COMPARATIVE ANIMAL PHYSIOLOGY
WRITING ASSIGNMENTS

One of the most important aspects in virtually all jobs is clear and concise communication of your ideas to others. The importance of clear communication is only magnified in the sciences. Results of biological investigations are normally communicated in a very standardized format called a research paper. It often frustrates beginning researchers to conform to this apparently sterile and highly regimented writing format. However, keep in mind that there is a purpose for this writing format; when communicating scientific information, you want your reader to focus only on your scientific results, not on your writing style, use of English, or organizational format. In addition, your research is much more likely to get the recognition it deserves if you present your work in a clear, organized, easy-to-read style.

The ability to write excellent research papers comes only with time, effort, and lots of practice. Try not to be discouraged if you get papers back covered with comments. These comments are only meant to help you master the skill of writing research papers. As the course progresses, you may find that the amount of comments on your papers does not decrease, and may actually increase. When you read the comments, however, you will most likely find that they reflect interested comments about the science rather than comments on sentence structure and paragraph usage. This switch in focus is GOOD and something to be proud of!

WRITING REQUIREMENTS

Although we do 7 different laboratory exercises PLUS a research project that you design yourself, you are each required to turn in only three research papers. We have designed these requirements around our belief that good writing is a process that requires much thought, time and effort; for most of us, writing is not an event which occurs within one draft. The choices and order of events for each writing assignment are listed below.

<table>
<thead>
<tr>
<th>ASSIGNMENT</th>
<th>TOPIC</th>
<th>ORDER OF EVENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAPER #1</td>
<td>Choice of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Crustacean heart rate</td>
<td>First submission responded to by Prof*</td>
</tr>
<tr>
<td></td>
<td>b. O2 consumption: terrestrial</td>
<td>Final submission responded to by Prof*</td>
</tr>
<tr>
<td></td>
<td>c. O2 consumption: aquatic</td>
<td></td>
</tr>
<tr>
<td>PAPER #2:</td>
<td>Choice of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Oxygen binding by hemocyanin</td>
<td>First submission responded to by classmates*</td>
</tr>
<tr>
<td></td>
<td>b. Crustacean osmoregulation</td>
<td>Final submission responded to by Prof*</td>
</tr>
<tr>
<td>PAPER #3 THE INDEPENDENT PROJECT PAPER</td>
<td>Independent project</td>
<td>First draft of Introduction and Materials &amp; Methods responded to by Prof*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First drafts responded to by classmates^</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Final submission responded to by Prof*</td>
</tr>
</tbody>
</table>

* these steps have specific due dates
^ these steps are highly encouraged but are done at your own discretion
RESEARCH PAPER SPECIFICS

PAPERS #1 & 2 (These papers must be written independently):
Readings in Writing Handbook (these books contain very helpful information ... please start early!)
• If you have Writing Papers in the Biological Sciences by McMillan: Chapters 1, 2, 3, 4, 6, 7, 8
• If you have A Student Handbook for Writing Biology by Knisely: Chapters 1, 2, 3, 4, 5, 6

VERY IMPORTANT
➢ Papers 1 & 2 require at least TWO pieces of primary literature, although you will probably need more to effectively write the paper. You may use other resources (reviews, books, credible web sites, etc.) but there must be at least two primary articles.
➢ Papers 1 & 2 require statistical analyses of the data. This will not be the focus of the results section. Moreover, the statistical results obtained do not matter in the evaluation of your paper as long as you (a) use an appropriate test, and (b) correctly interpret the results. In most cases, you will probably use T-tests, ANOVA, and/or ANCOVAs.

PAPER #1 Topic options: Crustacean heart rate OR Oxygen consumption: terrestrial environment OR Oxygen consumption: aquatic environment.
Main Goals of Paper #1:
• To apply what you learned in the writing workshop as soon as practical.
• To work on refining the CONTENT, CONTEXT, and COHERENCE of a piece of scientific writing.
• To get direct feedback from the professor as a way to clarify expectations on all major sections of a paper.
• To practice the art of revising and note the difficulties inherent in revising the different sections of a paper.
• To help you determine your comfort zone in terms of budgeting time for writing in this class.

PAPER #2 Topic options: Oxygen binding by hemocyanin OR Crustacean osmoregulation
Main Goals of Paper #2:
• To continue working on refining the CONTENT, CONTEXT, and COHERENCE of a piece of scientific writing.
• To work on drafting a paper that sparks the interest of readers and tells a story.
• To help and be helped by your peers by discussing a work in progress.
• To practice integrating outside literature into your own writing.
• To practice the art of revising using discussion and comments from peers and your own careful evaluation of your work.
INDEPENDENT PROJECT PAPER (PAPER #3) (This paper may be written in collaboration with ONE other research partner -- please see note on next page regarding grading collaborative work):

Readings: McMillan: Chapters 1, 2, 3, 4, 6, 7, 8 –or- Knisely: Chapters 1, 2, 3, 4, 5, 6

Topic options: Your project

Main Goal of the Assignment:
- To synthesize all that you have learned in lecture and lab about writing and physiology in the context of a project that you have designed, refined, worked on, sweated over, lost sleep over, laughed over, cried over, cursed, loved, hated, and, above all ... FINISHED!

SPECIAL NOTE ON GRADING COLLABORATIVE WORK

Grading collaborative efforts presents some unique problems, most notably assessing the relative contribution of the individual group members. This problem is not confined to the classroom. Indeed, the overwhelming majority of scientific papers have more than one author, indicating that more than one person contributed to the design, execution and presentation of the experiment. The convention within science is that the relative contribution of the authors is indicated by the order of the authors names. The name that appears first (the first author) is acknowledged to have done most of the work, followed by the second author, and so on. In the rare cases in which two authors have contributed equally to the research, this fact is acknowledged by placing an asterisk after the two names and adding an explanatory footnote.

All students in animal physiology MUST collaborate on their oral presentation. In addition, you have the option of collaborating with ONE other person on the independent project paper. Although your professor will have some idea of the relative effort of the group members in the lab, we ask you to help us assess the contributions of the group in the analysis and presentation of the data. We will ask all members of a group to fill out a short group evaluation. In addition, we expect you to document your contributions by turning early drafts along with the final paper. Generally, both authors will receive the same grade on the final paper and associated drafts. However, in special circumstances, we may employ the following grading procedure:

You and your lab partner will be graded as a group and will be given a group grade, totaling a maximum of 2 times the assignment value (Ex. the final paper is worth 100 points so that the maximum that your group could receive is 200 pts). In most cases, the points will be divided evenly among group members. However, I reserve the right to allocate them differently based on the relative contribution of the group members.
FORMAT AND CONTENT OF RESEARCH PAPERS

BASICS
Guidelines for writing research papers in Animal Physiology are in your writing handbook, *Writing Papers in the Biological Sciences*, by V. E. McMillan. In this book, McMillan describes the basic format of research papers, references, and citing sources as well as gives tips on writing clearly, concisely, and using subheadings effectively.

Before writing your first paper read the chapters in your writing handbook (see above). Continue referring back to these chapters during all writing assignments of this course.

SPECIFIC FORMAT
The format of all Animal Physiology research papers must follow the format guidelines specified in the Instructions to Authors in the journal *Physiological and Biochemical Zoology*. These are outlined on the next few pages.

These format guidelines specify elements such as:
- the maximum number of words in the abstract.
- the line spacing.
- the format of tables.
- the format of the in-text citations and reference section.
- the content of the figure legends.

We admit that these format guidelines are almost laughably rigid but these are REAL instructions from a REAL journal. Collins library gets Physiological and Biochemical Zoology so you can see some examples of papers published according to these format guidelines.

*** I WILL BE PICKY ABOUT FORMAT SO PAY ATTENTION TO DETAIL ***
*** HELP EACH OTHER BY LOOKING OVER EACH OTHER'S PAPERS ***

FORMAT GUIDELINES (modified from the Physiological and Biochemical Zoology web site: [http://www.journals.uchicago.edu/PBZ/instruct.html](http://www.journals.uchicago.edu/PBZ/instruct.html))

Abstract
The abstract should summarize the findings concretely. The abstract should not contain abbreviations that will be recognized only by an expert on the subject, and it should not contain citations of the literature. The abstract should be approximately one-twentieth or less of the length of the main body of the paper, with a maximum of 200 words.

Main Body of the Text
The main body of the text should be divided into sections headed Introduction, Material and Methods, Results, and Discussion, followed by Literature Cited, Tables, and Figures with Legends. These headings should be set with no indentation from the left margin. Primary subheadings should be underlined and also set with no indentation from the left margin. Secondary subheadings should be underlined and followed by a period, with no indentation from the left margin. The text should begin on the same line.

Footnotes should not be used!!!!
Spelling may follow either American or British convention, which must be consistent throughout. Punctuation, however, should follow that recommended in The Chicago Manual of Style.

**Literature Cited (Please note that I will be picky about proper formatting of references so, again, pay attention to detail!)**

Literature should be cited in the main body of the text by author name(s) and four-digit year of publication, with no comma separating the two. Multiple citations within a parenthesis should be made in chronological, not alphabetical, order, and separated by a semicolon. If two publications by the same author(s) appeared in the same year, the first should be designated by a lowercase a, the second by b, and so on, following the date. Papers by one or two authors should be cited in the text by one or two names; papers by three or more authors should be cited by the first author's name followed by "et al.," for example, Smith and Jones (1994a), but Johnson et al. (1995) for three or more authors. Bibliographic information should be given in the Literature Cited section. The listings should be double-spaced and arranged in alphabetical order.

**A. Journal article**

The name of a journal should be spelled out and not italicized; the volume number should also be set in standard type and not italicized. Italics should be used for scientific names. Full pagination should be given.

Examples:


**Tables**

Tables should be double-spaced on separate sheets following the Literature Cited section. They should be numbered in order of presentation in the text. The title should be placed at the top. Explanatory information and experimental conditions should be given as a note at the bottom. In the text, tables should be cited as Table 1, Table 2, and so on.

**Figures**

Figures should be numbered in order of presentation in the text. They should be cited in the text as Figure 1, Figure 2, and so on. The font of lettering used for figures should be simple and consistent throughout. Figure legends should be placed on a separate sheet following tables. A legend should begin with a title, followed by explanatory material and experimental conditions, in complete sentences. All pertinent conditions, such as temperature, salinity, pH and buffer composition, and so on, should be given, even if redundant.
EVALUATION:
I will evaluate your papers according to the criteria laid out on the Research Paper Checklist. The point breakdown will be based on the following scheme:

<table>
<thead>
<tr>
<th>Category</th>
<th>% of total points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing style, clarity, and apparent effort</td>
<td>25</td>
</tr>
<tr>
<td>Content and presentation (50% broken down as follows)</td>
<td></td>
</tr>
<tr>
<td>• Abstract</td>
<td>4</td>
</tr>
<tr>
<td>• Introduction</td>
<td>10</td>
</tr>
<tr>
<td>• Material &amp; Methods</td>
<td>10</td>
</tr>
<tr>
<td>• Results</td>
<td>12</td>
</tr>
<tr>
<td>• Discussion</td>
<td>10</td>
</tr>
<tr>
<td>• References</td>
<td>4</td>
</tr>
<tr>
<td>Understanding</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

VERY IMPORTANT

PLAGIARISM:
The University of Puget Sound considers falsification of data or attempting to get credit for an experiment that you did not do a violation of academic honor equal in seriousness to plagiarizing a paper or cheating on an exam. This may seem rigid but actually reflects the standard of established scientists in every field. A hallmark of good science is honestly and accurately reporting results. Fabrication of results, using data that you did not personally obtain within your lab group, and/or plagiarizing the laboratory manual or another student’s lab report is a very serious offense and will be dealt with as academic dishonesty and appropriate action will be taken, possibly including the assignment of an F for the course. Because we sometimes forget the subtleties about what constitutes plagiarism, we insist that you each review the definitions of plagiarism in The Logger. Also refer to pp. 18 - 19 in McMillan or page 24 in Knisely.