Camp Evolution 2016 – February 21-25
Summaries of Lectures & Readings
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6) The evolution of combined versus separate sexes

The vast majority of flowering plants are hermaphroditic (cosexual) producing both male and female gametes and transmitting genes to the next generation as both maternal and paternal parents. There are several advantages to cosexuality, including reproductive assurance at low density, and shared reproductive costs associated with female and male reproductive function. However, a minority of species have abandoned cosexuality and populations of these species are composed of various combinations of female, male, and hermaphroditic plants. In this lecture I will discuss the various forms of gender dimorphism in flowering plants including dioecy (females and males), gynodioecy (females and hermaphrodites) and androdioecy (males and hermaphrodites) and the mechanisms responsible for their evolution and maintenance. I will discuss evidence for the gynodioecy and monoecy pathways to dioecy and argue that these pathways may not be as distinct as previously thought. I will also discuss comparative studies of dioecy aimed at determining the ecological and life correlates of separate sexes. The second part of my lecture will focus in detail on two case studies of the evolution of dioecy. In *Wurmbea* (Colchicaceae), a small genus of insect-pollinated geophytes native to southern Africa and Australia, dioecy has evolved on several occasions via the gynodioecy pathway. I will provide evidence that this evolutionary transition is associated with ecological radiation into stressful environments and shifts to inferior pollinator service. In *Sagittaria latifolia*, a widespread North American emergent aquatic, populations with both combined (monoecy) and separate-sexed (dioecy) plants are common. I will illustrate how this intraspecific variation can be exploited through crossing studies, common garden experiments on life-history traits, and marker gene analysis of selfing rates and inbreeding depression, to provide insights on the mechanisms favouring the spread of unisexuals in hermaphroditic populations. In common with many shifts to dioecy, the evolution of unisexuality in *Wurmbea* and *Sagittaria* is associated with the origins of sexual dimorphism, I conclude by discussing secondary sex characters in plants and the mechanisms responsible for their evolution.

Barrett, S.C.H. & Hough J. (2013). Sexual dimorphism in flowering plants. *Journal of Experimental Botany* 64: 67-82.

Barrett, S.C.H. & A.C. Case. (2006) The ecology and evolution of gender strategies in plants: the case of Australian *Wurmbea* (Colchicaceae). *Australian Journal of Botany*. The Turner Review No. 11 54: 417-433.

Dorken, M.E., J. Friedman, & S.C.H. Barrett (2002). The evolution and maintenance of monoecy and dioecy in *Sagittaria latifolia* (Alismataceae). *Evolution* 56: 31-41.