

Bioengineering 6000 Term Paper

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April 16, 2012

The goal of the Bioengineering 6000 semester project is to integrate material we cover in class with primary literature to describe the response of the body to a specific set of extreme external conditions.

The *Nova* video about Everest mountaineering illustrated how the body responds to external (and internal) challenges with a multifaceted set of changes, some long term, some short term. While we know some of the physiology behind these changes, there are many open questions, especially when it comes to predicting how individual organisms will respond. We may understand the nature of the response when it occurs, but not be able to predict which of a variety of possibilities will actually occur.

Topic Choice

For the project, please select a topic based on the following constraints:

1. Identify a type of external physiological stress and describe how the body responds to that stress.
2. Try and find a stress that elicits a response involving more than one system, *e.g.*, both the cardiovascular and respiratory or respiratory and renal systems.
3. Provide not only a summary of the known responses, but also try and find one or more specific aspects of the response that are not well known.
4. Identify a topic that you can describe and then, using primary literature, explain the current state of knowledge and the approaches researchers currently use to seek answers.
5. Specific examples of stresses include altitude, underwater, extreme heat and cold, and different types of exercise.

Outline

In order to guide you through the development of the projects, I would like to see an outline of the report during, by the deadline posted on the web site (and Canvas).

The outline is mandatory and please use it well to formulate your plan for approaching the topic. In some cases, we will iterate on the outline until it is suitable.

Paper Format

Use the format of the *Nova* video as an example of how to present the information and the questions.

1. **Introduction:** Start with an outline of the condition of the stress, describing what is special and challenging about this stress.
2. **Background:** Then describe in overview fashion what we know about the physiology of the response to this stress, highlighting particular problem areas where our knowledge is inadequate.
3. **Methods:** Then describe some experimental approaches you find in the literature to answer some of these outstanding questions.
4. **Results:** Describe the data from the resulting experiments and how those data modify or enhance the state of knowledge.
5. **Discussion:** Integrate and discuss the results you have found and identify some themes that emerge. Make sure to highlight the limits of current knowledge.

Intended audience: The audience for this paper should be fellow classmates—you can even exchange drafts to be sure that the level of description is appropriate. I expect you to start with textbook level descriptions but to eventually include material from primary literature sources when describing the current state of knowledge and the experimental approaches used. Primary literature means the scientific papers written by the scientists carrying out the research. *Scientific American* is not primary literature.

Length: The length of the report should be about 8-12 single spaced pages but do not pad! I will evaluate the clarity and conciseness of the prose and not reward the inclusion of rambling, unrelated material. Include only the necessary material to explain the physiology and the science assuming a reader with a graduate student level of knowledge of physiology, *i.e.*, yourselves at the end of this course.

Writing tips: Writing is a technical skill like any other and requires guidance and practice. There are some general tips on this web site so this is at least one place to start. There are also specific suggestions for this paper on the Class Web Site.