**BE.430/2.795/6.561/10.539/HST.544**

# Midterm

**Handed out: Friday Oct. 28**

**Paper Due: Tuesday Nov. 10 by 5pm**

# MIDTERM ASSIGNMENT

**Paper:** Ramirez, P. et al. "Synthetic nanopores with fixed charges: An electrodiffusion model for ionic transport." *Physical Review E*, 68:011910, 2003.

**Assignment:** The global objective is to read, understand, and provide a detailed critique-review of the journal article in the form of a paper. The paper is to be no more than 20 pages in length, single spaced, including any pasted-in figures, graphs, etc that you may wish to generate, as well as a bibliography listing any additional references that you may wish to quote or consult.

Each paper will present the combined efforts of a team of 3 people; on your cover page, please list the three co-authors. Each Team can "assign" each of its members to perform specific tasks (e.g., (a) to understand and critique the "bio"-content of the article, (b) to check-critique the transport formulation, (c) to check-critique numerical simulations if you think that's necessary, etc.)

You should first read and review the paper as if you were asked by a journal editor to provide a review of a manuscript. In such a case, you would just list strengths and weaknesses of the manuscript, and additionally provide comments and suggestions for improvement where necessary.

For your Midterm paper, we ask you to expand and provide a more in-depth analysis. Your paper should include:

(1) A <u>Background</u> section (length ≤ 1 page) that summarizes the biological problem being addressed, its relevance and/or importance to physiology or human health.

(2) A <u>Summary and Critique of the Mathematical Model</u>: first, describe the modeling approach and the general methods used; then give your opinion of the strengths and weaknesses of the approach and modeling results; are there any fatal flaws?

(3) <u>Comparison of model to experimental data</u>: Has the proposed model been tested? Have previous, related models been compared to experiments? How do you (or the authors) know whether the model is predictive under a wide range of appropriate conditions?

(4) <u>Improvements</u>: Do you think the paper can/should be modified or improved? How so? Are there additional analyses that you can propose and/or carry out that would lead to a more substantial conclusion? Are there additional experiments that you would prose that would provide a better test of the model under relevant conditions?

(5) <u>Your summary recommendation</u>: If you received this document from a journal editor as a manuscript for a review, what would be your recommendation? As a document that represents work supported by the National Cancer Institute, if this paper were included in the Progress Report section of an NIH grant renewal proposal, and you were on the Study Section, how would you describe the paper in your proposal review?

**In addition, please note that the material covered in this paper overlaps with that in Problem 3 of Homework Set #5 (i.e., Prob 2.7.1). We will therefore <u>NOT require that you hand in 2.7.1</u>. However, we strongly recommend that you read and understand sections 2.6 and 2.7 of the Grodzinsky text as was assigned in P.S. 5 in order to compare and contrast with the approach taken in the Midterm Paper.**