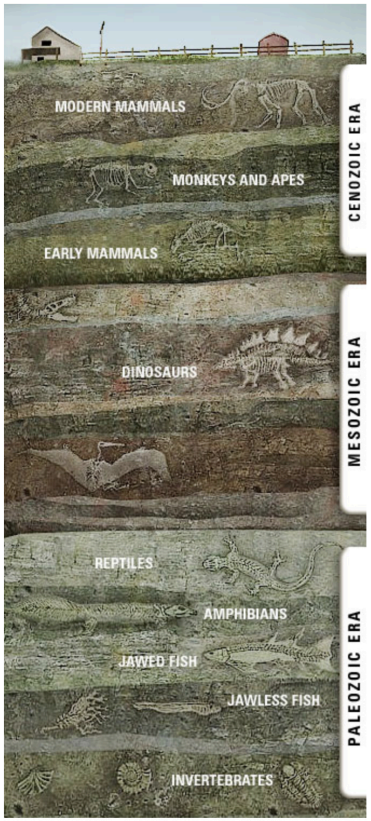
SCIENCE Fossil Records Darwin & Evolution	MS-LS1-1. Plan and conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. MS-LS1-3. Construct an explanation supported by evidence for how the body is composed of interacting systems consisting of cells, tissues, and organs working together to maintain homeostasis. MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli, resulting in immediate behavior and/or storage as memories. MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to	A. PRESENT: Observing Plants and Animals 1. In every classroom, make sure there are at least ONE - not more than TWO - pets of any kind: Bearded dragon, gecko, bird, etc. If the animal gets sick, it is the responsibility of the Learners to call the vet, schedule and transport the pet to the doctor - as well as take any further care of the animal. Purchasing food and daily care is also part of Learner responsibility. On breaks, the pet will find a home with families. 2. Also, make certain there are a number of plants in the classroom that will need care from the Middle Learner. The wellbeing of these plants is in the hands of the Learners. See AEC Plant Care Presentation Film here: https://members.tshanywhere.org/curriculum/plant-care/ Plant new plants every Session and watch them grow in the classroom. SEE PLANTING SCHEDULE AT THE END OF THIS PACING GUIDE. They will also observe how plants change and grow as well as discover what is critical in the life of a plant. B. PRESENT: Fossil Records 1. PRESENT: The Work of Rock and Sedimentary Layers.

	infer evolutionary relationships. MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geologic processes.	See AEC Film Here: https://members.tshanywhere.org/curriculum/composition-of-the-earth/ a. As these sediments are pressed together over millions of years, you get a series of fossils and these tell us that there were different species at different times on planet earth. Many of the Greek mythological creatures came about because the Greeks found fossils and could not have imagined they were dinosaurs. b. Rock layers on the bottom are the oldest, while the ones at the top are the newest layers.

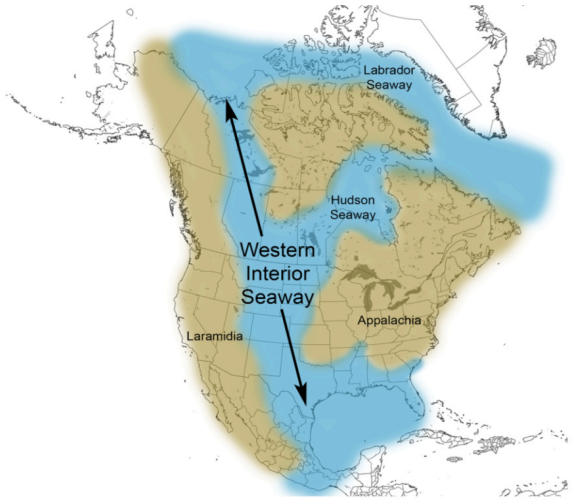


Organisms Leave Fossils Behind

Animals die and their bodies rest in sediment which protects it. Hard body parts like bones and teeth remain preserved for thousands and millions of years. The soft body organs deteriorate quickly or are eaten. The soft tissue of animals is seldom preserved. We have dinosaur bones but we don't have a record of their internal organs. The study of fossils of ancient remains of animals and plants tell us about the past. Paleontologists study fossils to reveal that animals and civilizations were like in ancient times.

Notice from the image on the left, the many organisms that lived long before dinosaurs. Fossils are a record of all the biological life on the planets history.

c. If you travel to the middle of the United States, this area used to be a SEA.



The X Fish was found in Kansas:

And these monuments are built up corals left over from when this area in Kansas was covered in sea water.

d. LEARNER WORK OF NECESSITY: WHAT IS THE KT BOUNDARY?

Research and draw its place around the globe. What does it delineate? Where can you actually go see and touch it? Are there fossils in it? Is all the rock the same?

Using your search engine, find photographs of the KT boundary in different places and use your knowledge of sediments, fossils and timelines to label what is happening before and after.

Formally present this to your Parents. This may not be something they are aware of and you can kindly share your knowledge.

C. PRESENT: Darwin and Evolution.

1. Who was Charles Darwin?

a. As part of Session II, Middle Learners will read DARWIN: A VERY SHORT INTRODUCTION by Jonathan Howard.

		2. Adaptation in Plants and Animals: Cells a. The adaptation of animals (and plants) is one of the most fascinating things we have ever discovered as human beings. Let's go back to our knowledge of the CELL. b. You know the parts of the cell, that it is a living thing in most cases and that certain cells perform certain duties. Liver cells do their job, neurons do their job. We are walking around every day on a planet full of cells that are working without us noticing them much. c. HOWEVER, one of the most important things to know about cells is that they ADAPT. <u>If you change a cell's environment, it will also change!</u> This is one of the most important things you will ever learn. Here are some examples. <u>A blind person will adapt by hearing or auditory cells become more useful.</u> <u>Plants that can't find light will grow tendrils to climb up other plants.</u> <u>Fish that routinely get eaten will develop a poison to fend off predators.</u> <u>A bison developed a large head to dig through feet of snow for grasses in the winter.</u> <u>Muscle cells expand when you exercise.</u> d. NIH: "Survival of the fittest expresses that evolution aims toward matching an organism to its environment. Fitness and forces cannot be understood without accounting for environmental conditions, such as food and nutrient levels,

		other competing or cooperating organisms, or stressors such as heat or drugs. Biological change can be driven by a changing environment." This is called HOMEOSTASIS. e. Here are the reasons WHY our cells change: • Changes in water: either too much or too little in the cells. • Temperature. • Ph changes. • Oxygen levels. • Nutrient levels. f. LEARNER WORK OF NECESSITY: Working in PAIRS, create an experiment that shows how cells adapt using one of the environmental changes above. Learners can use plants, simple animals like insects or themselves in conducting the experiments. Make certain that they are participating in all the requirements of the Scientific Method: https://www.simplypsychology.org/steps-of-the-scientific-method.html 3. PRESENT: The Three Gifts of Humans. See AEC Film Here: https://members.tshanywhere.org/curriculum/history/ E. SOCRATIC QUIZZING: 1. In their groups, Learners will create a quiz for this whole section of Science starting with Fossil Records.