November 10th, 2010
The Science of Dogs: History, Genetics, and Psychology of Man's Best Friend

Introduction:

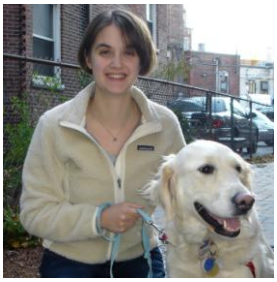
How did dogs as we know them come to be? How did ancient "proto-dogs" yield the wide variety of shapes, sizes, skills, and behaviors of modern dogs? In this lecture, we will discuss archaeological and genetic evidence about the origin of modern dogs from their canid ancestors, and the process of domestication. We will then discuss natural and artificial selection and the rapid radiation of modern dogs into breeds as different as chihuahuas and great danes, and briefly discuss what studying dog breeds can teach us about animal and human biology and behavior. Finally, we will delve into the special relationship that humans hold with dogs - how do we affect dogs, and how do dogs affect us?

We encourage you to ask questions of the speakers both during and after their presentations. After the lecture, there will be a brief tour of a Harvard University laboratory where you can see first-hand the equipment and tools that allow scientists to expand our knowledge about animal behavior.

Speakers:

Amanda Nottke is a 6th year student in the Biological & Biomedical Sciences PhD program, where she is studying the interplay between genomic packaging and DNA damage repair. Before moving to Boston, she attended the University of Oregon for her Bachelor's degree in Biology and then worked as a research assistant at Oregon Health & Science University. Due to her low tolerance for winter, she hopes to return to the West Coast sooner rather than later. Her extracurricular activities include blogging for SITN, planning her next trip overseas, and wondering about the identity of the vegetables in her local farm share.

Pan-Pan Jiang is originally from Toronto, Canada, and is now a 4th year graduate student in Organismic and Evolutionary Biology at Harvard. Her interests in science include conflict between the sexes, sex chromosomes, and speciation. Specifically, she studies how the Y chromosome influences the expression of hundreds of genes on non-Y chromosomes. In Pan-Pan's spare time, she likes to go on hikes, and always thinks about how much nicer it would be to have a dog for company on those hikes. She's pictured here with one of her other favorite animals in the world: the Asian elephant, one of only three living species of elephants left in the world.



Christine Kiely grew up in New York state and did her undergraduate studies at Johns Hopkins University in Baltimore, MD. She is now a Ph.D. student here at Harvard Medical School, using yeast as a model system to understand DNA organization and gene expression. Outside of lab, Christine likes to knit and crochet, cook, and, most of all, to spend time with her 3 ½ year old golden retriever, Tessie.

Glossary:

DNA (deoxyribonucleic acid) - A molecule that stores genetic information as a chain of smaller components (the nucleic acids A, T, C, and G) and codes instructions for how to build proteins.

RNA (ribonucleic acid) - A molecule that, like DNA, is a chain of smaller nucleic acids (A, U, C, and G).

Protein - Molecules composed of amino acids that are the machines for many of the cell's functions.

Mutation - A change in a nucleic acid or amino acid.

Central Dogma –

The unifying model for the transfer of genetic information. The Dogma states that genes, coded by DNA in a cell's nucleus, are copied into an RNA template during a process called transcription. The RNA template is then shuttled from the nucleus to the cytoplasm where additional cellular machinery decodes the information in the RNA molecule into protein.

Gene - Genes are units of heredity in living organisms, are composed of DNA, and are passed on to offspring.

Genome - The complete set of genes in an organism.

Genotype - The set of genes that an organism has that influence the phenotype, or trait, in question.

Phenotype - The physical manifestation, or observable traits, of the genotype. This happens by making either proteins or functional RNA from the genes encoded by the DNA. These functional proteins or RNA then achieve some work on the living organism and therefore produce the phenotype.

Natural Selection - The process by which genetic mutations that enhance reproduction become, and remain, more common in successive generations of a population while those that decrease reproductive success become less common. It follows from these facts: 1. Heritable variation exists within populations of organisms. 2. Organisms produce more offspring than can survive. 3. These offspring vary in their ability to survive and reproduce. 4. Those with traits best suited to survive the environment and reproduce pass on their genetic information to the next generation.

Artificial Selection - Intentional breeding for certain traits. This differs from natural selection in that mating is not random and that the selected trait might not increase reproductive fitness (number of offspring).

Darwinian Evolution - The change in heritable information from one generation of organisms to the next by the forces of natural selection. This theory was developed by both Charles Darwin and Alfred Russel Wallace.

For more information:

Psychology of Dogs: http://www.psychologytoday.com/blog/canine-corner
Dog Genome Information: http://www.ncbi.nlm.nih.gov/genome/guide/dog/
American Society for the Prevention of Cruelty to Animals: http://www.aspca.org/
The Humane Society: http://www.humanesociety.org/animals/dogs/

Next Week's Seminar: Star Power: New Ways to Harvest Energy from our Sun

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http://sitn.hms.harvard.edu