Writing a Scientific Report in the Geological Sciences

Many university students are intimidated by the prospect of preparing a scientific report, especially if they are used to writing essays. The information included below is geared specifically to the geological sciences, but many of the ideas can be applied to scientific reports in other disciplines as well.

What is a Scientific Report?

A scientific report is a piece of writing used to communicate research to an audience. This may be new research (i.e. an experiment testing a hypothesis) or a review (i.e. a summary of others' research on a specific topic). For most university students, the report will be in the form of a review, where a specific topic is assigned and the scientific literature on that topic is summarized and discussed. Scientific reports are most commonly written in APA style (be sure to check your assignment guidelines) and utilize headings/subheadings to subdivide information. The writing style is impersonal (no 'I', 'we', 'you', etc.), formal, and concise.

Getting Started

- Before starting your report, be sure to read through all the information provided by your instructor. Read through the syllabus and explore any online materials (if applicable).
- Have you been assigned a specific topic? If so, are there specific discussion points suggested? These discussion points can be used to organize your paper into defined sections.
- If you are asked to come up with your own topic, ensure it is not too broad and can be properly discussed within the limitations of the assignment.
- Construct a preliminary **outline** for your report.

Elements of a Scientific Report

Below is a list of the primary components of a scientific report. Some elements may not be required, so consult the syllabus or ask your professor.

- *Title Page* – Includes a descriptive title, a running head at the top, and relevant course-related information (e.g. name/student number, date, course, professor)
- *Abstract* – Provides a brief (<250 words) summary of the background and conclusion(s) of the report. Not a direct repetition of the introduction or conclusion.
- *Table of Contents* – Lists all headings used in the paper along with their page numbers.
- *List of Figures* and *List of Tables* – Lists all the figures and tables in the report with the figure/table number, a brief description, and a page number where the figure/table occurs.
- *Introduction* – Introduces the topic along with any background information. Should include a **statement of purpose** (similar to a thesis statement), usually placed at the end of the introduction, to give the reader an indication of where the paper is going and what the main points of discussion are.
- *Body* – Provides main content of the report, subdivided into various sections and subsections. For review papers, multiple ideas should be compared and discussed.
- *Conclusion* – Provides concluding remarks and a summary of main points discussed in the report. Should contain no new information.
- *Reference List* – Lists all sources used in the report properly formatted in **APA style**. References should be in alphabetical order by first author's last name and should utilize a hanging indent.

Finding Sources

The best sources are academic and peer-reviewed, usually in the form of **journal articles**. Journal articles are published periodically and can be searched and accessed online through the University of Manitoba Libraries. Some of the more popular journals in the geological sciences include *Geology* and *The Canadian Journal of Earth Sciences*; many journals focus on a specific discipline ranging from paleontology to volcanology and beyond!

Other academic sources include scientific books on a specific subject, government websites (e.g. Geological Survey of Canada, United States Geological Survey), or accredited science news websites (e.g. ScienceDaily.com). Avoid non-scientific websites, blogs, and newspapers, as the quality of content may be low. Wikipedia should not be used as a primary source but can be helpful for finding links to other academic sources or for finding images/figures. Textbooks and course notes should generally not be used as source material in a scientific report, unless instructed by your professor.

Common places to find academic sources include:

- *University of Manitoba Libraries* – Explore the Geological Sciences subject guide on the libraries website, as well as popular academic databases such as **GeoRef**. You can also consult a reference librarian who can help you find relevant sources if you are having trouble.
- *Google Scholar*
- *Other journal articles* – Look through the reference list of journal articles you have already found for other potentially relevant sources. Ask a librarian for help if you are having trouble locating a specific source.

NOTE: If you are having trouble finding relevant sources, it may be an indication that your topic is too specific or poorly understood. Do not be afraid to change topics if necessary, if you are allowed to do so.

Layout and Formatting

A professional and visually-appealing report will often result in a higher grade. If specific formatting instructions are not provided by your professor, here are some general guidelines to follow:

- Use single-sided sheets for your report
- Double-space the report
- Use a professional font (e.g. Times New Roman) and size (12 pt. is the standard)
- Include a page number in the header of each page on the right side
- Use 1" (2.54 cm) margins on all sides
- Include headings and subheadings, using the italicized "Elements of a Scientific Report" above. Replace the "Body" headings with descriptive headings and subheadings pertinent to your topic. Look up how to format the headings and subheadings in APA style.

Figures and Tables

One thing that separates a scientific report from an essay is the use of **figures** (e.g. illustrations, diagrams, charts, maps) and **tables** to complement the text.

- Figures should be clear and legible and include a figure number, a **caption** that fully explains the figure (including any abbreviations or symbols) and a citation showing where it originated.
- Tables should be logically organized, with the most important information at the top/left. Use appropriate spacing/gridding to ensure each table is presentable. Instead of captions, tables have **titles** consisting of a table number, a short description, and a reference for the data (if applicable).
- Figures and tables should always be referred to in the text and placed after the paragraph where they are first mentioned.

Examples:

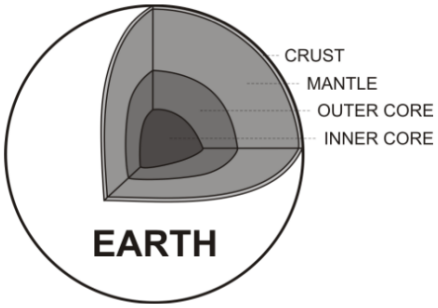

Figure 1: Simplified, cross-sectional diagram of the Earth showing the four main layers (from Demski, 2014).

Table 1: Three Main Rock Types (data from Demski, 2014)

Rock Type	Proportion of Crust (%)	Source	Common Examples
Igneous	64.7	Solidification of magma/lava	Granite, Basalt
Metamorphic	27.4	Subjecting other rocks to intense heat/pressure	Gneiss, Marble
Sedimentary	7.9	Cementation of other rock fragments or precipitation in water	Sandstone, Limestone

Notes on Referencing

When presenting data, ideas, interpretations, or any other information that is not your own, you must specify where it came from. This is done by including an in-text citation which corresponds to a full entry in the reference list. References and citations are usually formatted using APA style (see the *Publication Manual of the American Psychological Association, 7th Edition*). Many scientific journals will use a modified version of APA. Here are some suggestions relevant to geological science reports:

- Whenever possible you should **paraphrase** rather than use direct quotations. If it is necessary to include a quote, add the page number to the in-text citation.
- When a source has three or more authors, cite only the first author's last name followed by "et al." in the in-text citation (all authors get credit in reference list).
- If using a source with no author (e.g. a government website or industry report), treat the publishing agency as the author (e.g. 'United States Geological Survey'; 'Imperial Oil').
- Many sources in the geological sciences are uncommon in other disciplines (e.g. government publications, fieldtrip guidebooks, maps) and can be confusing to properly cite/reference. Refer to Grant (2003) or the reference list of other publications if you are having trouble. Many sources may also have a 'Suggested Citation' so keep your eye out for that.
- Even if an entire paragraph in your report draws on information from the same source, repeat the citation throughout (every 2-3 sentences). Do not just place a single citation at the end of the paragraph.

References

Copeland, P. (2012). *Communicating rocks: Writing, speaking, and thinking about geology.* Pearson Education.

Grant, B. (2003). *Geoscience reporting guidelines.* Prospectors and Developers Association of Canada.