

## Reading 2.1 - Selective Breeding

For thousands of years, some people have been carefully controlling the breeding of different types of animals in an effort to reliably produce a specific combination of traits in the offspring for their livestock or their pets. This intentional selection of which individuals to breed for more desirable offspring is called **selective breeding**. It is called selective breeding because humans (not the animals) carefully select which individuals they will allow to mate and have offspring.

In class today you selectively bred birds in a computer model. As you chose which birds to breed and which offspring to keep, you were intentionally trying to develop an offspring with a particular set of variations for four different traits (wing color, tail color, head feather color, and chest feather color).

**Question 1:** In addition to feather colors, what are some other traits that you think people might want to selectively breed for in birds?

Trait	Possible Variations
Chest feather color	Gray, red

Selective breeding has been done with dog populations for thousands of years. By selectively breeding a population of dogs, a person can make intentional choices about what traits and variations they are trying to get to appear in the offspring. For example if a person always breed tall legged dogs with short tailed dogs they have a better chance of getting a pup that is both long legged AND short tailed. Likewise, a person can always breed the dogs they own with a dog that has shiny coat of fur. Each new litter of dogs from these parents has a better chance of some of the pups having genetic information for producing the substance that give dogs a shiny coat of fur, than if both parents did not have shiny coats of fur.

One goal of some breeders is to develop or maintain a stock of **purebred** animal. A purebred animal is an individual animal that reliably passes only one variation in genetic information for a trait in its sex cells. Two purebred dogs with the same trait variation, when mated, will produce offspring that only show that trait variation. No other variations will appear in their offspring.

For example, when one purebred dog of a specific breed such as a poodle is mated with another purebred dog of the same breed (another poodle), the offspring will have all of the same traits as its parents that would qualify it as a poodle.



image from <http://en.wikipedia.org/wiki/Poodle>

People have been experimenting with developing new breeds of dogs for thousands of years. Many new breeds of dogs have been developed in that time. For example, breeds of dog such as the poodle were developed in the past 1000 years, while the Chinook breed was developed about 100 years ago (in 1917 in America).



image from [http://en.wikipedia.org/wiki/Chinook\\_%28dog%29](http://en.wikipedia.org/wiki/Chinook_%28dog%29)

**Question 2:** What are some of the expected variations that you would expect to see in the fur, ear shape, and body size in a litter of pups that might be produced as offspring from the mating of the poodle with Chinook shown on the previous page?

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People have selectively bred other species of animals besides dog and birds. By selectively breeding cattle, birds, and fish, new breeds of these animals have been created by people over time that has new sets of desirable characteristics. The characteristics that people have bred animals include traits such as running speed, color, size, fur, quality of meat, quality of milk, growth rate, strength, hunting instincts, and sociability.

**Question 3:** List some of the types of animals, which you think people might have selectively bred in the past to develop new colors of skin, fur, or scales?

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**Question 4:** List some of the types of animals, that you think people have selectively bred in the past to be more sociable with humans?

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People have changed the characteristics of many kinds of animals and plants over time by selecting which ones will reproduce together. Some plants that people have selectively bred for thousands of years include rye, peas, wheat, olives, grapes, rice, and corn.

To see the effect of selective breeding on plants over thousands of years, compare modern day corn to its ancient ancestor (Teosinte). A picture of both of these plants is shown to the right. Notice how dramatically different the end result of selective breeding is. Modern corn has many times more kernels of corn per ear, it has larger ears and larger kernels, it has a different kernel color, and it is less bushy plant than its ancestor.

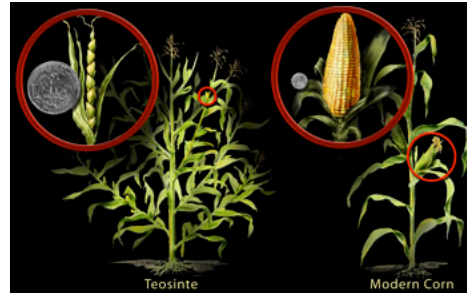


image from [http://www.nsf.gov/news/mmg/mmg\\_disp.cfm?med\\_id=55528&from=mn](http://www.nsf.gov/news/mmg/mmg_disp.cfm?med_id=55528&from=mn)

The dramatic difference between the characteristics of modern sweet corn, poodles, and birds compared to the characteristics of these organisms' ancestors are the result of three interacting principles:

- Sexual reproduction creates new combinations of characteristics in each offspring, through random recombination of half the genetic information from each parent.
- In a single generation of offspring, new combinations of variations will probably be appear due to random selection of which chromosome is passed on to the sex cells for each individual offspring. Some variations are closer to the desired characteristics, some are not much different than the parents, and some have less of the desired characteristics that the breeder wants.
- By selecting individuals to keep based on these characteristics, the breeder is choosing which genetic information is more likely to be increased in frequency in the population over time.

**Question 5:** What do you think are some other types of plants that people have selectively bred throughout history?

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**Question 6:** In general, why is selective breeding a process that requires many generations of offspring to get a desired outcome:

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