3 KEY OBSERVATIONS

* the striking ways in which organisms are suited to their environment

* the many shared characteristics (unity) of life

*the rich diversity of life

INFLUENCING DARWIN

Fossils and Geology

-**Cuvier**:	catastrophism
-**Hutton**:	gradualism
-**Lyell**:	uniformitarianism

ADAPTATIONS

- characteristics of organisms that enhance their survival and reproduction in specific environments

- "can the origin of new species and the adaptation of species to their environment by closely related processes?"

NATURAL SELECTION

- differences between the 13 species of finches that Darwin collected were adaptations to the food available in their habitat

- these adaptions arise by natural selection, a process where individuals with certain inherited characteristics leave more offspring than individuals with other characteristics

ADAPTATION FINDINGS

- **natural selection**:	a process in which individuals that have certain heritable traits survive and reproduce at a higher rate than other individuals because of those traits

- over time, natural selection can increase the match between organisms and their environment

ADAPTATION FINDINGS (cont)

- if an environment changes, or if individuals move to a new environment, natural selection may result in adaptation to these new conditions, sometimes giving rise to new species in the process

KEY EVIDENCES OF EVOLUTION

-**direct observation of evolution**	MRSA and Soapberry bug
- **homology**	similarity in organisms resulting from common ancestry

- **the fossil record**

- **Biogeography**	the geographic distribution of species

DESCENT WITH MODIFICATION

- Darwin defined **evolution** as *descent with modification* proposing that Earth's many species are descendants of ancestral species that were very different from those alive today

- evolution can also be defined more narrowly as a change in the genetic composition of a population over time

LAMARCK: 1809 THEORY

- based his theory of evolution on observations of fossils

-2 main principles	1.) use and disuse
	2) inheritance of acquired characteristics

- thought that evolutionary change was driven by organisms drive to increase complexity

DESCENT WITH MODIFICATION

- all organisms are related through descent from a common ancestor that lived in the remote past - explains unity of life!

- over time, descendants of that common ancestor have accumulated diverse adaptations that allows them to survuve and reproduce in specific habitats

- this descent with modification has lead to the rich diversity of life we see today!

EVOLUTION BY NATURAL SELECTION

1.) *individuals do not evolve*	a population is the smallest group that can evolve over time

2.) Natural selection can act only on heritable traits, traits that are passed from organisms to their offspring. Characteristics acquired by an organism during its lifetime may enhance its survival and reproductive success, but there is no evidence

3.) environmental factors vary from place to place and from time to time. A trait that is favorable in one environment may be useless or even detrimental in another environment

EVOLUTION: both pattern & process

- the *pattern* of evolutionary change is revealed in observations about the natural world

- the *process* of evolution consists of the mechanisms that have produced the diversity and unity of living things

CHARLES DARWIN (1809-1882)

- naturalist on the HMS Beagle (1831)

- Chart South American coastline

- Galapagos Islands

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DARWIN'S OBSERVATIONS

- plants and animals of South America are very different from those in Europe

- Animals that lived on islands resembled those that lived on the mainland, but were different

BRANCHING IN EVOLUTION

- darwin viewed the history of life as a tree with multiple branches

- closely related species share the same line of descent until they diverge from each other

ARTIFICAL SELECTION

humans have modified a variety of domesticated plants and animals over many generations by selecting individuals with desired traits as breeding stock

KEY POINTS OF NATURAL SELECTION

- natural selection is a process of editing, not a creative mechanism
- a drug does not create resistant pathogens; it selects for resistant individuals that are already in the population
- natural selection depends on time and place
- what is beneficial one place can be detrimental in another place