Topic 6 - The Best Selection

Long before the science of genetics started, people tried to reproduce organisms with only the most preferred traits, by allowing only those organisms with the desirable traits to reproduce. This method was not always successful, but through time (trial and error), this practice of controlled breeding provided scientists with the information to determine which alleles were responsible for specific traits. http://www.mansfieldct.org/schools/mms/staff/hand/geneticspageone.htm Artificial Selection is the process of selecting and breeding individuals with desirable traits to produce offspring with the desired traits. The selection process is simple. Only those individuals, with the desired trait, will be allowed to reproduce. This selection process also applies to plants, which can be bred to possess desirable traits. The main difference between 'natural' selection and 'artificial' selection is that, humans control the artificial selection process.

Artificial Selection in Agriculture (and Ranching)
The process of intervention to produce more desirable organisms has been going on for some time. This process takes a long time to see results - usually many generations.
Farmers, dog and horse breeders, along with scientists can now speed up the artificial selection process by using 'low-tech' or 'high-tech' technologies, such as;
- **cloning** (made from cells)
- **artificial insemination** (artificially joining the male and female gametes)
- **in vitro fertilization** (male and female gametes are selected and then allowed to fertilize in a controlled setting)
- **genetic engineering** (directly altering the DNA of an organism)

Plant breeding is an important part of agriculture. Selective breeding programs bring positive characteristics of two different varieties together to create a new variety that has more desirable characteristics, such as what was done to produce Western Red Spring Wheat. The flour fro m this grain is used to make pan bread. Canadian Western Durum is good for making pasta. Other varieties have also been engineered for specific purposes, such as resistance to disease, length of time to mature, resistance to extreme temperatures (hot or cold), and even taste.

Accounting for Biological Diversity
The specimens and observations made by Charles Darwin about the diversity of life on the Galapagos Islands is detailed in his most famous book, *Origin of the Species by Means of Natural Selection*. Find out more about **Charles Darwin** and his work through the Mystery Scientist link: http://www.edquest.ca/content/view/227/

The Theory of Natural Selection
The diversity of life in the Galapagos Islands helped Darwin explain his theory of natural selection. It can be summed up in four statements:
1. All organisms produce more offspring than can possibly survive.
2. There is incredible variation within each species.
3. Some of the variations increase the chances of an organism surviving to reproduce.
4. Over time, variations passed on through offspring lead to changes in the genetic characteristics of a species.
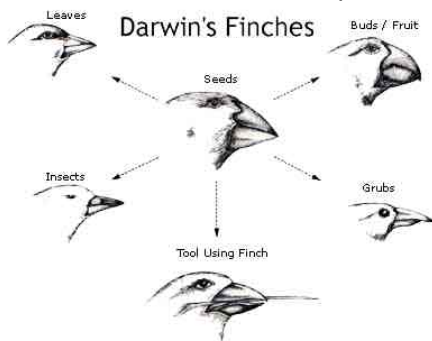
Natural selection happens when factors in the environment determines, or 'selects' which individuals, within a species, will be able to survive. If they are able to live long enough to reproduce, then those individuals with their 'survival adaptations (characteristics) will have offspring with similar survival characteristics.
These observations and conclusions were supported by another biologist Alfred Wallace. The Galapagos finches provide the best example of this theory – how the fittest, or best-adapted, organisms for a specific environment survive.

Other Natural selection examples include Equus (Horse p. 64 Science Focus 9 textbook) and the Peppered Moth: http://www.millerandlevine.com/km/evol/Moths/moths.html