resources available, broader aims.

About Grant Proposals

- What happens after a grant proposal is submitted?
 - Each organization has their own method of evaluating proposals.
 - Generally, most organizations (eg NSF, NIH) will select scientists with similar expertise to review and evaluate your grant. Two types of reviewers: panelist and ad-hoc reviewer.
 - NSF and NIH then hold a panel review where panelist reviewers come together and discuss the merits and limitations of each proposal. Written reviews of ad-hoc reviewers are used to fill in expertise gaps among panelists. Proposals will be ranked according to funding priority.
 - Program managers will then decide which proposals to fund out of their budgets.

In Summary

- Two major forms of written communication in science are **papers** and **proposals**.
- Papers are peer-reviewed and published in reputable journals.
- Grant proposals are reviewed by grant panels (at NSF and NIH) which recommend proposals for funding by program officers.
- The two forms of communication have different goals, processes, and standard parts.

In-class Exercises

- 1. Complete past assignments.**
- 2. Work on SK 4.1 and Project 3.**

Action Items

- 1. Complete past assignments.**
- 2. Work on SK4.1**
- 3. Work on Project 3.**