

15–2 Ideas That Shaped Darwin's Thinking

An Ancient, Changing Earth

Hutton and Lyell helped scientists recognize that Earth is many millions of years old, and the processes that changed Earth in the past are the same processes that operate in the present.

Hutton and Geological Change

In 1795, James Hutton published a hypothesis about the geological forces that shaped Earth.

Most of these geological forces operate very slowly, over millions of years.

Hutton proposed that Earth had to be much more than a few thousand years old.

Lyell's *Principles of Geology*

Lyell stressed that scientists must explain past events in terms of processes that they can actually observe.

The processes that shaped the Earth millions of years earlier continue in the present.

Lyell's work explained how geological features could be built up or torn down over long periods of time.

This understanding of geology influenced Darwin:

- If the Earth could change over time, life might change as well.
- It would have taken many years for life to change in the way Lyell suggested.

This would have been possible only if the Earth were extremely old.

Lamarck's Evolution Hypotheses

Jean-Baptiste Lamarck recognized that:

- living things have changed over time.
- all species were descended from other species.
- organisms were adapted to their environments.

Lamarck proposed that by selective use or disuse of organs, organisms acquired or lost certain traits during their lifetime. These traits could then be passed on to their offspring. Over time, this process led to change in a species.

Tendency Toward Perfection

Lamarck proposed that all organisms have an innate tendency toward complexity and perfection.

They are continually changing and acquiring features that help them live more successfully in their environments.

Use and Disuse

Lamarck proposed that organisms could alter the size or shape of particular organs by using their bodies in new ways.

Inheritance of Acquired Traits

Lamarck thought that acquired characteristics could be inherited.

He believed that if an animal acquired a particular feature in its lifetime, that feature would be passed on to its offspring.

Evaluating Lamarck's Hypotheses

Lamarck's hypotheses of evolution are incorrect in several ways.

Lamarck did not know: * how traits are inherited.
 * that an organism's behavior has no effect on its heritable characteristics.

However, he paved the way for the work of later biologists.

Population Growth

In 1798, Thomas Malthus published a book in which he noted that babies were being born faster than people were dying. The only forces he observed that worked against this growth were war, famine, and disease.

Malthus reasoned that if the human population continued to grow unchecked, sooner or later there would be insufficient living space and food for everyone.

When Darwin read Malthus's work, he realized that this reasoning applied to plants and animals.

If all the offspring of almost any species survived for several generations, they would overrun the world.

This information was central to Darwin's explanation of evolutionary change.