***Evidence of Evolution***

**Fossils, patterns of early development, and similar body structures all provide evidence that organisms have changed over time.**

* Homologous Body Structures - Structures that have different mature forms but develop from the same embryonic tissues.
* Vestigial Organs - traces of homologous organs in other species where the organ serves no useful function (Appendix in humans)
* Similarities in Embryology - In their early stages of development, chickens, turtles and rats look similar, providing evidence that they shared a common ancestry.

**Scientists have combined evidence from DNA, protein structure, fossils, early development, and body structure to determine the evolutionary relationships among species.**



 

**A new species can form when a group of individuals remains isolated from the rest of its species long enough to evolve different traits.**

* Geographic Distribution of Living Species - Similar animals in different locations were the product of similar lines of descent.

***The Fossil Record***

**Most fossils form when organisms that die become buried in sediments.**

* Specific environmental conditions are necessary in order for fossils to form.
	+ Permineralization occurs when minerals carried by water are deposited around a hard structure.
	+ A natural mold forms when flowing water removes all of the original tissue, leaving an impression. The cast is the copy of the shape of the organism that makes the mold.
	+ Trace fossils record the activity of an organism.
	+ Amber-preserved fossils are organisms that become trapped in tree resin that hardens after the tree is buried.
	+ Preserved remains form when an entire organism becomes encased in material such as ice.
* Only a tiny percentage of living things became fossils.

**Scientists can determine a fossil’s age in two ways: relative dating and radioactive dating.**

* Relative Dating - Can determine a fossil’s relative age
	+ Performed by estimating fossil age compared with that of other fossils
	+ It compares the placement of fossils in layers of rock.
	+ Scientists infer the order in which species existed.
	+ Drawbacks – provides no info about age in years
* Radioactive Dating – also known as Absolute Dating
	+ Can determine the absolute age in numbers
	+ Is performed by radioactive dating – based on the amount of remaining radioactive isotopes remain (measured in a half-life)
	+ Half-life: the amount of time it takes for ½ of the isotope to decay
	+ Drawbacks - part of the fossil is destroyed during the test

**The calendar of Earth’s history is sometimes called the Geologic Time Scale.**

* Time divided into major past events.
* Eras last tens to hundreds of millions of years.
* Periods last tens of millions of years.
	+ most commonly used units of time on time scale
	+ associated with rock systems.
* Epochs last several million years.



* Precambrian period lasted approximately 4 billion years.

**Scientists still do not completely understand the causes of mass extinctions and the rate at which evolution occurs.**

* Gradualism – evolution occurs slowly but steadily. Tiny changes in a species gradually add up to major changes over time.
* Punctuated Equilibria – species evolve quickly during relatively short periods. These periods of rapid change are separated by long periods of little to no change.