

Evolution, Dogs, Wolves and Diabie





Jack London
(1876-1916)



Biological Evolution=Descent with Modification

Mechanisms

1. Natural Selection

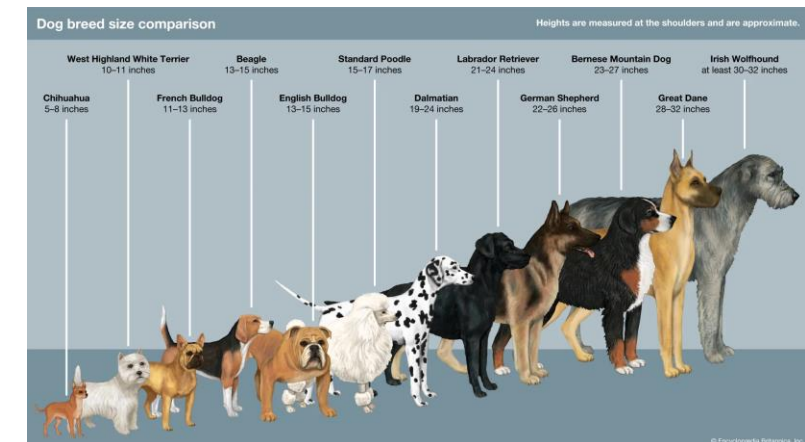
- No two individuals are the same. There is variation in populations.
- More are born than survive.
- Some variation increases the chance of survival.
- Some variation is heritable.
- Individuals with heritable traits that increase the chance of survival and therefore reproduction will leave more offspring than individuals who don't have these traits.
- More individuals in the next generation are likely to have these traits that increase the likelihood of survival and reproduction.

2. Genetic Drift

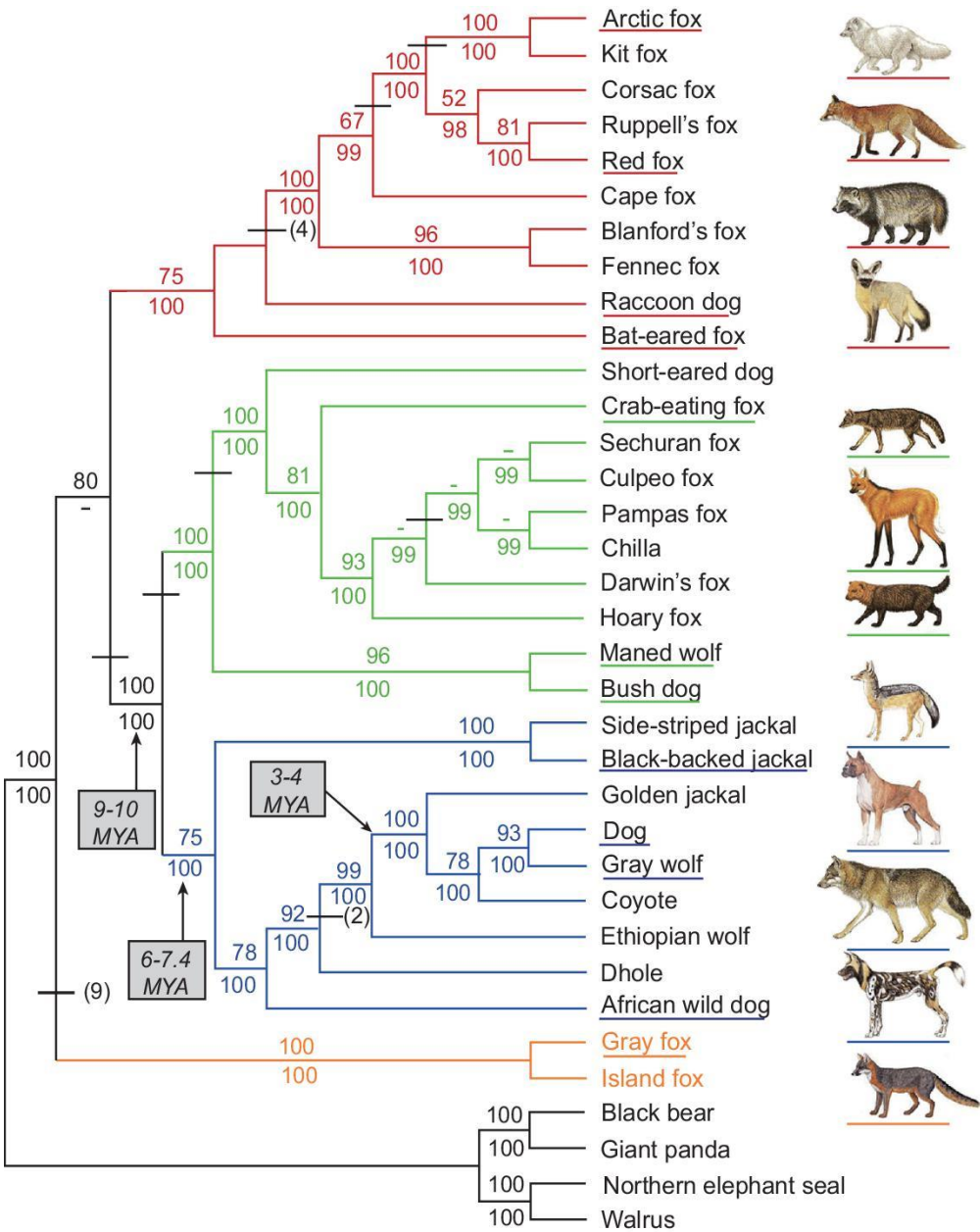
- Traits are eliminated from a population randomly.

3. Artificial Selection

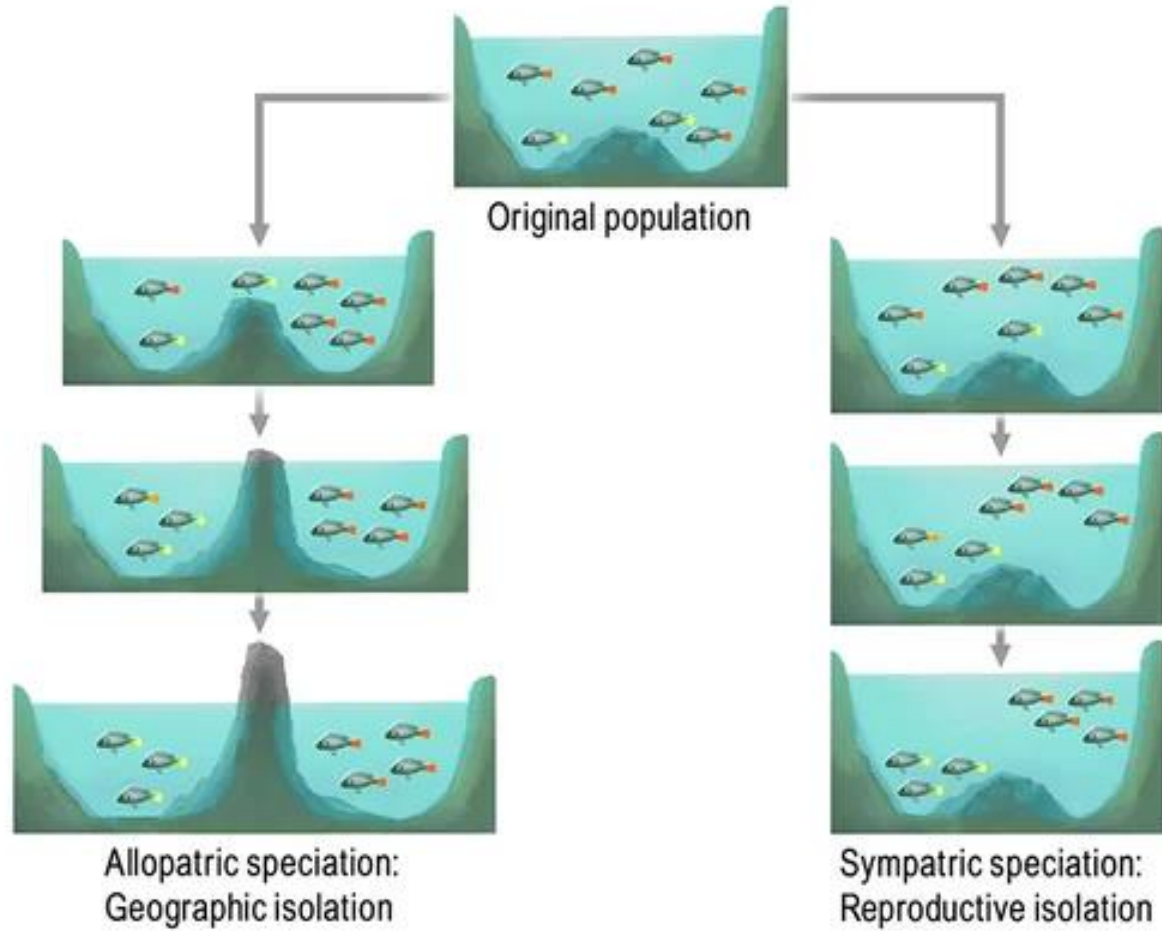
- Result of selective breeding to increase the frequency of desirable traits.



Phylogenetic tree shown is based on 15 kb of exon and intron (DNA) sequence. Branch colors identify the red fox-like clade (red), South American clade (green), wolf-like clade (blue), and the gray and island fox clade (orange).



Types of Speciation



How Wolf became Dog

“You can't have an animal—a large carnivore—living with you and behaving like that,” she says.

“You want an animal that's like a dog; one that accepts ‘No!’” Zsófia Virányi

Wolves were broadly distributed geographically, across the entire northern hemisphere, and ecologically, found in many different type of habitats. Humans encountered wolves as they spread across Europe and Asia.

Dogs did not evolve from gray wolves, but the two sister taxa shared a common ancestor which is now extinct.

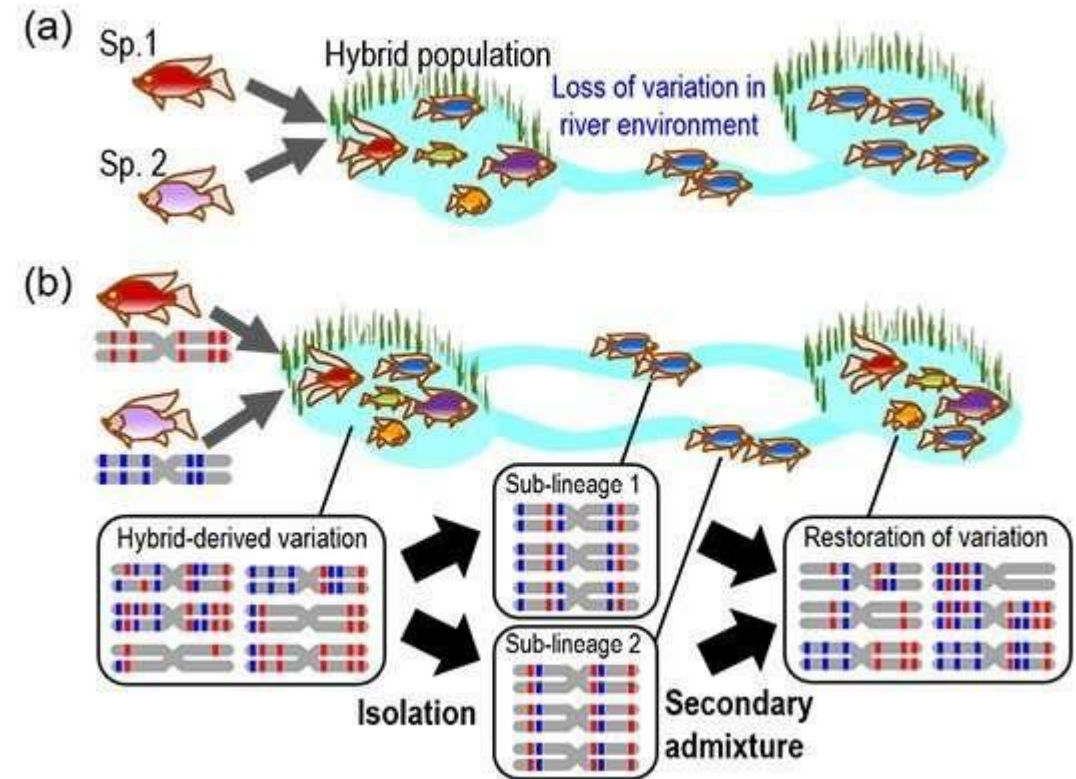
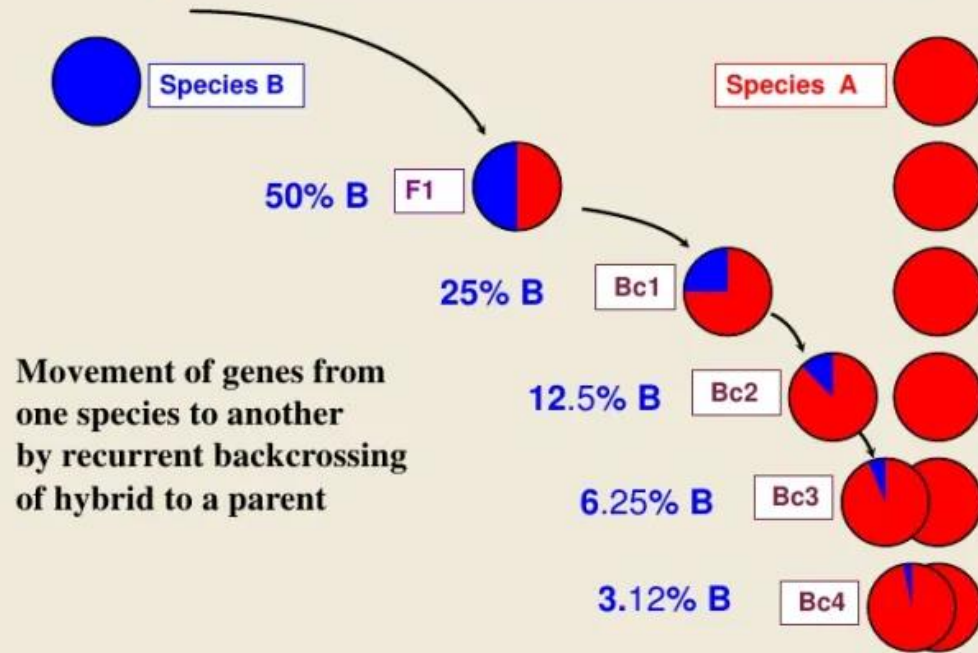
Dogs were the first animal domesticated by humans, and domestication occurred while humans were hunter gatherers not agriculturalists.

Dogs began to diverge as a separate species roughly 19,000 to 32,000 years ago in Europe. It's possible that the dog/wolf divergence happened more than one time. Did humans steal wolf pups to raise them for rituals or did wolves start following humans as a source of food? The relationship between these early dogs and humans became mutually beneficial.

Wolves with dog traits (snout length, teeth, skull width) show up 27,000 years ago. These traits are exhibited by other mammals who have been tamed or bred for tameness. These traits may derive from a reduced number or defective neural crest cells which control skull and nervous system development.

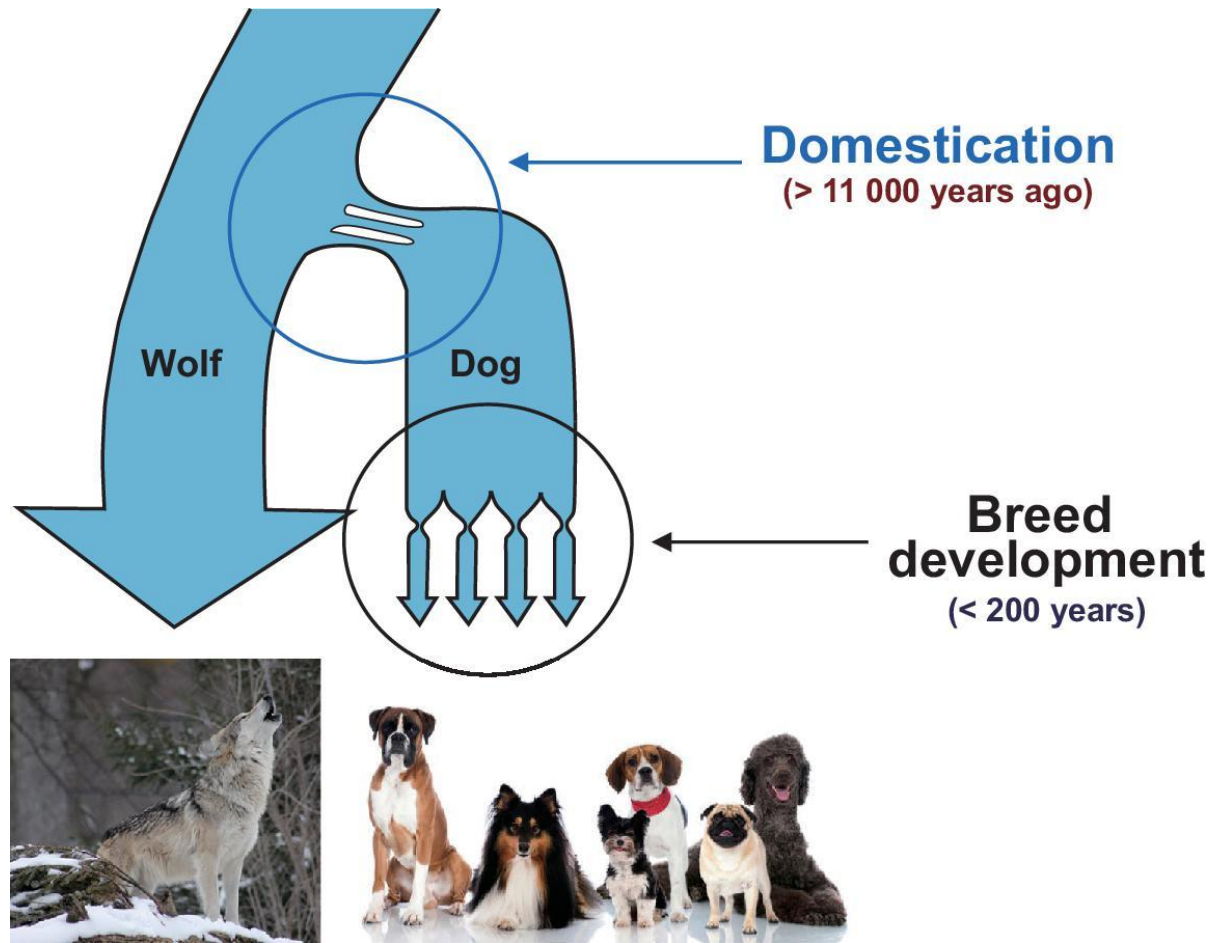
The earliest undisputed dog shows up 14,000 years ago. Ritual burials of dogs as pets become common suggesting that humans had affection for their dogs. Dog fossils from 8,000 years ago show different dog sizes.

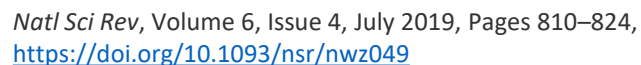
Introgression - Gene Transfer



Admixture

Figure 3. Multiple bottlenecks have shaped the structure of haplotypes and LD observed in modern breeds. Schematic ...





Ostrander EA, Wang GD, Larson G, vonHoldt BM, Davis BW, Jagannathan V, Hitte C, Wayne RK, Zhang YP; Dog10K Consortium. Dog10K: an international sequencing effort to advance studies of canine domestication, phenotypes and health. *Natl Sci Rev*. 2019 Jul;6(4):810-824. doi: 10.1093/nsr/nwz049. Epub 2019 Apr 10. PMID: 31598383; PMCID: PMC6776107.

Meadows, J.R.S., Kidd, J.M., Wang, GD. *et al*. Genome sequencing of 2000 canids by the Dog10K consortium advances the understanding of demography, genome function and architecture. *Genome Biol* **24**, 187 (2023). <https://doi.org/10.1186/s13059-023-03023-7>

Background: The international Dog10K project aims to sequence and analyze several thousand canine genomes. Incorporating 20 × data from 1987 individuals, including 1611 dogs (321 breeds), 309 village dogs, 63 wolves, and four coyotes, we identify genomic variation across the canid family, setting the stage for detailed studies of domestication, behavior, morphology, disease susceptibility, and genome architecture and function

Dog10K: the International Consortium of Canine Genome Sequencing

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Dogs (*Canis lupus familiaris*) were the first species to enter into a domestic relationship with people [1] and are a source of fascination all over the world, not only due to their history of domestication and dispersal along with human beings [2], but also because of their diverse phenotypes and behaviors, driven by both artificial and natural selection [3]. Dogs and humans have often been subjected to similar selection pressures [4], and these shared evolutionary trajectories have led to the emergence of the same common disorders including heart disease, neurologic disorders, diabetes and cancer [5].