

The Story of Life Resource Guide

TIMELINE OF LIFE:

[Teachers Pay Teachers](#)

[Fossilicious](#) (coming soon!)

[Alison's Montessori](#)

[Keys of the Universe](#)

[FREE: Discovery Days and Montessori Moments](#)

BOOKS: Details about these resources can be found [here](#).

[From Lava to Life](#)

[Continental Drift](#)

[Fossilicious Children's Research Books](#)

[Encyclopedia of Animals](#)

[Grandmother Fish](#)

The Story of Life is not purely factual; it is the story of evolution but it doesn't put forward any particular theory on evolution. It is NOT a list of animals in order with their scientific names.

There are ideas in the story that make it different to the concepts of evolution:

- At the beginning of the story, there's interplay between the environment and life. According to the story, life came as an answer to a problem.
- The part that narrates the argument among the elements to determine "whose fault" it is, gives the idea that life was created to restore order to creation.
- There's a close connection between the animate and inanimate world.
- The inanimate world and life were all given a set of laws; this is the innate behavior of each element, and it's part of its nature.

The way we present the story helps the child understand at some level that we human beings are also part of the Earth and therefore part of the Universe.

Milestones: The most important turning points in the Story of Life are...

1. Beginning of life – Unicellular beings as an answer to a need.

- a. It's a new kind of element with its own laws; we see how it multiplies driven by an urge for efficiency and survival. From unicellular beings come multicellular ones. New types of beings arise through specialization, wherein beings are created with special parts (organs). This phenomenon can be seen in parallel in modern society, whereby the more specialized a society is, the more complex it becomes.

2. Invasion of Land – It was invaded first by plants, then arthropods and then vertebrates (amphibians).

- a. For amphibians, survival on land is the answer to a necessity that arises from a decrease in the availability of water. On land, they must solve the problem of breathing out of the water and of skin that loses moisture. This problem is solved by the evolution of reptiles.

3. Invention of Warm Blood and Feathers/Fur – These qualities provided greater independence in terms of being active and mobile.

- a. Mammals lived where reptiles couldn't. Warm blood allows activity independently of the conditions of the surroundings, while cold-blooded creatures became lethargic when temperatures dropped. The solution of keeping the eggs inside the mother's body and providing parental care of offspring ensures the survival of the species (the longer the duration of parental care, the fewer young that are birthed). With mammals came human beings, who have incredibly long childhoods.

4. Coming of Human Beings – Human beings have material and physical poverty compared to other creatures, but we have the advantage of a brain that permits imagination and reasoning.

- a. This material poverty constitutes an advantage, for human beings are not born with weapons on their bodies but can invent them. The human body is not specialized, so we don't have the limits placed on other beings by specialization.
- b. With evolution, we see a love that grows, if we understand love as being the ability and willingness to care for one's young. Even fierce animals have a nurturing instinct when it comes to their offspring. This love is especially seen with mammals. However, what the human being feels goes beyond the love for one's own children.

We don't worry about children understanding everything about the story when it is first introduced. The children are intuitive; they might not understand everything but the ideas stay with them and drive them to find out more. After all, when we scatter seeds on the ground, we don't pull them up to see how they are doing. We leave the children in peace to ponder. We should feel free to throw ideas around without worrying about what the children are learning.

Above all, the story should hit all the milestones and appeal to the child's imagination and sense of wonder.

Practical Points:

- This story is told at the beginning of each school year, a couple of weeks following the first Great Story.
- After the story is told, stay with the timeline and the children. The children can look at the timeline and ask questions. We can answer briefly but we should not give long explanations. We want to give time for the children to reflect and savor the story. We do not ask the children questions because we want the impressions to incubate in their minds and form engrams that permit spontaneous discoveries.
- Leave the timeline out for a few days; then take it down. It is NOT a permanent fixture on the wall because it's too precious to leave like an old picture. When you take it out again, it will give a new impression and provide renewed interest to the children.

Follow-up Presentations (presented by adult):

More information on animals

1. Present additional animal names as you point them out on the timeline.
2. Share special features about these animals.

Types of invertebrates

1. Classify invertebrates into cephalopods, gastropods, arthropods, etc.
2. Provide books to guide your presentation and the children's exploration.

Groups of animals as they evolve

1. Look at the red lines to mark the change in eras.
2. Discuss how some animals are still around while others have become extinct.

Extinction

1. Explore the concept of extinction and how it has affected the evolution of plant and animal life.

Facts regarding the environment

1. What kind of climate was prevalent during different eras/periods?
 - a. Use vegetation and appearance of fur as a basis for exploration.
2. How did animals and plants contribute to the environment?
 - a. Discuss how the animals and plants that exist during one period prepare the environment for those who come later.
 - b. Example: During the Carboniferous period, there was lots of vegetation. These plants died when the next ice age began and they turned into coal. Coal became very beneficial for human beings several million years later.
3. Explore ice ages and changes in land masses caused by temperature fluctuations.

Names of Eras/Periods

1. Gradually work your way through the different stages of the timeline.

Note: There is no need to pressure the children to learn this information by heart, because it does not form part of any state curriculum. We should consider it as an introduction to the study of life.

The Golden Thread in the Story (The Story of Life as part of Cosmic Education)

Each kind of life has to take care of its own existence, and in this way they are being quite selfish. But at the same time each kind of life contributes to their environment and prepares the conditions for the next kind of life to arrive.

For example, algae needed the sun, water, and carbon dioxide to make food. However, they also give out oxygen, which allowed our atmosphere to reach the oxygen level it has now. All life needs oxygen in order to breathe; only photosynthesizing beings can emit oxygen. When plants breathe, they take in oxygen and expel carbon dioxide. But when they photosynthesize, they take in carbon dioxide and expel oxygen.

Another example is the corals. They are drinking all the time, taking in calcium carbonate from the water to build their structures. By so doing, they are purifying the water.

Cosmic Education helps children understand that there are selfish and altruistic behaviors in every creature. Each creature's behaviors are based on the laws and directives they are following, which are set by Nature.

Points to bear in mind during the exploration of the timeline:

1. Enormous contributions were made by tiny unicellular beings. This shows the children that there is no need to be large and complex to make a difference in life. One example is the globigerina, a type of protozoa. They are less than one millionths of an inch, and yet layers and layers of them have come together to build cliffs, including the White Cliffs of Dover in Great Britain.
2. Nature can take a long time to find a solution to a problem, but once a solution is found the pace of change accelerates. One example is the brain, which took a long time to reach the complexity of the human brain. However, once it reached this level, it's amazing to see what human beings have been able to achieve.
3. Ooze is liquid mud that covers the ocean floors. It is the remains of organisms and volcanic dust. The different oozes are named according to the main organisms that compose it. Globigerina ooze is the most widespread type of ooze. It covers 1/3 of the bottom of the ocean.

Orientation of the Timeline

Red Lines

- The red lines constitute the lines of fortune for each particular animal group.
- If a red line rises, it indicates an increasing population and variety of a type of animal group.
- If a red line disappears, it indicates the extinction of that type of animal or animal group.

Identity of the red lines:

_____ invertebrates

_____ fish

_____ mammals

_____ reptiles

_____ birds

_____ amphibians

_____ insects

- It can also be interesting to explore the evolution of plants.
- As you follow the lines, note the times of mountain building, indicated at the bottom of the timeline.
- Note the time of incredible volcanic activity during the Permian Period. This is associated with the Permian extinction.
- Note as well the ice ages, marked by icicles at the top of the timeline.

Maps at the Bottom of the Timeline

- The maps are world maps that show:
 - Black: The distribution of land and water on the Earth as it is now.
 - Red: How land was distributed at that particular point in time (depending on the location of the map on the timeline)
- Note that Pangea is not shown (it comes before the Age of Reptiles)

Related Activities:

- Children can look at the timeline whenever they wish while it is left out. They can discover new details each time they see it and they can read the texts, which are summaries of the events that took place at that time.

1. Fossils:

- Children can research the different ways that fossils are formed in nature.
 - Then, they can use clay, plastic insects or real leaves, and plaster of paris to make their own fossils.
- Find the lesson [here](#).

2. Classification: By animal groups (a first classification)

- Protozoa
- Porifera (sponges)
- Coelenterates/Cnidarians
- Worms
- Arthropods
- Mollusks
- Echinoderms
- [Big Picture Science](#) has a useful material for classification.

2. Books: Prepare the library to satisfy the children's curiosity

- The teacher is a link between the children and the knowledge they wish to acquire.
- Books also constitute a link to knowledge.
- Each book must be handpicked, like a precious jewel.
- Make sure the books can be appreciated by children who are not very good readers – choose books with high-quality pictures.

3. Writing: The children might want to write about what they've discovered.

- Children don't have to work chronologically.
- The format of their writing should be in report form; they should not copy parts from books. They should find information from books. To help children develop the ability to write reports, you can ask them to summarize what they have learned.

- The Animal Q&A cards are a great tool for beginner research projects.
4. **Blank Timeline:** This work creates a consciousness of the types of animals in each time period.
 - On the timeline, the children will find:
 - All the colored strips (for eras/ages/periods) without names
 - All the red lines
 - The silhouettes of the icicles
 - The loose materials consist of:
 - Labels with the names of eras, ages, periods...
 - Maps of how continents looked at a particular age and how the Earth looks today
 - Icicles
 - Pictures of the animals
 - Texts
 5. **Going Out and Coming In:** Visits to museums, etc.
 - Elementary children “go out” once they have been prepared in the classroom; once they have started the work and need further exploration.
 - The children can organize a visit to the natural history museum or other related institution.
 - Aquariums are good sources of information on invertebrates.
 - We should have our own natural history corner in the classroom with specimens on temporary exhibit.
 - Talk to local institutions about borrowing specimens.
 - Invite experts in as visitors so they can talk to the children.
 - Inform the children beforehand of these visits so they can prepare themselves psychologically and intellectually.
 6. **Drawing to Scale:** Exploring relative sizes between animals
 - Children will soon realize that the animals on the timeline are not drawn to scale.
 - Because children have a tendency to be impressed by size, they can explore the scales of different animals and draw them in comparison to each other or to a human being.

Extensions for Older Children (end of 1st cycle/beginning of 2nd cycle)

1. How did we find out about our natural history? People weren't around during all those eras, so how could we acquire that kind of knowledge?
 - Invite children to discover how fossils came to be formed and where they are found. Include fossils in the natural history corner of the classroom.
 - Introduce them to Darwin, his work on “The Origin of Species” and the concept of natural selection.
 - Discuss how, when people understood fossils, they could read the “book of the Earth” (the strata or layers of the Earth).
 - Note: The LaBrea tar pits in Los Angeles are a great source of fossils.

2. How did we discover how old fossils are?
 - Introduce the concept of relative dating: Stack a pile of magazines from the oldest to the most recent and compare it to layers of sedimentary rock. Point out that fossils are dated according to the layer of rock in which they are found.
 - The children can investigate the types of absolute dating (whose use depends on the type of fossil being studied):
 - Carbon
 - Potassium
 - Radioactive
 - Tree ring

Upper Elementary (2nd cycle) Activities:

1. Study in detail a geological period or era
 - Each group of children could choose a different time period and then they can report to each other.
 - The teacher can isolate one time period on the blank timeline.
 - The students should give an oral presentation including the sources they used.
2. Study geology of their own area
3. Undertake the study of life through studying fossils
4. Compare the physical structure of human beings – bones and organs
5. Study genetics and mutations
6. Study the evolution of plants
 - Plants were pioneers of living on land.
 - They faced many challenges, including: How to remain vertical and reproduce in dry conditions.
7. Explore the ice ages and the changes in climate (including the various theories)

Final Thoughts

Our goal is to help the children develop interdisciplinary connections. Disciplines are just a categorization of knowledge, which in turn is simply a way of organizing facts in order to find answers. We are not tied down with classification of knowledge.

This classified knowledge depends on the experiences of human beings of the past. In order to understand how we get this information, we must understand our inter-dependence – one of the defining characteristics of Cosmic Education. We want the child to ask multidisciplinary questions and get them to find the inter-relatedness in their answers.