

## Bio 1 Scientific Term Paper

Date: August 25, 2014

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### Summary

**You are to write a scientific term paper about a topic related to evolution, ecology or behavior.**

#### Goal

The goal is for you to produce a term paper that illustrates that you have researched and thought in depth about a topic in evolution, ecology or behavior. The term paper will tell me that you understand the important issues in a particular field and have identified the current cutting edge in that research.

This paper is NOT an essay. I do not want you to explain a topic to me. I want you to discuss **current research** on a topic. If you find yourself including extensive background material then you are not doing the paper correctly. The paper is about the **research**, not just about the phenomenon. For each of your source papers, tell me what the authors were trying to investigate, how they did their investigation, what they found and what it means.

It is very likely that you have never done this kind of paper before. If you are unclear about what you are doing, ask me about it.

**If you think this is like writing a typical term paper on some topic, you are dead wrong.**

Most importantly, think of this as an opportunity to show me what you can do, not as something that you have to do. I want you to discover something and to share that discovery with me.

#### Potential Topics

I suggest you look at the following journals for inspiration:

*Science, Nature, Animal Behavior, Behavioral Ecology and Sociobiology, Behavioral Ecology, Ethology, Behavior, American Naturalist*

You may also find material in the journals devoted to particular organisms, e.g. *Auk* (birds), *Copeia* (fish, herps), *Journal of Mammalogy* (mammals), etc. If you have a specific area of interest, I can suggest particular journals that you might look in.

#### Source Material

Our library has some of the journals mentioned above, and I have others in my own personal collection. Your task is to find recent research. You may use online approaches (e.g., Google Scholar) to get copies of journal articles in pdf form, but do NOT cite websites, unless you are absolutely sure that they are primary literature (which will almost NEVER be the case; ask me).

#### Mechanics

You will use the **primary** literature, not secondary sources like newspapers, magazines, encyclopedias or the internet. I want you to read what the current researchers are writing, not what someone else wrote about what the researcher wrote.

Your term paper will make use of a minimum of 3 papers from the primary literature. None of this literature may be older than 1995.

In writing the paper, you may need to cite some secondary literature as background material. So that I know that you know the difference between primary and secondary literature, in the References section of your paper, you must put an asterisk in front of each paper you deem to be primary literature.

By the first due date, you need to provide me with a **typed** (not hand-written) one page proposal for your paper. This proposal must include your name, the date, the title, the full and proper citation of one paper from the **primary** literature that you intend to use and a brief description of your proposed paper (one paragraph) that cites that paper. Examine the sample proposal online to see how this is done. See below for

the proper way to format your citation. **This proposal must not be hand-written.**

By the second due date, you must provide me with the **cover page**, the **introduction** and the analysis of **one** of your pieces of **primary** literature, along with the full and proper citation of the literature that you have cited in your work. The cover page must include your name, the current date (NOT the date it is due), and the title of your paper. It must be numbered as page 1. The introduction begins on page 2 (all pages must be numbered). The introduction provides a brief introduction to the topic, often citing some literature, and then briefly tells me how you are going to approach the topic, i.e., provide a roadmap to the rest of the paper. You must introduce and cite all three of your primary sources in the introduction.

For the final due date, you will turn in the completed paper, which includes analysis of all of your primary literature, along with the checklist (see below). You are allowed (and encouraged) to turn this in before the final deadline. You will attach all previous drafts that you turned in to the back of your final paper, after the checklist. At the same time, you will email me a copy of the final paper, with a file name in the following format:

Lastname\_Firstname\_Bio1Fall2014\_termpaper.docx

It should go without saying, but I will say it anyway, you cannot submit a term paper that you are submitting, have submitted, or will submit, for another course.

**You must have someone else read over your paper (to help you improve the writing) before you submit it.** They must sign the checklist. You are to fill out the rest of the checklist, not them.

### Types of Literature

In class, we will discuss the differences between the primary and secondary literature. The primary literature consists of the material published in journals (which are very distinct from magazines), written by the scientist doing the work and reviewed by scientific referees. Reviews or books (with rare exceptions) do NOT constitute the primary literature. Textbooks are NEVER primary literature. These are considered secondary literature. Magazines like *Scientific American*, *Biosciences*, *American Scientist*, *Discovery* or *National Geographic* are NOT primary literature.

Sometimes the same issue of a journal will contain items that are primary literature and others that are secondary literature. Many journals often have a review article in the front of the issue. The word "Review" at the top of an article should be a strong hint that this article is NOT primary literature. For example, the journal *Science*, the most respected journal in science, often includes many news reports, etc. that are not primary literature, as well as substantial primary literature, in the same issue.

If you are unsure as to whether a paper is primary literature or not, ask me about it.

As a very simple litmus test: if a paper is really easy to understand, like it was written for non-scientists, the odds are very high that it is NOT primary literature. Primary literature is densely written, often full of unexplained highly technical jargon. It is that stuff that you need to use for this term paper.

### Format

The paper MUST BE TYPED -- I will not read handwritten papers under any circumstances.

The paper must be double-spaced with pages numbered, starting with the cover page as page 1. It may be printed on one side of the page or double-sided.

This paper should be no more than, and definitely not less than, 6 pages (all inclusive) and should include a cover page with the title, your name, and date.

e.g.,

Sperm competition in humans: fact or myth?

by

Ron Coleman  
November 10, 2014

The references go on the last page, but that need not be a separate page, i.e., they can start right after the last bit of text.

Write clearly and precisely.

I am very unimpressed with spelling mistakes or grammatical mistakes. These kinds of mistakes can **DRAMATICALLY** affect the grading of your paper. Use a spelling checker program to check your writing and **have a friend read it as well**. I expect a very high quality product.

### How to Cite Sources

The purpose of citing material in a scientific document is to properly credit the work of others. A citation shows that the thought or information just presented is not that of the author, but rather comes from someone else and that person deserves the credit (or the blame).

You do NOT cite what is regarded as general knowledge. But, and here is an important point to ponder, you should not be writing much general knowledge in your paper anyway. For example if you are writing a paper on the swimming biodynamics of tuna and you find yourself writing that tuna are fast moving fish that live in the ocean, then there is no need to cite anyone for that, but equally, there is no need to write the original sentence in the first place. We all know that tuna are fast moving fish that live in the ocean. Now if you want to tell me something specific, like tuna are the fastest swimming fish, clocked at over 50 miles per hour, you need a citation because I want to know who said that and then I can check it out myself if I don't believe it.

#### The References section

The **References** should contain ONLY citations to published work and must be set out consistently and professionally, i.e.,

journal article:

Galen, C., J.A. Shykoff and R.C. Plowright (1986) Consequences of stigma receptivity schedules for sexual selection in flowering plants. *American Naturalist* 127: 462-476.

book chapter:

Plowright, R.C. and C.M.S. Plowright (1987) Elitism in Social Insects: A Positive Feedback Model. Pp 413-436 in: *Interindividual Behavioral Variability in Social Insects* (Ed. R.L. Jeanne), Westview Press, Boulder, Colorado.

book:

Moyle, P.B., and J.J. Cech Jr. (1988) *Fishes: An Introduction to Ichthyology (Second Edition)*. Prentice Hall, Englewood Cliffs, New Jersey.

The references should be listed in alphabetical order of the last name of the first author of each paper. In other words, a paper by Connor, S. (2006) would appear higher in the list than a paper by Jones, A.B. and C.D. Dunnit (2001).

You NEVER change the order of the authors within a particular reference.

Notice the placement of the various pieces of information, such as the year. Notice that the issue number is not included, only the volume and pages. Write out journal names in full. Notice the use of hanging indentation. This is NOT done by hitting the space or tab key. Ask me if you do not know how to do this properly.

Some of the papers you may encounter will be published in electronic journals, such as PloS ONE. This is NOT the same as a website. Such papers often do not have page numbers. Instead they might have a document number.

#### How Citations Appear in the text

The three citations listed above would appear in your text as, respectively, Galen et al. (1986), Plowright and Plowright (1987), and Moyle and Cech (1988). Note that citations to papers with more than two authors -- such as the first one above -- appear in your text as the first author followed by the words 'et al.' (Latin for "and others") but the full list of authors is given in your References section. Notice that in the words "et al." there is no little dot after the word et but there is a dot after the word al. (Why?)

Unpublished work is referred to in the text either as "(A.J. Smith, unpublished data)" or "(J.G. Bloggs, personal communication)", depending on the context, but is not listed in the References.

DO NOT USE footnotes as a means to cite references. In fact, do not use footnotes at all. Most scientific journals do not allow them. Some journals use a numbering system when referring to references. DO NOT do that in this paper.

### Quotations

It is almost never correct to use quotations in scientific writing. This is because in science we are interested in the ideas we get from others, not their exact words. If Jones said something interesting in 1992, then paraphrase what Jones said and give her credit. For example, the following might appear in your paper,

The bluegill sunfish exhibits a diversity of reproductive styles (Jones 1992).

You do not need to put the words in quotation marks because you are telling us that Jones wrote a paper on this topic. We now know that it was not you that first found out this exciting fact, but rather it was Jones and we know where to look to find more details.

The only time you need to use quotations in science is when the actual exact words are very important. For example, Robert Trivers wrote a very famous definition of parental investment in 1972 and this one line is quoted extensively in the literature because each and every word is very precise and important.

### Long chunks of text

Imagine you are writing a term paper on sea snakes and you want to make extensive use of Roberts (1999) paper on sea snakes.

You do NOT do the following:

Roberts (1999) wrote extensively on the ecology and reproduction of sea snakes. He found that most sea snakes are livebearers (Roberts 1999). Fourteen of 26 species are striped (Roberts 1999). They are found in all tropical oceans (Roberts 1999).

You would do the following:

Roberts (1999) wrote extensively on the ecology and reproduction of sea snakes. He found that most sea snakes are livebearers. Fourteen of 26 species are striped. They are found in all tropical oceans.

There is no need to put "Roberts (1999)" everywhere because it is clear that all of this material is coming from Roberts' paper.

**The bottom line when citing material is as follows: you are trying to make sure that the reader knows who said what and where the reader can go to find more information.**

**DO NOT QUOTE when writing in science.**

### **Plagiarism**

**Do not copy material from a source. With few exceptions, any time 4 or 5 words appear exactly the same in your paper as in a source, that constitutes plagiarism and you will receive an automatic F. I will check this with the software Turnitin.**

### **Check List**

At the end of this document is a checklist that **must be turned in** with your final term paper. **Do not ask me for a copy of the checklist when you turn in your paper.** Doing so makes it clear that you did not USE the checklist in writing your paper and I will be very unhappy.

### **Due Dates**

September 30, 1:30pm: Proposal due  
October 21, 1:30pm: Part I due  
November 18, 1:30pm: Final paper due

Note: You may turn in the paper BEFORE the due date if you wish. You are encouraged to do so.

**Grading**

The paper will be graded out of 20 points. **There is no late. All deadlines are exactly at 8:00 am. After that time, even 5 minutes, the paper is worth 0.** Inappropriate literature will be a loss of 5 points at a minimum.

[A sample introduction to a term paper]

**Conflict and Cooperation: A review of biparental care**

Biparental care is the name given to any situation where both parents (the male and the female) participate in parental care of the offspring. Biparental care is the norm in birds, is widespread in mammals and occurs sporadically in amphibians and fishes (Gross and Sargent, 1985). Biparental care is intriguing because it is a balance between cooperation and conflict between the two parents (Houston and Davies, 1985). In many cases, the long-term interests of the two partners are not aligned, e.g., when mating is only for a single reproductive event, and thus there may be conflict in terms of how much each parent is willing to invest in the offspring. And yet, if the parents do not cooperate to some extent, e.g., to protect the young, the offspring will perish and so some degree of cooperation is necessary. What factors influence this careful balance between cooperation and conflict? In this paper, I will examine five studies, from a diversity of taxa, which illustrate that the balance can be influenced by such things as availability of other partners, age of the offspring, number of offspring and even characteristics of the parents themselves (e.g., their relative sizes). Together these studies show that parents incorporate diverse information into their biparental investment decisions.

Coleman (1993) examined biparental care in the convict cichlid (*Archocentrus nigrofasciatus*) using a manipulative laboratory experiment to see the effect of relative value on the balance of biparental investment. In this experiment, Coleman utilized 15 pairs of convict cichlids, which he bred in 15 different aquaria. The key to the experiment was that Coleman deliberately created pairs of particular size combinations....

[...and so on.]

Notes:

1. The papers cited in the first paragraph are for background information. Some of them are secondary literature (e.g., reviews). These do not count in the three primary literature papers you are to utilize for this assignment.
2. Notice the underlined sentences at the end of the first paragraph. I have underlined them so that you will notice them – do not underline them in your paper. However, you should have roughly similar sentences in your paper at the end of the introduction providing a clear ROADMAP of where the paper is going and what it finds.
3. Do not describe the Methods of each source in great detail but give enough information so that the reader has a good feeling for what was done, how many animals were used, whether it was a lab or field experiment, etc]

**Term paper Checklist**

Name: \_\_\_\_\_

**The Author (not the proofreader) must fill out and turn in this page with the term paper.****Overall**

- \_\_\_ The paper was read by a proofreader. Printed Name of proofreader \_\_\_\_\_
- \_\_\_ There is a title page Signature of Proofreader \_\_\_\_\_
- \_\_\_ The pages are numbered, starting with the cover page as page 1
- \_\_\_ The paper is at least 6 pages in total (including the cover page)
- \_\_\_ The paper is double-spaced
- \_\_\_ You read your paper carefully for spelling and grammatical mistakes
- \_\_\_ You have written a careful analysis of RESEARCH on a topic, not a description of a topic
- \_\_\_ There are no quotations in the paper
- \_\_\_ There is an introductory paragraph to introduce the topic
- \_\_\_ There is a concluding paragraph at the end to bring the material together
- \_\_\_ You have attached the previous draft of the paper on the back
- \_\_\_ You have emailed me a copy of the paper, as a file attachment, with the following file name format  
 Lastname\_Firstname\_Bio1Fall2014\_termpaper.docx

**General Punctuation**

- \_\_\_ Every sentence ends with a period, exclamation point or question mark.
- \_\_\_ Scientific names are written in italics, e.g., *Lepomis macrochirus*, including those in the references.
- \_\_\_ The name of the Genus is capitalized and the specific epithet is NOT capitalized, i.e.,  
*Lepomis macrochirus*, NOT *Lepomis Macrochirus*

**Citation of Literature in the body of the paper**

- \_\_\_ You used at least three pieces of primary literature
- \_\_\_ You used "et al." when there are three or more authors
- \_\_\_ You checked that "et al." is correctly written -- notice the "." after "al." Do not put the words "et al." in quotation marks in your paper.
- \_\_\_ EVERY paper cited in the body of the paper is listed in the Literature Cited section

**Literature Cited section**

- \_\_\_ The papers are listed in alphabetical order by the last name of the first author
- \_\_\_ You put an asterisk in front of each piece of primary literature in the reference section
- \_\_\_ Papers with three or more authors have ALL authors listed fully (i.e., you did not use et al. in the Literature Cited section)
- \_\_\_ EVERY paper listed in the Literature Cited section is actually cited in the body of the paper

Note: All these things must be true or your grade will suffer severely. In addition, if you check these things off and they are not true, your grade will also suffer severely.