Seminar in Biomathematics
(BSC 420.36 – Spring 2012)

INSTRUCTOR:	**Steven Juliano**	E-MAIL:	**sajulian@ilstu.edu**
OFFICE:	**335 FSA**	PHONE:	**82642**
OFFICE HRS.:	**TBA**	MEETING:	**5:00PM Tuesday, FSA 129**
WEB PAGE:	**http://bio.illinoisstate.edu/sajulian/**		

CONTENT. As a seminar in Biomathematics, the breadth of topics that we might cover is great. Because I am an ecologist and evolutionary biologist, I encourage people to choose topics in that general area, however, any topic related to application of mathematical tools and techniques to biology could be acceptable. Because I am a biologist and this seminar is run in biology, it is of primary importance that the papers and biological questions covered be important and generally significant from a biologist's perspective. An important secondary criterion is that some level of mathematical sophisitication is involved in the papers we are to discuss. Papers addressing questions via dynamical or statistical models, or via novel statistical applications, would be suitable. In general, it will **not** be suitable to choose papers that make use of standard statistical techniques (however elaborate) for data analysis. We want something more innovative than that. My main criterion for approving your choice of papers is whether your choice seems to have sufficient conceptual content so that the papers and topic will be broadly interesting, and sufficiently sophisticated mathematical applications. I have appended a list of recent papers that I have encountered that may be of some interest.

SEMINAR STRUCTURE. Seminar will consist of readings from the primary literature, each led by one student. Each discussion leader will be responsible for giving a short (10 minute) introduction to the discussion, and providing a short (1 p.) critique of the paper that will provide direction of discussion. **Leaders should lead the discussion not lecture.** Other participants should come prepared to discuss the papers we have read.

Leaders will provide the group with an electronic copy of the paper(s) for discussion **one week in advance of our meeting**. **You must have my approval for the paper you have chosen,** so see me early on if you have a paper in mind. I can make suggestions of good recent papers. If you cannot come up with an electronic copy see me. If all else fails, get me a hard copy and I will have it photocopied and distributed. Leaders will e-mail the 1 p. critique to me and to all participants (I will provide all of you with email addresses) **on the Monday before our meeting**.

Your grade will be determined by both your success in leading the discussion (80%), including preparation, clarity, evidence of understanding, quality of questions posed, and quality of your written critique, and by your participation in discussion and attendance when you do not lead (20%). Note that this arrangement means you **cannot** manage an A in this seminar if you do not participate in discussions. I will provide feedback to discussion leaders following their presentations.

The schedule:

DATE	DISCUSSION LEADER
17 January	Scheduling
24 January	Teresa Filshtein
31 January	Bethany Evans
7 February	April Campen
14 February	Craig McKenzie
21 February	***SAJ away – no meeting***
28 February	Justin Hickey
6 March	Eric Leung
13 March	***Spring break – no meeting***
20 March	Ozan Sonmez
27 March	Hazel Ozuna
3 April	Sara Leigh
10 April	Travis Mitchell
17 April	Jian Liu (Gaga)
24 April	
1 May	

Competition and Predation

Abbott, K.C., Greg Dwyer. 2008. Using Mechanistic Models to Understand Synchrony in Forest Insect Populations: The North American Gypsy Moth as a Case Study. The American Naturalist 172:613–624.

Adler, P.B., John M. Drake. 2008. Environmental Variation, Stochastic Extinction, and Competitive Coexistence. The American Naturalist. 172:E186–E195.

Becks, L., Hartmut Arndt. 2008. Transitions from stable equilibria to chaos, and back, in an experimental food web. Ecology, 89:3222–3226

Camposa, D.,Vicenç Méndezb, Vicente Ortega-Cejas. 2008. Lattice Models for Invasions through Patchy Environments. Bulletin of Mathematical Biology 70:1937–1956

Fox, J.W., David A. Vasseur. 2008. Character Convergence under Competition for Nutritionally Essential Resources. 172, The American Naturalist 172:667–680.

Giliolia, G., Sara Pasqualib, Fabrizio Ruggeri. 2008. Bayesian Inference for Functional Response in a Stochastic Predator–Prey System. Bulletin of Mathematical Biology 70:358–381

Gravel, D., F. Guichard, & ME Hochberg. 2011. Species coexistence in a variable world. Ecology Letters 14:828-839

Lingle, S., Alex Feldman, Mark S. Boyce, W. Finbarr Wilson. 2008. Prey Behavior, Age-dependent Vulnerability, and Predation Rates. The American Naturalist. 172:712–725.

Lockwood, D.R., Alan Hastings, Louis W. Botsford. 2002. The Effects of Dispersal Patterns on Marine Reserves: Does the Tail Wag the Dog? Theoretical Population Biology 61:297–309

Logan, J. D. 2008. Phenologically-Structured Predator-Prey Dynamics with Temperature Dependence. Bulletin of Mathematical Biology 70: 1–20

McGhee, J.D., Jim Berkson, David E. Steffen, Gary W. Norman. 2008. Density-Dependent Harvest Modeling for the Eastern Wild Turkey. The Journal of Wildlife Management 72:196-203

Noonburg, E.G., J.E. Byers. 2005. More harm than good: when invader vulnerability to predators enhances impact on native species. Ecology 86:2555-2560

Okuyama, T. and BM. Bolker 2007. On quantitative measures of indirect interactions. Ecology Letters 10:264-271.

Disease dynamics

Adler, F.R., Jessica M.C. Pearce-Duvet, M. Denise Dearing. 2008. How Host Population Dynamics Translate into Time-Lagged Prevalence: An Investigation of Sin Nombre Virus in Deer Mice. Bulletin of Mathematical Biology 70: 236–252

Dwyer, G., Jonathan Dushoff, Susan Harrell Yee. 2004. The combined effects of pathogens and predators on insect outbreak. Nature 430:341-345

Esteva, L., Cristobal Vargas. 2000. Influence of vertical and mechanical transmission on the dynamics of dengue disease. Mathematical Biosciences 167:51-64

Hartemink, N. A., S. E. Randolph, S. A. Davis, J. A. P. Heesterbeek. 2008. The Basic Reproduction Number for Complex Disease Systems: Defining R_0 for Tick-Borne Infections. The American Naturalist. 171:743–754.

Hsu, S-B., Ying-Hen Hsieh. 2008. On the Role of Asymptomatic Infection in Transmission Dynamics of Infectious Diseases. Bulletin of Mathematical Biology 70: 134–155

Williams, P.D.. 2012. New insights into virulence evolution in multigroup hosts. American Naturalist 179:228-239

Applications of fractals

Gamarra, J. G. P., F. He. 2008. Spatial scaling of mountain pine beetle infestations Journal of Animal Ecology 77:796–801

Hui, C., Melodie A. McGeoch. 2008. Does the self-similar species distribution model lead to unrealistic predictions? Ecology, 89:2946–2952

Jovani, R., Jose´ L. Tella. 2007. Fractal bird nest distribution produces scale-free colony sizes. Proceedings of the Royal Society. B. 274, 2465–2469

Kaspari, M., Michael Weiser. 2007. The size – grain hypothesis: do macroarthropods see a fractal world? Ecological Entomology 32:279–282

Food webs

Bascompte J.2009. Disentangling the web of life. Science 325:416–419

Lafferty, KD and JA. Dunne. 2010. Stochastic ecological network occupancy (SENO) models: a new tool for modeling ecological networks across spatial scqales. Theoretical Ecology 3:123-135