# Dissertation Committee Meeting Spring 2012

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## Contents



# 1 Meeting Outline (Max 2hrs)

- Overview of dissertation goal (5 min)
- List of requirements completed and to-do (5 min)

- Presentation of chapter outlines with discussion (1hr total, 15 min each)
- Other projects (5 min)
- Timeline (15 min)
- Discussion ...

# 2 Dissertation Summary

- Motivation for a network based approach:
  - Biotic interactions are frequenctly ingored when scaling ecological patterns
  - Species occur in complex communities of many species interacting in many ways
  - These complexities lead to potentially incacurate predictions and theory
- Interactions among species influence the dynamics of communities.
- Historically, ecologists have focused on pairs or triplets of species; however, organisms exist in multi-species communities where they interact with many species that also interact with many other species.
  - Overview of interaction studies (e.g. Lotka and Volterra)
- Although many ecologsists had acknolwedged the presence and implications of many species interactions in communities, Robert May (1972) introduced network theory as a means to formalize the treatment of the complexity of interactions in ecosystems.

  - Overview of Elton, Odum, MacArthur, Systems Ecologists (Patten, Ulanowicz, others)

- More recently ecologisits have embraced network analytical applications to food webs, mutualistic interactions and other interaction network structures in communities.

  - Overview of Cohen, Williams, Martinez and Dunne, Bascompte and Jordano, Rezende, Sinberloff and ????, Valiente-Banuet and ????, Vacher, Thebault and Fontaine

- Of primary interest is how network architecture contributes to functioning of communities, particulary stability (i.e. the propensity for the community to change over time).

- Research in the field of community genetics has shown that intrapecific variation in a foundation tree species can influence [1]:

  - community composition
  - tri-trophic interactions
  - community stability

- The primary questions of this work are:

  1. How does network architecture influence the spread of selection events through communities?
  2. How does intraspecific variation (phenotypic and genetic) influence interaction network architecture?

# 3 Projects

1. REVIEW– Ecological and evolutionary interaction network exploration (COMPLETED: Lau et al. 2010)

2. METHODS– Evolution of ecological interaction networks: a Genes to Ecosystems simulation framework (TARGET: Ecological Modeling and Software)

3. SIMULATION– Network architecture influences evolution in ecological communities (TARGET: Evolution)

4. FIELD– Genotypic variation in a foundation tree species structure co-occurrence networks of lichen species (TARGET: PLoS One)

5. FIELD– Inter-species hybridization and genotypic variation influence the structure of plant-herbivore networks (TARGET: Oecologia)

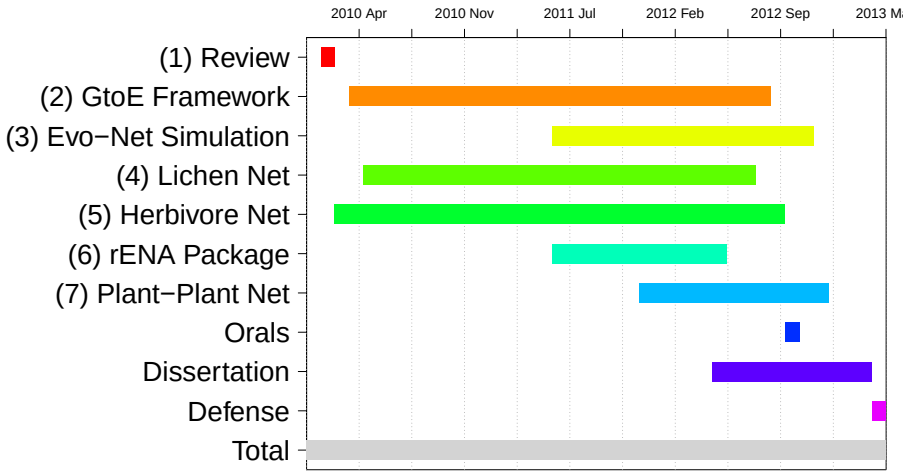
6. METHODS– rENA: Tools for Ecosystem Network Analysis in R (TARGET: Ecological Modeling and Software)

7. META-ANALYSIS– Phylogenetic structure influences co-occurrence network architecture in alpine plant communities (TARGET: Nature)

8. COLLABORATION– Directional selection by a non-native herbivore alters arthropod community composition and co-occurrence network structure (IN PREP)

9. COLLABORATION– Intraspecific variation in a foundation tree species influences endophyte community composition and interactions (IN PREP)

## 3.1 Timeline




# 4 Requirements

## 4.1 Forms/Paperwork

- **April 2012** Assessment, prospectus review and course plan approval

  Bio form 5 - PhD Program Form

  Bio form 10 - Progress/Funding Assessment

  Bio form 13 - Teaching requirement documentation

  Bio form 14 - Scientific paper presentation documentation

- **October 2012** Prospectus defense and oral exam

  Bio form 7 - Written exam results

  Bio form 10 - Progress/Funding Assessment

  Bio form 8 - Oral exam results REPORT

Bio form 8.11a - Oral exam assessment/questionaire

Bio form 9 - Prospectus approval form

Bio form 11 - Oral exam results

Bio form 10 - Progress/Funding Assessment

- **May 2013** Final dissertation defense

  Dissertation draft

  Dissertation Defense Scheduling Form

  Graduate college final oral exam form (can only be accessed by advisor)

# 5 References

# References

[1] Thomas G. Whitham and et al. A framework for community and ecosystem genetics: from genes to ecosystems. *Nature Reviews Genetics*, 7:510–523, 2006.