

AMANDA MELIN

How We Came to Our Senses: Dietary Ecology and Primate Sensory Evolution

My long-term research aim is to understand how primates use their senses to find and select foods, and how diet and habitat have shaped vision, olfaction, taste, touch and hearing over the course of primate evolution. All major hypotheses concerning primate origins and adaptive radiation hinge on the relationships among sensory systems, diet and activity pattern. To propel forward our understanding of primate foraging ecology, my research program over the next 5 years will integrate fieldwork with state-of-the-art methods in genomics and recent technology for measuring food properties on-site in primate habitats.

For the past 12 years I have studied the genetic basis of sensation in primates, their close relatives, and other mammals with diets and habitats similar to primates. Since 2011, I have co-directed longitudinal research on capuchin monkeys in Sector Santa Rosa, Costa Rica. My past research has revealed that colour vision variation impacts the feeding efficiency of monkeys for different foods. My collaborators and I have also shown that the genetic polymorphism underlying this colour vision variation is maintained through balancing selection. I now propose to advance this line of research by investigating whether colour vision variation leads to dietary niche divergence, thus lowering intragroup feeding competition. In addition, I will begin new investigations of the genomic basis of the senses of smell and taste in primates and their relatives, and how primates integrate vision with other senses to assess food edibility. In addition, using newly available technologies, I will measure the odours, colours, and mechanical properties of dietary foods. There is a growing recognition that non-visual senses are important to the foraging ecology of primates, including humans, yet little is known about the molecular evolution of these senses and how they are integrated during real-world tasks. By combining observations of wild monkeys for which I have detailed data on lifetime reproductive success, with comparative genomics, and portable equipment for measuring food properties, my research program is uniquely positioned to make major advancements in the field of mammalian sensory ecology. For decades, biological anthropologists have questioned whether primates “sacrificed” their sense of smell for better vision, what the earliest primates ate, when our ancestors shifted from a nocturnal to a diurnal niche, and the repercussions of this adaptive shift. By forging new transdisciplinary pathways, examining ecologically and phylogenetically relevant species, and conducting fieldwork at the longest-running primate field site in the neotropics, trainees and I will shed new light on these long-standing questions. This research will advance the fields of behavioural and molecular ecology in Canada by linking genotypes with phenotypes, foraging success, and fitness of wild animals.