AMATH 410/510
Finding a paper on which to base your project

Know what life sciences field you're most interested in already? Time to find a paper that uses a dynamical model to explore it. You are after a paper using one of the classes of models we'll cover in class:

1. Discrete-time "map" models
2. Markov chain, or stochastic "map" models
3. Differential equation models (including stochastic differential equation models)

How do you find it? Or what if you don't know what area you want to work in? Talk to us, search via the web of science database below, or check out the list of of suggested papers below.

- Find articles on topics of interest via searching the web of science: linked from http://www.lib.washington.edu/types/databases/
- Access articles via http://www.lib.washington.edu/types/ejournals/

How to find a paper:

- A superb place to look for these papers is in the references section for each chapter of our textbook, Ellner and Guckenheimer (E+G).
- Some example papers and topics from Ch. 2 are below, to give you an idea of what to look for in this and any of the later chapters.
  - Easterling et al, 2002 (citation given on p. 29 of E+G).
  - The papers cited in section 2.6 of E+G: exploring elasticity and other questions.
  - The papers cited in section 2.7.2 of E+G: density dependence.
- Other topics:
  - **The Hodgkin-Huxley Model of a spiking neuron.** Hodgkin and Huxley, A quantitative description of membrane current and its application to conduction and excitation in a nerve. Journal of Physiology 117: 500-544. **Also see, Lab Manual section 11, where MATLAB starting code is given.**
  - **Simple Model of Spiking Neurons.** IEEE Transactions on Neural Networks (2003) 14:1569- 1572. Also see link to paper at **http://vesicle.nsi.edu/users/izhikevich/publications/spikes.htm , where MATLAB starting code is given.**
  - **Statistical models for gene network architectures.** Network motifs in the transcriptional regulation network of Escherichia coli. Shai S. Shen-Orr, Ron Milo, Shmoolik Mangan, Uri Alon. Nature Genetics Volume 31, 2002.
  - **Computing neural networks** Proc. NatL Acad. Sci. USA Vol. 79, pp. 2554-2558, April 1982. Neural networks and physical systems with emergent collective computational abilities. J. J. HOPFIELD

- **Dynamics of Infectious Disease** A Tale of Two Futures: HIV and Antiretroviral Therapy in San Francisco, S. M. Blower, H. B. Gershengorn, R. M. Grant, 28 JANUARY 2000, VOL SCIENCE.
- **Dynamics of Infectious Disease II** Many superb references are given in section 6.8 of E+G!
- **Agent-based models** Choose a paper from sections 8.1-8.5 of E+G. Note that some useful starter MATLAB code is given in the textbook itself in these sections.

MORE EXCELLENT SUGGESTIONS, from Motoki Wu. These papers and some of the above can be found by typing `http://www.amath.washington.edu/courses/410-winter-2009/lectures/` into a browser.

- Hastings 1991 - Looks a predator prey models generalized to 3 dimensions. The prey-predator-predator equations get cool looking chaotic dynamics not seen in 1 or 2 dimensions. You can change the assumptions of the model, say creating equations of prey-prey-predator or prey-predator-super predator to see different chaotic dynamics (and forces the student think about functional forms of their interactions).
- Hanski 1997 - This is one of the many metapopulation papers by Hanski. You can simulate data of n populations, and take equation (1) to see what happens given a colonization rate and extinction rate. One can go deeper and use a more complex function for colonization and/or extinction rate to see what the dynamics are. The dominant eigenvalue is useful in assessing population persistence. Gotelli 1999 is another useful paper as an application to salmon metapopulations (less theoretical).
- Salinger 2006 - Another paper with discrete models. It is a bioenergetics model on salmon and how it is affected by the environment. The data can be simulated from the table.