**Department of Ecology & Evolutionary Biology,**
**University of Tennessee, Knoxville**

**Exemplar Research Questions for Masters and PhD Studentships**
**Fall 2015 Entry**

The following list provides some examples of topics on which faculty in Ecology and Evolutionary Biology at University of Tennessee, Knoxville, would be interested in recruiting graduate students for entry in August 2015.

This list is not exhaustive – indeed, far from it. There are other faculty members who will be recruiting students in the Department. Also, the listed faculty members may recruit students who have different interests to those listed. But we prepared this list just to illustrate to prospective students some of the diversity of topics on which we envision recruiting, spanning conservation, macroevolution, global change ecology, molecular genetics, biology education and systematics, among many other topics.

**Faculty member: Paul Armsworth** (web.utk.edu/~parmswor)

1. How can large-scale efforts to conserve biodiversity or ecosystem services, which are led by governments or international nonprofits, most effectively complement bottom-up conservation efforts led by local communities?
2. Conservation organizations often have a hierarchical management structure – how effectively do hierarchies allocate resources to support conservation of biodiversity and ecosystem services?

**Faculty member: Joe Bailey** (web.utk.edu/~jbaile29/Default.html)

1. How will species range dynamics drive genetic divergence? How do feedbacks reinforce patterns of genetic divergence on the landscape?
2. Does contemporary evolution along the gradients of global change alter ecosystem function?

**Faculty member: Alison Boyer** (www.bio.utk.edu/boyer/index.html)

1. How are various remote-sensing derived vegetation phenology data related to citizen-science phenology efforts, and how can we combine them to better inform terrestrial biosphere models?
2. How have changes in land use and climate affected population dynamics, phenology, and conservation status of birds over the past 40 years?

**Faculty member: Ben Fitzpatrick** (web.utk.edu/~bfitzpa1)

1. What is the coevolutionary relationship between turtles and Salmonella?
2. What determines the form of hybrid zones between salamanders in the Great Smoky Mountains?

**Faculty member: Jim Fordyce** (web.utk.edu/~jfordyce)

1. How does among population variation in plant phenotype affect population structuring of herbivores?
2. What role does host breadth play in range size and diversification rate of herbivorous insects?

**Faculty member: Sergey Gavrilets** (www.tiem.utk.edu/~gavrila)

1. How can we understand better theoretically the origins of news species and the links between micro-evolutionary processes and macro-evolutionary patterns?
2. How did human social complexity evolve and what are the implications of our evolutionary past for our social behavior?

**Faculty member: Mike Gilchrist** (eeb.bio.utk.edu/peopletwo/michael-gilchrist)

1. How do assembly costs and translation errors shape selection on codon usage and how do they play themselves out in the face of biased mutation and genetic drift?
2. Some pathogens replicate intracellularly within hosts and move between host cells through budding or bursting. How does the rate of intracellular replication affect the rates of immune response clearance by the host? How, in turn, does this lead to changes in the survival of the host and transmission of the pathogen between hosts?

**Faculty member: Lou Gross** (http://www.tiem.utk.edu/~gross/)

1. How are biological processes integrated across scales and levels of biological resolution from within organism level to those operating at population/community/landscape levels?
2. How do we effectively utilize mathematical and computational methods for spatial control – what to do, where to do it, when to do it, and how to assess the resulting solutions – for problems in epidemiology, invasive species management and conservation biology?

**Faculty member: Charlie Kwit** (www.charleskwit.com)

1. What are the effects (actual and predicted) and ramifications of land-use and climate change, management, and disturbance on biodiversity in natural, managed, and agricultural settings?
2. What important roles do animals play in the seed dispersal process in animal-mediated seed dispersal systems?

**Faculty member: Brandon Matheny** (www.bio.utk.edu/matheny/Site/Home.html)

1. Why are there so many species of fungi? What traits promote diversification and evolutionary radiations in fungi?
2. Why are there so many species of ectomycorrhizal fungi in temperate areas of the globe in contrast to the tropics? Are ectomycorrhizal fungi ancestrally tropical in distribution?

**Faculty member: Gary McCracken** (email: gmccrack@utk.edu)

1. How do highly mobile predators (bats) track ephemeral and patchy resources (insects) in three dimensional space?
2. Why are some host species associated with a greater diversity of viral pathogens than are other host species?

**Faculty member: Brian O'Meara** (www.brianomeara.info)

1. How have plants evolved in response to global temperature change through time?
2. How would you develop a method for inferring species boundaries despite past migration?

**Faculty member: Susan Riechert** (email: sriecher@utk.edu)

1. What is the importance of behavior in adapting animal populations to different and changing environments?
2. What factors limit local adaptation to environmental context and why do weaker strategies persist?

**Faculty member: Ed Schilling** (www.bio.utk.edu/schilling)

1. What is the parentage of the presumed allopolyploid lettuces (Lactuca) in North America, how many species are present, when did they arrive from Eurasia, what has been the consequence of polyploidy for their biology and evolution.

**Faculty member: Beth Schussler** (www.bio.utk.edu/SchusslerLab)

1. How can biology programs enhance graduate student instruction of introductory biology courses?
2. How can introductory biology curricula be structured to enhance specific student learning outcomes such as nature of science, self-efficacy, and core biology concepts?

**Faculty member: Jen Schweitzer** (jenschweitzer.com)

1. What is the genetic basis for plant-soil linkages and feedbacks in a changing world?
2. Can phylogenetic history predict ecological traits and ecosystems services?

**Faculty member: Dan Simberloff** (eeb.bio.utk.edu/peopletwo/daniel-simberloff)

1. What are the direct and indirect effects of particular plant invasions? A direct effect might be shading, for example, or allelopathy, while an indirect effect might be changing the nutrient cycle (e.g., for instance, by being a nitrogen fixer) or the fire regime.
2. What are the non-target impacts of particular insects introduced for biological control?

**Faculty member: Randy Small** (web.utk.edu/~rsmall)

1. What is the role of polyploidy in governing the success (in terms of species richness) of plant lineages? Why are some polyploid lineages highly diverse, while others are not?
2. What can contemporary patterns of genetic variation within and among populations tell us about species boundaries and the process of speciation?

**Faculty member: Joe Williams** (eeb.bio.utk.edu/peopletwo/joseph-williams-jr)

1. What are the causes/consequences of diversification of reproductive traits in plants?
2. How does a particular reproductive trait, or set of traits, in a clade of plants develop and how does it contribute to diversification of the clade?