



16.2 Ideas that shaped
Darwin's thinking

An Ancient, Changing Earth



Geologists James Hutton and Charles Lyell concluded that Earth is extremely old and constantly changing.

Hutton and Geological Change

- rocks can form from lava.
- Sedimentation
- Erosion (example = Grand Canyon)
- Mountain formation

Hutton and Geological Change

Geological change operates very slowly.

Therefore Earth must be very old.

Deep time—*Earth's* history stretches back over a period of time so long that it is difficult for the human mind to imagine

Lyell's *Principles of Geology*

Uniformitarianism - geological processes working today are the same forces that shaped Earth millions of years ago.

Earth was extremely old

Darwin asked himself, if Earth can change over time, could life change too?

Lamarck's Evolutionary Hypotheses

Darwin wasn't the first scientist to suggest species change over time.

A growing fossil record suggested that life evolved, but **how** did life evolve.

Jean-Baptiste Lamarck proposed that organisms could change during their lives by using or not using body parts, and that individuals could pass these **acquired traits** on to their offspring, enabling species to change over time.

Acquired characteristics = Traits altered by an individual organism during its life

Lamarck's Hypotheses

Lamarck's hypotheses were incorrect because

1. Organisms don't have an inborn drive to become more perfect.
2. Evolution does not mean that over time a species becomes "better", and evolution does not progress in a predetermined direction.
3. Traits acquired by individuals during their lifetime cannot be passed on to offspring.

Population Growth

In 1798, English economist Thomas Malthus reasoned that if the human population grew unchecked, there wouldn't be enough living space and food for everyone.



Population Growth

Darwin realized that Malthus's reasoning applied even more to other organisms than it did to humans.

When Darwin realized that most organisms don't survive and reproduce, he wondered which individuals survive...and why?

Artificial Selection

Darwin studied change produced by breeders.

For example, farmers would select cows that produced the most milk for breeding.

Over time, this selective breeding would produce cows that gave even more milk.

Darwin called this **artificial selection**, a process in which humans select those natural variations they find useful

Artificial Selection

Darwin had no idea how heredity worked or what caused natural variation, but he did know that variation occurs in species.

Darwin recognized that natural variation provided the raw material for evolution.