**The Evolution of Ecological Networks**

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The dynamics of species interactions are fundamental to the evolution of biodiversity. Charles Darwin in “Origins” described communities as “tangled” banks, and extensive research has shown empirically that species interactions contribute to evolutionary dynamics in ecosystems. Recently, the advances in the field of community genetics have begun to put complex communities into an evolutionary framework. Historically, evolutionary investigations of species interactions have focused on one or a few species; however, the complexity arising from the size of communities and indirect effects among species suggest that a purely reductionistic approach is unlikely to yield comprehensive insight into species rich communities.

Network theory was developed over 300 years ago to address problems of relationships among discrete entities. Although network theory has been used in ecosystem science for over half a century, it is only recently that it has been used to address eco-evolutionary questions. Now the application of network theory to studies of ecological interactions has begun to shed light on evolution in a community context. Combining this approach with significant advances in genetic methods, such as whole genome sequencing of foundation species (i.e., species that define the structure of communities by modulating and stabilizing local conditions in ecosystems) has the potential to provide insight into many previously un-approachably complex questions in ecology and evolutionary biology. The goals of this dissertation are to: 1. Explore how real communities evolve as networks of ecologically connected species, 2. Integrate community genetics and network theory, and 3. Develop useful theoretical and computational methods for applying network methods.