

“Conservation Ecology and Wildlife Biology in the Age of Genomics”

In this seminar we seek to examine how advances in molecular biology and genetics are broadly influencing ecology and conservation. First we will explore historical underpinnings of natural history, the role ‘scientific natural history’ can play in biology, and how embracing molecular biology can improve ecology. We will examine the basics of DNA and PCR and explore various examples of the application of genetics to ecology including the effects of trophy hunting on a bighorn population’s gene pool; how a genetic change in a virus decimated an African lion population; and how the introduction of genes saved the Florida panther, to name a few. We also will consider advances in the use of genetic markers such as SNPs (single nucleotide polymorphisms) and microsatellites (highly repetitive DNA), and discuss alternative techniques and applications such as non-invasive sampling and the use of organism response as an early warning system for pollution. Finally, we will close with a focus on the evolution of man’s best friend, the dog. We will see how dogs originated, examine the similarities and differences between their genome and our own, and will discuss the promises genomics holds not only for ecology but for humanity as well.

1/23 - Week 1 – Introduction

1/30 - Week 2 – Scientific Natural History and its relationship to Conservation Ecology & Wildlife Biology

Schmidly, D. J. 2005. What it means to be a naturalist and the future of natural history at American Universities. *J. Mamm.* 86:449-456.

Greene, H. W. 2005. Organisms in nature as a central focus for biology. *TREE* 20(1):23-27.

2/6 - Week 3 – The Evolutionary Consequences of Trophy Hunting: An Example of Management Effects on Heritable Traits

Coltman, D. W. et al. 2003. Undesirable evolutionary consequences of trophy hunting. *Nature* 426:655-658.

2/13 - Week 4 – The Basics of DNA and PCR

Readings from Lodish et al. 1995. “Molecular Cell Biology”, 3rd Edition, W.H. Freeman & Co., New York.

2/20 - Week 5 – No Class (Desert Tortoise Research Council)

2/27 - Week 6 – Phylogeography and Dispersal: Understanding within and among population variation

Paetkau, D., G. F. Shields and C. Strobeck. 1998. Gene flow between insular, coastal and interior populations of brown bears in Alaska. *Molecular Ecology* 7:1283-1292.

3/6 - Week 7 – Landscape Genetics: Coupling landscape ecology and genetics to understand large scale processes

Manel, S., M. K. Schwartz, G. Luikart and P. Taberlet. 2003. Landscape genetics: combining landscape ecology and population genetics. *TREE* 18(4):189-197.

Schwartz, M. K., L. S. Mills, K. S. McKelvey, L. F. Ruggiero and F. W. Allendorf. 2002. DNA reveals high dispersal synchronizing the population dynamics of Canada lynx. *Nature* 415:520-522.

3/13 - Week 8 –No Class – Wildlife Conclave

3/20 – Spring Break

3/27 - Week 9 – Application of Non-invasive Sampling

Kohn, M. H., and R. K. Wayne. 1997. Facts from feces revisited. *TREE* 6:223-227.

Kohn, M. H., E. C. York, D.A. Kamradt, G. Haught, R. M. Savajot and R. K. Wayne. 1999. Estimating population size by genotyping feces. *Proceeding of the Royal Society, Series B, Biological Sciences* 266:657-663.

4/3 - Week 10 – Conservation Genetics: Rescuing the Florida Panther

O'Brien, S. J. 1994. A role for molecular genetics in biological conservation. *PNAS* 91:5748-5755.

Hedrick, P. W. 1995. Gene flow and genetic restoration: The Florida panther as a case study. *Conservation Biology* 9(5):996-1007.

4/10 - Week 11 – Emerging infectious diseases and their effects on Wildlife populations

Roelke-Parker, M. et al. 1996. A canine distemper virus epidemic in Serengeti lions. *Nature* 379:441-445.

4/17 - Week 12 – Canary on a chip – Ecological Genomics

Klaper, R. and J. A. Thomas. 2004. At the crossroads of genomics and ecology: The promise of a canary on a chip. *BioScience* 54(5):403-412.

Substitute: Riley, S.P.D. et al. 2006. A southern California freeway is a physical and social barrier to gene flow in carnivores. *Molecular Ecology*.

4/24 - Week 13 – Ecological Genomics, cont.

Stearns, S. and P. Magwene. 2003. The naturalist in a world of genomics. *American Naturalist* 161:171-180.

Thomas, M. A. and R. Klaper. 2004. Genomics for the ecological toolbox. *TREE* 19(8):439-445.

5/1 - Week 14 – The evolution of the domestic dog

Vila, C. et al. 1997. Multiple and ancient origins of the domestic dog. *Science* 276:1687-1689.

Savolainen, P., Y. P. Zhang, J. Luo, J. Lundeberg, and T. Leitner. 2002. Genetic evidence for an East Asian origin of domestic dogs. *Science* 298:1610-1613.

Lindblad-Toh, K. et al. 2005. Genome sequence, comparative analysis and haplotype structure of the domestic dog. *Nature* 438:803-819.