

Problem/Discussion Set for Molecular Mathematical Biology

1. **Problem 1.** Read and come prepared to discuss the following excerpts:
 - (a) The Introduction (and Table of Contents) of *Mathematical Biology* by Nicolas Rashevsky;
 - (b) “The usefulness of mathematical models in biology” from *Conversations on Mind, Matter, and Mathematics* by Jean-Pierre Changeux and Alain Connes;
 - (c) Chapters 3 and 8 of *Making Sense of Life* by Evelyn Fox Keller; and
 - (d) “Can a biologist fix a radio?—Or, what I learned while studying apoptosis” by Yuri Lazebnik.
2. **Problem 2.** What are the roles that models play in biology? Are these roles different than in physics or engineering? Does the very idea of “what constitutes an explanation” for some phenomenon differ in the various fields? (And how do physics and engineering differ from each other?)
3. **Problem 3.** If the roles played by modeling/mathematics are different among the fields, how and why are they different?
4. **Problem 4.** How do the models presented by Turing, van Dassow et al., and Yuh et al. differ in their overall purpose and approach? What do the authors regard as the value of their work? What do you regard as the value of each model? Did Keller’s discussion of these models change your thinking/assessment of them?
5. **Problem 5.** Keller describes how most biologists have historically had a very negative view of “mathematical biology” and how this might be changing. Do you think a similar tension has existed/does exist in the auditory field? Give examples when possible.