

Massachusetts Institute of Technology
Biological Engineering Division
Department of Mechanical Engineering
Department of Electrical Engineering and Computer Science

2.797/20.310/3.0536.024, Fall 2006
Molecular, Cellular & Tissue Biomechanics

Term Paper Plans

Issued: 11/7/06

Due: 11/16/06

This assignment is to formulate plans for your term paper. Please hand in 11/16/06 in class: (a) a tentative title; (b) a tentative list of references that will form the basis for your critical review or your short proposal; (c) a short abstract summarizing your topic and how you will approach it. (For a Short Proposal, provide in (c) a summary of the aims or objectives of your proposed research.)

You will, of course, still have the flexibility to modify or add to your choice. This assignment is to help you get started and to stimulate discussion of the suitability of a given topic.

Please consider all aspects of the course in making your selection, even those that might be taught later on in the term.

TERM PAPER DUE: 12/8/06

FORMAT: Two alternatives (MAXIMUM length = 5 pp single-spaced):

1. Write a **CRITICAL REVIEW** either of a single paper or a sub-field of biomechanics.

You can choose one of two approaches for your Critical Review.

a) Single paper critique. In this case, you should provide a brief summary of what was done and presented in the paper, but a large part of your paper should be comprised of your critique of the work, and your suggestions for future research that would further advance the field. You should provide enough of a summary so that we can see that you understand what was done (experiments or theory) and that you appreciate the main contribution the authors have made to the field. If there are shortcomings in the paper, you should be sure to explain them and described how these might have been avoided or how they might be corrected in future studies.

b) Review of a sub-field in biomechanics. The second alternative is to read and review up to 5 papers in a particular sub-field (e.g., the role of protein conformational change in force sensing by cells) and write a comprehensive review. In this review, you should define the current state of understanding, identify the important questions that remain, and suggest ways in which the field can make progress on these critical questions. (We will hand out a reading list with some suggestions and examples of papers that you might find useful and interesting, but you are welcome to search for any

others as well). The goal is to try and get an up-to-date review of the subjects as it currently stands and emphasize the outstanding questions that need to be addressed in the field.

The emphasis in either case, is on your critical analysis and your original thinking. For (a), consider questions such as: What did you like about the paper? In what ways was it deficient? What important questions were not addressed? For (b): Where is the field headed? What are the critical impediments to progress? What advances might you expect to see in the next 10 years? A paper that simply repeats or summarizes the literature without a critical assessment will not receive a top grade.

Maximum length, excluding title page, and reference list: 5 pages.

2. Write a **SHORT PROPOSAL-NIH Style** on any biomechanical subject, using the guidelines that follow (you might find some of the papers from the reading list useful).
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Hints For Writing Short Proposals:

The format for the proposal should be as follows. Include a cover page with your name and the title of your proposal. This page will not be distributed to the “reviewers.” The main body of the proposal will begin on the next page. The page limit for the main body of the proposal (excluding the title page and references, but including everything else) is 5 pages. Please number the pages of your proposal but do not put your name on any page except the cover page. The body of the proposal should be organized into the following sections:

A. Summary Page: Roughly 150 words. Describe briefly what question you propose to study, why it is important, and what you plan to do. Include the title again at the top of this page. (Not included in the 5 page limit.)

B. Background and Significance: This section gives the reader an introduction to the problem that you propose to study. It should briefly summarize the key ideas in the field and build up to the specific questions that you will pose. *Make sure you choose an interesting problem* – grants in the real world are penalized harshly if they simply attempt to cross the T’s and dot the I’s of previous work. Suggested length: ~ 1 page.

C. Specific Aims: List the two or three specific questions or hypotheses that you will test. State the aims in as direct and simple a manner as possible. This section should be short (one to two sentences for each aim) and very clear. Suggested length: ~ 1 page.

D. Methods: This is the meat of the proposal in which you describe exactly what you propose to do, how you would do it, what results you might obtain, how you would interpret those results, and what pitfalls or problems might present difficulties in your approach. Here are some other (potentially relevant) issues that you might discuss: Are there any technical difficulties that might make your approach impractical? Do you have a backup plan if things go wrong? Are there alternative interpretations? If so, is there a follow-up study that could disambiguate the interpretation?

You can organize this section any way you like, however, you should certainly lay it out according to your specific aims. Have one subsection on the first specific aim, and so on. In each of these subsections, be specific enough so that we will understand what you are planning to do. Suggested length ~ 3 pages.

References: List references that document your point in all the previous sections.

There is no need to provide a summary or conclusion at the end of your proposal. You may, however, want to include a brief section called “Future Directions” in which you explain where this work might lead in the future, and what further issues could be addressed once you know the answers to the questions at hand.

Remember a good grant communicates to the reviewers clearly and simply what you are planning to do and why it is important. Assume that the reviewers are looking for excuses to reject your proposal.

Reviewers in the real world get annoyed: (1) if they cannot understand you; (2) if you pretend that something will be easy when it may actually be difficult; (3) if you try to claim that some result(s) will be conclusive when there are other possible interpretations.

Any of the instructors would be happy to provide a list of references if you need help in choosing a topic and getting started.

REMINDER: FINAL EXAM, TUESDAY, DEC. 19, 9:00AM – 12:00NOON