

Marina Caillaud Section 13

My main interest is in the genetics of ecologically important behaviors that affect organisms' interactions with their biotic environment. Considerable variation within species or between species has been described for traits such as feeding preferences and mating behavior. These traits have often been shaped by natural selection and became adaptations. My objective is to ultimately sequence loci underlying behavioral variation. I use Quantitative Genetics to map behavioral characters and Genomic tools to compare genome wide patterns of gene expression in alternative phenotypes. I currently have two projects.

Genetics of Host-plant acceptance in the pea aphid
(*Acyrtosiphon pisum*, Hemiptera).

Gene flow between populations of the pea aphid occupying closely adjacent fields of red clover and alfalfa is drastically restricted, due to strong host-plant choice (Via, 1991; Via et al, 1999a,b; Caillaud and Via, 2000). I use a functional genomics approach to identify transcripts associated with differences in plant acceptance. In 2007, we dissected 270 aphid heads, either specialized on alfalfa or clover. We extracted Total RNA then isolated mRNA, amplified this mRNA then labeled it with Cy3 (clover aRNA) and Cy5 (alfalfa aRNA). These samples were hybridized by the Cornell Microarray facility to 4x44K or 2x105K custom-made Agilent Arrays based on ESTs and Unigenes available from Aphid Base. We are currently analyzing the hybridization results with the R-package (Limma). We are also isolating mRNA from aphid heads of both host races for Solexa sequencing at the BRC. We will then look for SNPs that can be related to host-plant specialization. Collaborator: Sara Via (U. of Maryland).

Genetics of induced feeding preference in the tobacco hornworm
(*Manduca sexta*, Lepidoptera)

Manduca larvae raised on artificial diet are willing to accept as food a variety of plants but larvae raised on a *Solanaceae* (the host plant of this moth species in nature) for just a few days accept as food ONLY that plant or anything that has the plant chemical indioside D (Del Campo et al., 1999, 2003). We are currently comparing the RNA profile in taste sensilla of diet-raised and plant-raised moths using Microarray technology. In 2006-2007, we identified two cDNAs expressed only in the gustatory sensilla of *M. sexta*. One of them matched to antennal OBPs (Odorant Binding Proteins) sequenced in other moths, yet it is a novel OBP. We obtained the Full Length cDNA sequence of this OBP and used RNA-in situ hybridization to show that its expression was restricted to taste cells located on the mouthparts of *M. sexta* (Del Campo et al. *in press*). Collaborator: Marta Del Campo, Cornell University.