

# SURVIVORS OF CHANGE

Teacher Resource Guide

## Program Overview

**TOPIC:** Patterns of evolution as seen in the fossil record.

**THEME:** Patterns of evolution can be seen in the fossil record and in the characteristics of living survivors of change.

**PROGRAM DESCRIPTION:** In the natural world, the rule is to adapt or go extinct. In this program, students learn about the process of evolution as they compete in a game of survival. Spinning the “wheel of death”, earning immunity from extinction and voting each other off the island (Earth) are just a few of the challenges that await.

**AUDIENCE:** Grades 9 - 12

**DURATION:** 1.25 hours

## Curriculum Connections

**Grade 9 Science:** Biological Diversity

**Grade 10 Science 10:** Energy Flow in Global Systems

**Grade 11 Biology 20:** Ecosystems and Population Change

**Science 20:** The Changing Earth; Changes in Living Systems

**Grade 12 Biology 30:** Change in Population and Communities

**Science 30:** Living Systems Respond to Their Environment

## Program Objectives

1. Describe why a particular group of organisms (that their team is representing) are survivors of change.
2. Participate in activities that will explain how evolution relates to groups of organisms.

3. Demonstrate and explain six components of evolution, including: geologic time, mutation, adaptation, homology, analogy, and extinction.

## Suggested Pre-Visit Activities

### 1. TERMINOLOGY

Introduce these terms to your class prior to your program at the Royal Tyrrell Museum to ensure your students are comfortable with the information presented in the program.

**Adaptation:** the evolutionary process whereby a population becomes better suited to its habitat. This process takes place over many generations, and is one of the basic phenomena of biology. The term “adaptation” may also refer to a feature which is especially important for an organism’s survival.

**Analogy:** in anatomy, structures are considered to be analogous when they serve similar functions but are not evolutionarily related, such as the legs of vertebrates and the legs of insects. Analogous structures are the result of convergent evolution and should be contrasted with homologous structures.

**Evolution:** the change in the inherited traits of a population of organisms through successive generations.

**Extinction:** the worldwide death and disappearance of a specific organism or group of organisms.

**Geologic time:** the period of time covering the physical formation and development of Earth, especially the period prior to human history.

**Homology:** a trait or characteristic within different organisms that can be traced to a common ancestor. For example, the wings of bats and the arms of primates are homologous.

**Mutation:** an abrupt change in the genotype of an organism, not resulting from recombination; genetic material may undergo qualitative or quantitative alteration, or rearrangement.

**Natural Selection:** Natural selection is the process by which certain heritable traits (those that make it more likely for an organism to survive and successfully reproduce) become more common in a population over successive generations. It is a key mechanism of evolution.

## 2. CLASS DISCUSSION AND RESEARCH

- a) Who was Charles Darwin and what did he propose in his Theory of Evolution?
- b) How do fossils help us understand evolution?

### Suggested references:

<http://www.pbs.org/wgbh/evolution/>

<http://evolution.berkeley.edu/>

<http://www.agiweb.org/news/evolution/fossilrecord.html>

[http://www.bbc.co.uk/schools/gcsebitesize/science/aqa\\_pre\\_2011/evolution/evolutionrev4.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/evolution/evolutionrev4.shtml)

<http://darwin-online.org.uk/>

**Keywords:** Charles Darwin, natural selection, On the Origin of Species, evolution, fossil record, fossil evidence

## Post-Program Activity

### 1. MASS EXTINCTIONS

There have been at least five major mass extinctions on Earth over the past 500 million years that have wiped out many different life forms. Each time, life has “bounced back,” and new life has evolved to fill the vacant niches.

Research mass extinctions and discover which life forms disappeared and which new ones appeared. What theories have been proposed to explain these extinctions? What evidence are they based on? Which species have survived the most mass extinctions? Why do you think the survivors are so successful?

### Here are some websites that will assist you with your research:

[www.pbs.org/wgbh/nova/sciencenow/3318/01.html](http://www.pbs.org/wgbh/nova/sciencenow/3318/01.html)

[www.dsc.discovery.com/earth/wide-angle/mass-extinctions-timeline.html](http://www.dsc.discovery.com/earth/wide-angle/mass-extinctions-timeline.html)

[www.sciencedaily.com/releases/2006/10/061025085208.htm](http://www.sciencedaily.com/releases/2006/10/061025085208.htm)

[www.pbs.org/wgbh/evolution/extinction/massext/statement\\_03.html](http://www.pbs.org/wgbh/evolution/extinction/massext/statement_03.html)

## 2. LIVING FOSSIL

“Living fossil” is an informal term for any living species of organism which appears to be the same as a species otherwise only known from fossils and which has no close living relatives. These species have all survived major mass extinction events, and generally retain low taxonomic diversities.

Investigate some “living fossils” and learn how they survived extinctions. Why are they so well adapted to their environment? What allowed them to survive when other species did not?

### Some websites to check out:

<https://theconversation.com/from-coelacanth-to-crinoids-these-9-living-fossils-havent-changed-in-millions-of-years-188886>

<https://phys.org/news/2024-05-fossils-unique-ancient.html>

<https://www.who.edu/oceanus/feature/five-marine-living-fossils-you-should-know/>

<https://www.discovermagazine.com/planet-earth/take-a-tour-of-these-incredible-living-fossils>

**Keywords:** making of the fittest, natural selection & adaptation, evolution

### *Links to Other Websites*

*Links to websites are provided solely for your convenience. The Royal Tyrrell Museum does not endorse, authorize, approve, certify, maintain, or control these external Internet addresses and does not guarantee the accuracy, completeness, efficacy or timeliness of the sites listed.*