Morphological and Genetic Evidence of Hybridization in Local Oak Trees, *Quercus* section *Lobatae*

Student Presenter: Caroline Bresnan  
Project Advisor: Amy Frary

Oak trees are well known for frequent and extensive hybridization, which challenges the biological species concept.¹,² Some evidence suggests that hybrid trees are more likely to grow in disturbed environments where the established plant species have been removed whether by a storm, forest fire, or human activity.¹ In the late 19th century, Prospect Hill on Mount Holyoke’s campus was almost completely deforested, but a variety of trees have now grown back including four oak species – *Quercus palustris*, *Q. rubra*, *Q. velutina*, and *Q. coccinea* – which are all part of the red oak section (*Lobatae*).³ Previous research by Rose Keith ’11 indicated that some of the adult red oaks that repopulated Prospect Hill are hybrids.³ The goal of this research was to determine if the juvenile trees growing in this ecosystem are also the products of hybridization.

Twelve oak trees with diameters less than 30 cm were selected from Prospect Hill and around Lower Lake. PCR was used to amplify six microsatellite loci in the trees’ DNA. The microsatellite genotypes were then entered into the programs *Structure* and *DARwin*, which grouped the trees by their allelic similarity to purebred controls. Additionally, leaf samples were measured for physical traits like length, width, and leaf blade area.

Due to the small sample size, *Structure* produced widely fluctuating results depending on the settings, but some consistencies were still evident. Most specimens had high probabilities of belonging to two oak species, which would indicate hybridization. For example, six out of the twelve trees had similar probabilities of being both *Q. rubra* and *Q. coccinea*. Only two trees showed a consistent, strong association with a single population, *Q. palustris*. Although the results from *DARwin* generally supported *Structure*, the morphological data was not as clear. Trees growing in shade had broad leaves for absorbing more sunlight, but trees in sunny areas had distinctly lobed leaves. This morphological plasticity made it difficult to compare the sample trees and the purebred controls. Despite the ambiguity of the morphological analysis, the genetic data gives reasonable evidence that at least some of the young oaks on Prospect Hill are the results of continuing hybridization among the adult populations. Further research on this topic would benefit from increasing the number of trees and microsatellite loci to ensure more robust results from the genetic analysis.