Name_____ Class_____ Lab Minutes _____ Date of Trip _____

Lab: Evolution & Human origins

TOTTEN SCIENCE

Adapted from AMNH Teaching Materials

Introduction: Humans, like all species, are a product of **evolution.** The Hall of Human Origins at the AMNH presents key and cutting edge evidence—fossils, genetic data and artifacts--- that scientists use to assemble the evolutionary story of our taxonomic family, **hominids.**

There is ample scientific evidence for evolution:

1. **Fossil evidence**- used to reconstruct the history of hominids and our larger taxonomic group, primates.
2. **Genetic Evidence**- Technology to study DNA has emerged recently. Because DNA is passed from generation to generation and can change over time, it can document changes in **species** and **populations**. Tracking heredity geographically explains the migration of modern humans around the earth. Comparing differences between species' DNA give measurements of relatedness. By studying how genes control body structure and function, scientists can explore behavior.

Evolution is driven by several mechanisms: Mutation, Natural Selection and Genetic drift**. Mutations** are random changes in DNA an individual has inherited. Mutations may or may not impact the ability to survive and reproduce. **Natural Selection** occurs when an individual with heritable features that enable it to cope better with its environment tends to pass them to the next generation. Over time, a population of individuals will exhibit more of the better adapted features. Genetic Drift occurs in small populations. Genes and traits will increase in abundance over generations by chance, not because they impact an individual's chance of survival.

Evolution does not progress toward a goal and does not proceed as a single line of sequential species. Rather, new species diverge from common ancestors like branches on a tree. Trees of life show relatedness between species, living and extinct. Evolutionary trees show how specific taxonomic groups evolved over time. The hominid evolutionary tree tells us that at many times in the past several hominid species lived on earth simultaneously. Some survived much longer than the 150,000 years *Homo sapiens* has existed. Yet all hominids went extinct—except our species.

What makes us human? Early humans emerged in Africa, then spread in waves throughout the continent and the rest of the world. Humans have large brains relative to body size, but it isn't the size that sets us apart. It is that we are capable of **symbolic thought.** Our mental capacities enable us to produce increasingly complex tools and a vast range of symbolic expression, such as art, language and music. Both innate talent as well as skills nurtured in society create the cultural complexity of humans. Our diversity of cultures is a hallmark of our humanity.

Procedure

Students will visit the American Museum of Natural History in New York City and answer the following questions based on permanent exhibits in the **Hall of Human Origins.**

Questions

I. Chimpanzee, Modern Humans, and Neanderthal Skeletons

1. Why do you think these skeletons introduce the exhibit?

_____

2. Compare the skeletal structures of the three species. What structures are similar and which are different?

Hands_____

Jaws_____

Skulls _____

Arm Length _____

Feet_____

II. Fossils: A Record of the Past

1. Find an example of a trace fossil and a body fossil _____
2, What can fossils reveal about extinct species ? _____
_____

III. Evolutionary trees
Hominid Family Tree
1. What do the orange bars indicate? _____
2. Locate Homo sapiens on the tree. What does its position on the tree tell you? _____
_____
3. What Hominids are extinct? _____
4. Which Hominids lived at the same time as H. sapiens? _____
5. Who is our most direct ancestor? _____

Tree of Life- Located across the room
1. Where are H. sapiens located on the tree? Who are our closest relatives? _____
_____

IV. Cell Model
1. With your partner identify and list the cell structures you know**.** _____
_____
2. Which structures contain DNA or RNA? _____

V. DNA: Comparing Humans and Chimps
1. Which two chromosomes are most alike? _____
2. How are humans and chimps similar? Different? _____
_____

VI. Evolution: How it Works
1. What mechanisms produce variation? _____
_____2. Describe differences between individuals in our species. _____
_____

VII. Two *Australopithicus* Figures/ Laetoli Footprints
1. Compare yourself to the figures. Walk on the fossilized footprints. How do the prints compare to your feet and stride?
_____
_____2. What do your observations suggest about the individuals who left them? _____
_____

VII. The History of Human Evolution
1. What evidence was used to reconstruct how these hominids may have looked and lived? _____
_____
2. Compare the faces, bodies & environments of the hominid species. How are the similar? Different? How has the hominid family changed over time? _____
_____
_____

IX. Map: Our Earliest Migrations
1. In what continent did modern humans evolve? _____
Where did humans disperse? Did humans really leave Africa?_____
_____

X. The Brain
1. Compare the human brain to that of other species. _____
_____
2. What parts of the brain do you think make humans unique. _____
_____

XI. Language, Music, Art, Tools & Technology
1. What skills were you born with? What have you learned from others? What do you think makes us human?