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CPSG100 Science & Global Change First Year Colloquium I
Anatomy of a Scientific Paper Project
DUE: October 15, 2021

While research is where the core of Science is done, the transmission of research is how Science grows. And the primary means of transmitting scientific work is the scientific (or technical) paper. These are normally papers published in a periodical journal (which may come out weekly, monthly, or on a longer schedule). The purpose of this exercise is to get you used to reading and interpreting such papers.

PART I: RESEARCHING A RESEARCH ARTICLE

STEP ONE: Find a paper. Make sure it is a recent one. We'll define "recent" as in "published since 2016."

In the digital age, nearly all scientific journals have an online presence. Some of these are restricted to subscribers; others are available to everyone ("Open Access"). As a University student, you have access to a great number of these journals, because the University library has subscriptions to various journal services. You can access these from a University IP address (a hardwired computer on campus or wireless access from on campus), or by using <https://umaryland.on.worldcat.org/discovery> from off-campus. (Or, if you find a paper you want from a publisher for which the University has a subscription, add a ".proxy-um.researchport.umd.edu" after ".com" or ".org" or whatever, and that will put you straight into the article). (Actually, the best option is installing the "Reload@UMCP" link on your web browser. For more information, see <http://lib.guides.umd.edu/reload-button>).

Feel free to find an article from any scientific journal. There are a couple of strategies to use. You can use a searchable database (<http://scholar.google.com> or one of the University library's databases, for instance) and search on topics you are interested. Or, alternatively, you can browse the titles of papers from the tables of contents of different journals. There are hundreds (if not thousands) of specialized journals out there, but there are also some journals that publish across the entire field of Science. So, unless you have a real particular narrow interest, we recommend you checking out the following for potential papers:

- *Nature* (<http://www.nature.com/nature/archive/index.html>), published by the British Association for the Advancement of Science, a weekly journal
 - *Scientific Reports* (<https://www.nature.com/srep/research-articles>) and *Nature Communications* (<https://www.nature.com/ncomms/research-articles>), a pair of affiliated BAAS journal
 - And a whole mess of journals in the BAAS family at <https://www.nature.com/siteindex>
- *Science* (<https://www.science.org/loi/science>), published by the American Association for the Advancement of Science, a weekly journal
 - *Science Advances* (<https://www.science.org/loi/sciadv>), another AAAS journal

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- *Proceedings of the National Academy of Sciences* (PNAS for short) (<http://www.pnas.org/content/by/year>), published by the National Academy of Sciences of the United States of America, a weekly journal
- *Proceedings of the Royal Society A: Mathematical, Physical & Engineering Sciences* (<http://rspa.royalsocietypublishing.org/content/by/year>), published by the Royal Society of London, published monthly
- *Proceedings of the Royal Society B: Biological Sciences* (<http://rspb.royalsocietypublishing.org/content/by/year>), published by the Royal Society of London, published every two weeks.
- Some other specialized journals from the Royal Society of London include *Royal Society Open Science* (<https://royalsocietypublishing.org/loi/rsos>), *Biology Letters* (<https://royalsocietypublishing.org/loi/rsbl>), *Interface* (<https://royalsocietypublishing.org/loi/rsif>), and *Open Biology* (<https://royalsocietypublishing.org/loi/rsob>)
- *The Science of Nature* (<http://www.springerlink.com/content/0028-1042/>), formerly called “Naturwissenschaften”, published by a coalition of scientific organizations. Despite the old German title, papers in this journal are now published in English
- *Public Library of Science* (PLoS for short) (<http://www.plos.org/publications/journals/>), a purely online open access family of journals.
- *PeerJ* (<https://peerj.com/articles/>), another purely online open access journal, mostly focusing on biological and medical science
- *eLife* (<https://elifesciences.org>), an open access journal for the life sciences
- *Cell* (<https://www.cell.com/cell/archive>), another life sciences journal (covers vastly more than cellular biology), the sister journal *Current Biology* (<https://www.cell.com/current-biology/archive>), and a whole family of specialist journals at <https://www.cell.com>

For the purpose of this exercise, we require that the paper you examine:

- Is an actual research article, ***NOT*** a review article, news article, commentary, or the like: consult the lecture notes for the distinction between these
- Be less than 10 pages long (exclusive of supplementary online material; if it is a tad longer, this is okay; many will be much shorter than this). Some papers can be much, much longer: we don't want you to spend that much time on it.
- Was published in the last five years

STEP TWO: Read the paper. You may need to download the Electronic Supplementary material as well, because some journals move the Methods and Materials sections there.

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NOTE: Don't expect to understand all the scientific details in the paper! These articles are intended for professional researchers, so will include information, techniques, methods, etc. to which you have probably not yet been introduced. (After all, the point of an undergraduate and graduate education in your particular fields is to give you the skills and information to understand and actually do advanced work in your chosen subdisciplines!) That said, it is best to find a paper that interests you and that you can at least parse out the main details if not the nitty-gritty stuff.

STEP THREE: Provided the following information and answer the following questions a text entry (or Word document) in ELMS.

1. Give the proper bibliographic reference for the paper: Use the SGC format

(<https://www.geol.umd.edu/sgc/resources/biblio.html>)

2. Provide a direct URL link to the paper. **NOTE:** this link is to the publisher of the journal (e.g., sciencedirect, Elsevier, etc.), not to EBSCOHost or Google (which are search engines). Use the doi (digital object identifier) code if necessary to find that direct link.

3. Restate in your own words the main question(s) examined in this paper, the type of analysis that was used, and the conclusions from that analysis.

4. From your reading, is it clear how another researcher could use this paper to find out about the nature of the problem at hand, including previous work about this topic? If so, explain how and in which section of the paper you found that information. If not, explain why not.

5. From your reading, is it clear how another researcher could attempt to repeat the observations and analyses here (remember the importance of repeatability in hypothesis testing)? If so, explain how and in which section of the paper you found that information. If not, explain why not.

6. Does the paper discuss future possible work related to this topic? If so, what does it suggest?

PART II: BEYOND THE TECHNICAL RESEARCH ARTICLE

So far, we have looked at a technical research paper. But there are a number of other types of articles in science; some of these are published in the very same journals as the scientific research papers, and some in different venues. Here are some of the major ones you may encounter when researching information:

- **Review papers:** these often have the same general properties as a scientific technical research paper with one major exception: they are not announcements of new discoveries nor new analyses of data. Instead, reviews are summaries of the current state of research in a particular field. They typically do not give new analytical results or tests of hypotheses. However, they have an important role as places where different papers (often by many different researchers, perhaps but not necessarily the present one) are synthesized into a whole. They are also extremely useful in finding the original research (as references) in a particular field. Review papers are sometimes included within the typical scientific journal (and if so are normally indicated as such). Additionally, there are entire journals (e.g., the huge line of *Annual Reviews* journals; the *Quarterly Review of Biology*; etc.) which are entirely review papers.
- **Conference abstracts:** these are “proto-papers” in a sense: one-to-two paragraph overviews of the work presented at a technical conference (either as a stand-up platform presentation or as a poster). Oftentimes these presentations are the seeds of a future publication. But because just the abstract is presented, and because neither the data nor the analyses yet been subjected to peer-review, they are not regarded as “finished works” in the scientific community. They are occasionally cited in technical research papers because they serve as documents as to when a particular idea or discovery was first presented to the scientific world. However, when the full research article is published, it is that rather than the conference abstract which is regarded as the “real” analysis.
- **Commentary:** these are labeled as such (or with a special name, such as the “News & Views” section of *Nature*, the “Perspectives” section of *Science*, or the “Dispatches” of the various journals published by *Cell*). These are normally reviews of a particular technical paper (or occasionally multiple papers) in that issue of the journal, in which a different expert in the same subject is asked to present the important broader implications of that technical paper. (In contrast, true review papers review of the state of the field as a whole rather than a subset of particular papers.) In addition to the having a special designation, you can recognize a commentary by: having slightly less “jargon-y” text, as it is there to translate the highly technical language of the original article into something a non-specialist might appreciate, and; by indicating (typically in the first two paragraphs) the specific article(s) later in that issue which are being discussed.
- **News reports:** many journals will give short reports announcing the publication, results, and implications of significant new technical publications. These might be papers later in the issue of that journal, or they might be in entirely different journals. News reports can be distinguished from technical research reports (and indeed all the over types of articles already discussed) in that they a) often have no specific author listed; b) are very short (maybe just a single paragraph); c) normally have no references, except for the journal article that is being reported; d) do not show any actual analysis.

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- **Editorial:** some—although by no means all—scientific journals may have an occasional editorial or opinion piece. These are indicated as “Editorial” or “Opinion” and consist of an editor’s (or invited author’s) thoughts, comments, and opinions on some pressing topic. These almost never have new analytical results and will typically only have a few references (compared to an actual research article). These are useful to find out what particular editors think about various policies and subjects but are not scientific results as such.
- **Press releases:** these might be press releases from the home institution of a researcher, or a granting agency, or a corporation, or many other subjects. In the case of the first two, it is typical for the home institution of a researcher and an agency supporting a particular grant to put out a press release at the same time that important new technical research publications are published. (This is for a number of reasons, not least of which is to justify to the shareholders in that institution that their money is being put to good and productive use!) Note that these press releases are not subject to independent peer review, and consequently are not considered valid references by the scientific community. Their primary value is to communicate with the media and the general public. Similarly, public or private institutions and corporations may put out press releases on particular scientific topics. They might be useful in terms of presenting data not otherwise available (e.g., the statistics and measurements of a particular piece of scientific equipment, for instance), and so might be cited in that context. However, analytical results and observations in these are again not subject to independent peer review and are thus potentially suspect.

Follow the links and list which of the types of papers or articles it is (from the list above), and your justification for that identification.

Bourne, H.R. 2018. Opinion: Expansion fever and soft money plague the biomedical research enterprise. *Proceedings of the National Academy of Sciences* **115**: 8647–8651. Doi: 10.1073/pnas.1813115115
<http://www.pnas.org/content/115/35/8647>

7. Type of article, and your justification for that identification:

Renner, S.S. & C.M. Zohner. 2018. Climate change and phenological mismatch in trophic interactions among plants, insects, and vertebrates. *Annual Review of Ecology, Evolution, and Systematics* **49**: 165–182. Doi: 10.1146/annurev-ecolsys-110617-062525
<https://www.annualreviews.org/doi/pdf/10.1146/annurev-ecolsys-110617-062535>

8. Type of article, and your justification for that identification:

Holtz, T.R., Jr. 2018. Evolution: New branches on the alvarezsaur tree. *Current Biology* **28**: R941–R943. Doi: 10.1016/j.cub.2018.07.014

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[https://www.cell.com/current-biology/fulltext/S0960-9822\(18\)30913-8](https://www.cell.com/current-biology/fulltext/S0960-9822(18)30913-8)

9. Type of article, and your justification for that identification:

Fischer-Femal, B. & G.J. Bowen. 2021. Exploring soil carbon burial over the Paleocene Eocene Thermal Maximum: a case study of soil carbon response to rapid warming. Geological Society of America Abstracts with Programs **53**(6). Doi: 10.1130/abs/2021AM-367159

<https://gsa.confex.com/gsa/2021AM/meetingapp.cgi/Paper/367159>

10. Type of article, and your justification for that identification: