

# History :: 6-9

MONTESSORI TEACHERS COLLECTIVE (MOTECO.ORG)

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## The Concept of Time

### Daily Timelines

#### Materials:

...strips of paper with a horizontal line.

...pages of current daily calendars of assorted sizes

...wide strips of heavy paper marked with spaces for pasting and writing.

#### Group Presentation:

Discuss passage of time and different ways of telling how time has passed. Show how making a mark on this line is one way we can tell the passage of time for one day and is perhaps how the ancient peoples kept track of their days. Make a mark each morning.

Several days later: Children count to see how many lines have been placed to represent number of days which have passed.

Now a new line is set up to show units of days. A unit length is decided upon to show one day. Now, because we know how big to make a day, we will keep this unit of time consistent. The size of units can be changed for a new week or at a given point. The children must understand that one unit stands for one period of time.

The discussion goes on to the names of the days: today, yesterday and tomorrow. The date may also be discussed. The pages of a calendar are examined and compared with other calendar pages. One page signifies one day despite its size or shape. Today's page is pasted on the timeline and an anecdote is written below. Several calendars may be started and used to record daily atmospheric temperature, school events or schedules. Each morning, one more page is pasted on.

Several days later, compare calendars and remind them once again that the day is the same, but the unit for the different calendars is different.

**Age:** 6 years old.

#### Direct aim:

...To understand the concept of a unit of time:

...One unit for a specific period of time.

...To understand that within a timeline, this unit must be consistent.

...To learn the days of the week.

**Indirect aim:**

...To prepare for the timelines of history where very small units equal centuries.  
This is hierarchical representation which parallels math materials.

**The Whole Year****Materials:**

...Whole year calendars pasted together to be a long strip showing each day. This may be rolled or folded for storage.

..."Year and its parts" six strips of various parts of the year, six arrows or labels. for each part.

...Cardboard circle fraction inset of  $11/12$  and  $1/12$ .

...Metal insets: whole,  $1/2$ ,  $1/3$ ,  $1/4$ ,  $1/6$  of a circle.

After seeing time represented one day at a time, let's see what a year looks like.

One long calendar strip is rolled out. The children read the names of the days of the week and the names of the months.

Note; If the child at this point has not learned the names of the months and the number of months in the year, s/he should study them with this and other language materials.

Other calendars, the smallest last, are rolled out to be examined and compared, and to show the child that despite the different sizes, each shows the same amount of time: a whole year.

The measurement used for each unit (day) must be maintained throughout.

"A Year and its Parts" The whole year and its parts is laid out. The labels "One whole year - twelve months" is placed to the right.

The whole metal inset also representing ONE is placed to the left. The strip is folded to make two equal parts. The parts are then counted. The calendar strips for 6 months are compared to the two equal parts.

The children are shown that the two equal parts equal ONE Whole. The label " $1/2$  year - 6 months" is placed on the right and the  $1/2$  metal inset is placed to the left of the strip. The presentation continues with " $1/3$  year - 4 months", " $1/4$  year - three months, a season", " $1/6$  year - two months" and " $1/12$  year - one month".

A three period lesson follows this work as a review session.

**Direct Aims:**

...To have the child see a representation of a whole year.

...To have the child understand the concept of a year.

...To have the child understand the concept of a month.

...To have the child learn the divisions of a year.

**Indirect Aim:** Preparation for historical timelines.

**Previous work:** The child should have had previous work with fractions. The seasons work should be done parallel with this work.

**Personal Timelines**

**Materials:**

...Timeline paper  
...mounting paper  
...scissors, glue

**Group presentation:** Show the empty timeline.

"This timeline can represent how long you have lived or the lives of your family. You can decide how much time you want each unit to be. Why don't you start with a timeline for your parent(s)?"

The child will see that counting out the days or months of a year will be too long for a parent and will probably settle into one unit per year.

**Exercises:****1. My family**

The child can cut out timelines to represent him/herself and one for each member of the family along a straight line at the top of the page. These are placed vertically down the paper. They can write each name at the top of each timeline. The child's own name is written in color. Since each strip is one year, make a darker line to mark in each ten years to make counting easier. The child's timeline should be to the left. Have parents next, brothers and sisters and then a grandparent. Have child turn the timeline horizontally. The straight line that all the TL's sit on is now the present and it is possible to see how much longer the grandparents and parents have lived than the children, etc.

**2. My family by age**

Now paste each family member in chronological order. Now you can see who is oldest, youngest, etc.

**3. The history of my birthdays**

The teacher prepares a timeline representing at least seven years with the names of the months from January to December written in. Now the unit of time becomes a month. "During what month were you born? Each year, you have a birthday on the same day of the same month. Put a star on your month for every year." Now the child can count how many months until her/his birthday.

**4. A history of the child**

The teacher prepares a timeline representing each year of the child's life with space to write something about each year. This should be a family project where the child asks the parents questions about parents' or grandparents' memories about him/her. A picture can be used for each year. Timeline can be made on blocks of cardboard, taped and folded like a fan.

Writing should be age appropriate: a sentence or two for a first year child, several for second, a paragraph to a page for third.

Direct aim: to understand the concept of a timeline as a representation of events that have take place; to give the child a sense of the history of themselves in relationship with their family.

Indirect aim: To prepare for historical timelines.

Extensions: This lesson should be given to the child at age 6. A good parallel exercise is for second to make a family tree and grandparent interview. Third can write an autobiography.

## **The Year 200\_**

### **Materials:**

...Golden bead, numeral cards, chains of 100, 1000 (2 each), first historical timeline materials:  
...Two thousand chains, two hundred chains, thousand cube, hundreds, units as needed. Math quantity symbols for the current year  
...B. C. E./C.E. (B.C./ A.D) Timeline  
...Arrow labeled "This year"  
...Labels: "Before Common Era or Before Christ with B.C.E and B.C.on back  
..."Common Era and Anno Domini" with C.E. or A.D. on back  
...Cards with 1st - 21st on one side and I-XXI on the other.

### **Presentation:**

#### **1. "What year is this? 200\_."**

A child gets the numeral cards and corresponding quantity in golden bead material. The quantity is counted. The cards are arranged and the numeral is read. "We want to represent this quantity in a line. For each one thousand cube, we can use a long chain of one thousand." The children lay the two chains out (perhaps in a field) and count to 2000 by decades and puts the arrow 'this year' at the correct point. "But this is too long. Let's try another way." A chain of 100 is laid out. "We'll let each bead represent 10 years." The child counts by 10's and 100's until reaching the end of the chain. "This chain now represents 1000. We'll put this cube at the end to remind us. Another 100 chain is placed out and the children count by 10's until they reach 1990-2000. They place an arrow there with the numerical cards of this year.

#### **2. "Why do we call this 200\_?"**

What happened 200\_ years ago?

They may come up with suggestions--the earth was created, life began. "All of those things happened many, many years before this time. Throughout the world, there are different calendars that people use. Each people bases the beginning of their calendar with an important event. The calendar that we use in the Western world was based on when they thought Jesus was born". Place a flame or a star at the point of the year '1'. This is where our own calendar started. But there were many, many years before this time." Loose ten bars are laid out at the left side of the chain. "We could have many more ten bars because there are many, many years before Jesus was born. So many that these ten bars would go all the way through the school and out the door. The years before Jesus was born were called B.C. or Before Christ and the years from 0-present are called A.D. or Anno Domini, Latin for in the year of our Lord. Non-Christians call B.C. 'Before the Common Era or B.C.E.' and A.D. 'Common Era or C.E.'."

#### **3. Layout with cards**

Now the chains are replaced with the timeline strips. The green which is labeled B.C.E and B.C. stands for hope. The red which is labeled C.E. and A.D. stands for love. The star or flame can be at the two century ones. "Now we need to find out where to put the 'this year' arrow on this timeline. On this timeline, instead of representing one year at a time like we did with the thousand chain and 10 years at a time (or decades) like the hundred chains, each unit on this timeline will represent a century, or 100 years." The 1st card in red is put down, "This is the 1st century in the Common Era or A.D." Then the 1st card in green is put down. " This is the 1st century Before the Common Era or B.C." The child puts down 2nd century C.E. and 2nd Century B.C.E., etc. up to the 20th century C.E. and B.C.E. Both ends of the timeline should be arrows to show that time goes on in each direction. "When we write the numerals for the centuries, we can use Roman Numerals". Turn the cards over and the Roman Numerals are printed on them. (Extension: There can be

another whole lesson with craft sticks making the Roman Numerals) The cards are turned over and read again. Use three period lesson for any confusion of names.

**Age:** 7 years.

**Aim:** To orient the child to historical timelines and dates

**Extensions for older children:** study of other calendars

## **The Clock - Part I**

### **Materials:**

...Clock with movable hands (it is helpful to be able to remove the hands), divisions for minutes, Metal insets  $\frac{1}{2}$  and  $\frac{1}{4}$ . Rubber stamps of clock face without hands. Paper strips the length of the circumference of the clock. Two loose hands, hour and minute.

### **Presentation:**

#### **1. Introduction**

"Think of all the kinds of clocks or watches there are. The kind of clock with hands is called a face clock. The clock is round like a face. But no matter what kind of clock we are looking at, it is still measuring the same hour and minute of the day in our own time zone. There are 24 hours in a day. 12 hours for day and 12 hours for night".

Look at the clock in front of you. Use the hour hand to count out the hours as it moves around the clock from 1-12. "But I told you there were 24 hours! The clock goes around 2 times to make a day." The hands are placed on the 12 to represent noon. "What hour does this arrow point to ? What happens at 12:00? Twelve o'clock is called 'noon' After 'noon' there are 12 hours more. At the next 12:00, it is the middle of the night, 'midnight'. There are 12 hours before noon and 12 hours afternoon. Noon usually represents the sun at its zenith, at the highest point of the day. (Noon comes from the Latin prefix non meaning nine. It is supposed to be nine hours from sunrise, which would be about 3:00).

#### **2. The hours**

"Let's see what time you do the things that are important to you. What time do you get up? 7:00? This is 7:00".(or the child sets the clock to the correct time)  
The child makes a book of the things s/he does on a normal school day on the hour, and the time s/he does it.

#### **3. The half-hours**

"The day is divided into 24 hours but each hour is also divided into parts. There are 60 minutes in each hour. From 12:00 to 1:00 is sixty minutes. Each little mark on the clock represents a minute, or 60 seconds. People make telling time much easier by skip counting by 5's and by remembering how many minutes make a half. " Count by 5's to 30 and then place a half fraction inset down. This is twelve thirty or half past twelve. When it is half past twelve, the hour hand is halfway between the twelve and the 1. " Children can make a book of "Half pasts" with stamps.

#### **4. Minutes**

The hands show 3:00. How can I show 5 minutes after 3:00? I can count the little minutes.....or I can count by 5's like we did when we learned half past. 5 minutes past 3 is written 3:05. Children can make a book of one hour of minutes counting by 5's.

## 5. Quarters

Show a clock with example 8:15

Put the red 1/4 inset down to show 15 minutes past is 1/4 past the hour.

Therefore 8:15 is a quarter past 8.

Show a clock with 8:30 - remember half past 8?

Show a clock with 8:45 on the clock.

How many minutes have past? 45. There is one quarter to go to the next hour. This is called a quarter to 9.

Then you can teach 10 to the hour, 5 minutes to, etc.

**Extensions:** Use rubber stamp to make booklets of quarter to, quarter after, etc.

## History & Grammar - Three Fundamental Tenses

### Materials:

...A chart entitled *Fundamental Tenses* to be hung on the wall.

**Description of chart:** Below the title are three headings: Past, Present and Future with a red circle above each representing verbs beneath each. Below the circles is a single purple triangle representing pronoun. The rest of the chart consists of three lists of words corresponding to each title.

### Presentation:

The use of each of the words is discussed in relation to a pronoun in the first person singular. "I ate yesterday. " That has already happened; it happened in the past. "I eat today." That is happening in the present. I will eat tomorrow. Tomorrow has not yet come. That will happen in the future. The three words Yesterday, Today and Tomorrow are written on the chart.

When adding new words, begin with the present, and figure out the past and future in relation to the present. Some suggestions:

before now afterwards or then  
last year this year next year  
the seed the plant the fruit  
1991 1992 1993

Extensions: Make a group of cards for children to work with :

Make a chart with timeline with a pronoun sitting in the middle. This represents "I" in the present. The child can work with the cards using a verb symbol to move up or down on the timeline symbolizing past, present, future. 3 control charts show the verb and pronoun in the past, present and future.

ran	run	will run	
loved	love	will love	
ate	eat	will eat	etc.

**Age:** 7

**Aim:** To learn the three fundamental tenses.

**Note:** This chart is presented parallel to the next materials in history.

## Fundamental Needs of Humans

**Materials:**

...A chart entitled "The Fundamental Needs of Humans"

**Presentation:**

What kind of things does a person need?

(The discussion will probably go from food to toys)

Imagine that you are on an island and you will not survive without a few very important things.

What will this person need on this island that you do not need?

(Discuss human's needs and the similarities and differences of those needs through history and in different regions)

People who lived a long time ago - and people all over the world have the same basic needs. Humans need to clothe themselves, nourish themselves, to defend themselves, to transport themselves, to shelter themselves, etc., but they also have spiritual needs : the arts, religion or a belief in something more powerful than yourself, and vanity, or pride and caring of self.

Show chart.

Continue discussing related ways that different human groups have satisfied these needs or ways that these needs have been met through time.

Make examples different people: the Pilgrims of Plimoth Plantation, the Native Americans in Massachusetts, the people in the South Seas, the Arctic, etc.

**Age:** 7 years

**Aim:** To have the child come to her own conclusion that needs are constant and to show the difference in a need and a want.

## Stages in the Progress of Civilization

**Materials:**

...The Fundamental Needs Chart

...Many booklets: Stages in the progress of civilization each booklet contains pictures and corresponding labels.

## **Presentation:**

Let's look at one of these booklets - travel on the sea.

(The chart is put away and the booklet presented. The child puts the pictures down in any order.)

"Which boat looks like one that you might ride in today?"  
( It is chosen and put to the right of the child)

"Which one do you think was the oldest boat used"  
(Then look at the remaining boats and try to place them in the order of first to last trying to reason why. The teacher then presents a three period lesson naming each picture. In the first period, full descriptions are given for each picture, referring to various details in the picture. The child is then given the labels and matches them to the pictures. The child may then read the booklets.)

**Age:** 6 1/2 - 7 1/2

## **Vertical and Horizontal Studies of History**

Clarification:

**Vertical study** means to study a specific subject. This is taking one subject: e.g.. shelter and looking at it through time. The purpose for this is to take a subject and look at how humans met their needs with this subject through history. The younger child finds this easier to work with and enjoys the comparison of different aspects of the same thing through time. This lesson is also more impressionistic for the young child, allowing her/him the opportunity to imagine what things were like at different ages. *The vertical study is impersonal as it is involved with things.*

**Horizontal study** means to look at one age and compare the fundamental needs of a human during that specific time. This work done after the vertical studies and is especially relevant at the 9-12 level. Each civilization can be looked at specifically, e.g. Roman times for its housing, food, music, art, lighting, etc., etc. This is the child's first detailed research. *The horizontal study is personal as it is involved with people.*

### **A. Vertical Study of History**

#### **Materials:**

...Booklets of Stages in the Progress of Civilization

...Timeline on which each space is a century with 100 centuries (10,000 years) are represented for B.C.E. in white, 20 centuries for C.E.

in red. Set of labels for each booklet, these with dates indicated on back.

#### **Presentation:**

Choose cards which the child can relate to: shelter or lighting. Give the pictures one at a time without regard to order. Give a story with each picture and the name orally.

After you have done this, have the child give you the names.

Ask if she has a picture of her own house or can she draw one. (this involves the child in the project more).

Give the reading labels and have the child place under the appropriate picture.

Repeat for the series in this way with other cards and lessons.

**Extensions:** A group of children can build shelters through the ages and do research on this.

## **B. Passage from Vertical to Horizontal**

### **Presentation:**

Take the picture cards again. By now, she knows the names and stories. Now give a time sequence to these images.

Order them with the child from left to right - oldest to youngest

Observe with the child that if we connect these, we have a timeline of dwellings.

Remove the reading levels and put arrows there. The arrows say the same on the front as the reading labels.

See what is written on the back side. Turn each arrow over. Note that the dates go first by 1000's, then by 100's. This ordering will tell us if we have placed the picture cards in accurate order. 3000 BCE, 2000 BCE, 700 BCE, 300 BCE, 9th Century CE, 16th century, 19th century CE, etc.

Through this transition process, the child is entering the understanding of history.

## **C. Horizontal Study of History**

Have a group of children working together:

1. Put down two or more sets of fundamental needs cards.
2. Have the child choose one period of time and ask which part interests him the most.
3. Put a red arrow at this point. Take away all other cards except this period of time.
4. Have group work to go through all of the lamps, dresses, vehicles, heating, transportation, etc. for that one period of time.
5. Now when we look at the horizontal study of 1890, we have a good impression of how humans met their fundamental needs for this period of time.

The deepened study of a particular time's environment is the horizontal study of history.

Suggested time slots for Vertical/Horizontal Studies

Prehistoric Prior to 4000 BC

Early Civilizations 4000 BC-1000 BC

Greek 1000 BC - 146 BC

Roman 509 BC - 330 AD

Byzantine 330 AD - 800 AD

Middle Ages 800 AD - 1300 AD

Renaissance 1300 AD - 1600 AD

Baroque 1600 - 1700 AD

Classical 1700 - 1800 AD Eighteenth Century

Romantic 1800 - 1900 AD Nineteenth Century  
Modern 1900 - 2000 AD Twentieth Century  
2000 - Future

## The Long Black Strip

### **History of the Work**

Montessori was in India in June, 1939, at the beginning of W.W.II.

Mr. Arundel, President of World Theosophical Society invited her to give her lectures in Madras. There were several children to demonstrate her work.

One of the children told Dr. Montessori that there was nothing that he and India could learn from someone in the West. After all, the oldest real civilization was in India 10,000 years ago. Egypt was 3.5 thousand years ago. Babylon and Assyria were 5,000 years ago. The Indian civilization was actually 9,000 years old, but she said she would make it 10,000 to give him the benefit of the doubt.

Later she asked a printer to make a strip of cloth 300 meters long and 50 cm. wide. 299.99 were in black and 0.01 meters were in white.

When the roll was ready, she had it brought to the school and said "Now, I'm ready for something".

She had 2 teachers on bicycles unroll the whole thing along the street. They started with all black and finally came to the little piece of white.

The children asked what it was. Montessori said it was the history of the earth since it was created.

The children asked if it was of one color. Montessori answered. No. It changed to white when the history of humans began.

Now we make this as a 30 meter ribbon. It is still a lesson of humility. We could make it longer today to represent 4-5 billion years.

Notes:

1. Don't give the child the measurement of the strip. The demonstration is meant to be impressionistic and to pique an emotional response.
2. The colors should be opposing
3. The white dates form the first real appearance of civilization on the Indus River.

### **Presentation**

#### **Materials:**

- ...30 meters of ribbon
- ...29.999 m. in black
- ...0.001 m. in white
- ...1 centimeter = 1,000,000 years
- ...10 meters represent 1,000,000,000 years

...30 meters represents 3,000,000,000 years, the average accepted length of earth's  
...history (in 1939). Now we know it is approximately 4.6 billion years.

Remember the Dance of the Elements in our Creation Story? That was such a long, long time ago.  
(begin unrolling strip)

In the beginning we said that everything was dark, there were whirling gasses which gradually  
cooled and how long this process took.

It took thousands of years.

And then the rains came and filled in the hollows, the air was cleared up and the seas were formed.

Now the Earth was like a shriveled up apple.

There was no life on Earth.

At sometime, somewhere, a long long time ago, life began.

It began to fill the seas and after thousands of years, it began to climb out of the water onto the  
land.

(keep looking at how long it was, referring back to the strip)

Insects developed and large dinosaurs.

The insects have made a contract with the flowers and the earth is covered with grass...

There are flowers in her hair... and pure water is crystal clear...

Watch what is coming! How long it has taken!

What is it? A white line. What does it mean?

This is humanity - all humans. Hold it in your hands... this is all of history: cave people, Egyptians,  
Greeks... all here. How long it took for the earth to prepare itself.

A long time passed, while the animals developed and the plants prepared for Humans to come to  
this Earth.!!

## The Clock of Eras

### **Introduction**

This chart tells the history of the Earth from the time it was a ball of flaming gas up to the present.  
We call it the Clock of Eras because it looks like a clock. This clock is special, though, because the  
colors tell a part of the story of our planet. This clock is different from most, though, for each hour on  
the Clock of Eras represents 250,000,000 years!

#### **A. Formative Era** (Also called Azoic)

The first four hours are colored black. During this time, the Earth transformed itself from a mass of flaming gases into a planet with a cool, hard crust. The sun and earth were more alike then, but the sun did not cool like the earth. Its great size and heat brought about changes within our star, making light and heat stream out in all in all directions.

The Earth, much smaller, did not give off light. As it cooled, however, hot gases rose and fell on its surface. This was the cosmic dance. The rising flaming gas is represented by angels flying up with their basin of coals. When these gases were far enough away from the Earth they cooled. Then they descended, represented by angels flying down with their basins of ice.

Slowly the crust was formed, but it was very thin. Inside, the earth still held flaming gases, which needed space to expand. Where weak spots in the crust broke open, the gases escaped and volcanoes were formed. The volcanoes we have today are very few compared to the number then. They threw out such ash and smoke that a thick cloud formed and the earth grew dark and colder. At some point, we don't know when, water was formed in these clouds and rain began to fall. At first this rain turned to steam and rose again, but there was so much water that it finally cooled the earth and stayed. The valleys and lower parts of the Earth were covered. Afterwards, the clouds thinned and the sun began to shine.

On our Clock, we have now come to 4:00, and this long era is finished. How many years have passed? Even today, though the Earth's crust has thickened, it is still thin compared to the inside layers of our planet. There is still much heat and some of those layers are not solid.

In cooling, the earth's crust formed huge plates, which rode upon the surface and rubbed against one another. Where they collided, great mountains arose and sank, earthquakes spread out, or volcanoes brought forth matter kept hot by pressure. This action continues today.

Humans have only seen the center of the earth with computer images. No hole has ever been drilled so deep. It is believed the center is formed of nickel and iron. The symbols for these elements are **Ni** and **Fe**. Some scientists have named the center of the Earth **NIFE** because of this. The layers around the center form the mantle. The **crust**, also called the **lithosphere**, is outside. Look closely on the chart and you will see the thin layer of water called the **hydrosphere**. Surrounding it, invisible but essential to life, is the **atmosphere** we breathe.

## **B. Paleozoic Era**

The word **Paleozoic** comes from the Greek words *Paleo*, which means **old** and *zoic*, which means **life**. It is colored blue on the **Clock of Eras** to represent the color of the sea. This era lasted for approximately 385,000,000 years. This period saw the harmful ultra-violet rays of the sun beating down on the earth with no screen to protect it. Most life forms remained in the sea for protection from the sun. Now that the problem of putting more than one cell together was solved, more and more complex animals developed. During this period every phylum of the animal kingdom appeared.

## **C. Archaic Era**

The word "Archaic" means "ancient". This time period is also called the **Proterozoic Era**. **Proterozoic** comes from the Greek *Protero* meaning **early** and *zoic* meaning **life**. It is colored yellow on the Clock of Eras to represent the fact that there was little life. At the beginning of this era the earth was five billion years old and still there was only one-celled life. Many one-celled animals developed in this era. This era is the period of great rains. The rains carried millions of tons of minerals into the oceans. Concentration of the minerals in the oceans caused the oceans to become poisonous. (Too much of anything can be very harmful) One-celled animals discovered how to take the poison in and make their shells. Foraminifera was the one-celled animal that removed the poisons from the ocean. The Foraminifera did such a good job that their bodies cover about one third of our ocean floor.

## D. Mesozoic Era

The word **Mesozoic** comes from the Greek, Meso meaning **middle** and, *zoic* meaning **life**. The Mesozoic Era is colored brown on the Clock of Eras because it represents land. This era lasted for approximately 150 million years. Great masses of land were emerging out of the water. In the Mesozoic Era an atmosphere developed. Animal life, which lived principally in the water, now began to live on the land. The atmosphere shielded the Earth from the ultra-violet rays of the sun. New and more complicated animals appeared on the land. The reptiles appeared and still exist. This is the age of the great dinosaurs.

## E. Cenozoic Era

The word **Cenozoic** comes from the Greek word *Ceno*, meaning **recent** and *zoic*, meaning **life**. The Cenozoic Era is colored green on the Clock of Eras to represent the freshness of spring. This era lasted for approximately 65 million years. Two amazing things happened during this era: plants emerged on the land and animals developed that took care of their young. We know them today as mammals. Mammals bear their young alive and take care of them. The birds also played a major role at this time. Birds and mammals are the only warm-blooded animals. New volcanoes began to erupt. The climate grew a little drier and cooler and true flowering plants emerged.

## F. Neozoic Era

The word **Neozoic** comes from the Greek word *Neo*, which means **new** and *zoic*, which means **life**. It is colored red on the Clock of Eras to signify the appearance of humans on Earth. The beginning of this era was characterized by the great **Ice Age** when **glaciers** appeared. In the beginning humans played a minor role. Later, humans lived in caves and discovered the use of fire. They made tools and weapons of stone and pieces of bone. They hunted wild animals for food and clothing. They painted pictures of these animals on the walls of caves.

## The First Presentation of the Timeline of Life

### Materials:

The Timeline materials:

...Colored chart, blank chart, loose pictures, labels.

...Elastic strip which is the circumference of the Clock of Eras.

...Clock of Eras chart

...The Body functions of the Vertebrates

...If possible, pictures of the environments of each period for animals and plants.

### Presentation: Part One

Introduction

Repeat the three period lesson for the clock of Eras., recalling the meaning of the names of the last four periods.

Using an elastic strip which is a linear Clock of Eras, pick up the linear Clock.

" This is the clock as a line. Notice the colors are the same as the clock - but if I stretch out the last 4 colors, it will be the same as the top of the big timeline."

Notice that the colors along the top row are the same, and in the same order as the colors on the strip and the Clock. Recall the names of the Eras on the top row.

Scientists have studied the history of the earth for thousands of years. They have found the remnants of life on earth through crude discovery and now, with sophisticated instruments. They have developed a timeline of the life which has left its mark on the earth. This is a chart of many of the life forms which have been found. The name of each periods reflect the history of these scientists' discoveries.

**Read the name of each age mentioned in the second row**, recalling the meaning of the name, i.e. amphibians and locating these animals in the Classification or Body Function cards. Observe that the order follows the same direction on the timeline and the classification charts. Observe that the order follows the same direction on the timeline and the Classification or Body Function Cards. The child should be able to give simple descriptions for the characteristics of each vertebrate class. (NOTE: birds are on the timeline, but there is no time where they dominated the earth).

**Notice the great icicles.** These are glacial periods. During these times, a great part of the land was covered with ice. Before and after these periods, the earth was very warm. The triangular shape of the icicles show that the coldness increased gradually. At the vertex of the icicle, it was the coldest time, then it decreased.

**Notice the red lines and their paths.** Some of them start and the beginning, rise and fall. Some of them are continuous until the end. These lines indicate the appearance of animals on earth. The highest point is the time of their height of population and dominance. Their end points is when they became extinct for whatever reason.

**It is possible to study earth history through the rise and fall of mountains.** Mountains have not always been here. They usually developed slowly and then gradually eroded and became flattened over millions of years. The Rockies, Alps, Himalayas and others are among the last to appear on earth. They are being flattened so slowly that we wouldn't notice the change in our lifetimes.

(Give three period lesson to check comprehension.)

**Exercise:** The child can label the eras, the mountains and ice ages. The child can write their names or draw (especially later when animals are presented).

**Age:** 7-8 years (these presentations in this chapter continue on until the age of 10)

**Aim:** A general presentation of the timeline, relating it to the previous material: The Clock of Eras.

## The Second Presentation of the Timeline of Life

The first era is called the Paleozoic Era. Paleo means old and zoic means life. The Paleozoic is divided into 6 periods.: Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian. The Paleozoic Era is blue to represent life in the sea.

### **A. The Cambrian Period**

This period is called the Cambrian period because the first fossils were found in Cambria, a part of Great Britain, now known as Wales. Later fossils of this period were found everywhere.

Everything that lived in this time lived in the water. Invite the child to identify as many animals as possible, at least by the phylum name: protozoa, porifera, coelenterates, worms, arthropods, mollusks, and echinoderms. All of these are invertebrates This is the beginning of the age of

invertebrates. (In the child's work with the classification chart, she should have progressed up through arthropods.)

Look at the animals that are pictured all along the red line which is rising. These belong to the arthropods. Remember that arthropods means "jointed feet". Look at the characteristics of crustaceans,. These animals are called trilobites, and their bodies are divided into three parts. The trilobites were the most important animal of this period so it is called The Age of the Trilobite.

There were animals of different sizes and types in the ocean at this time. Some microscopic and some which were huge. The trilobites lived at the very bottom where there was no light and they were blind. They were plentiful, big and powerful. They were the most important animals because they had not predators - until the cold came. They could not change quickly enough when the seas became cold and part of it froze. They gradually became scarce and then disappeared altogether.

Exercise: For all the presentations of the timeline materials, the child matches all of the labels (names of eras and periods presented thus far) and the pictures pertinent to that period. The material may be left out, adding pictures to each new period as it is covered or the children may combine all of pictures of periods, presented and try to match to the right period.

## **B. Ordovician Period**

The name of this period comes from an ancient tribe of people known as the Ordovices who lived in a part of England where the first fossils of this period were found.

During this period, it is marked by the decline of the trilobites, but other animals appeared for the first time. Some looked like saws and were known as graptolites. They developed and increased in number, but for some reason they began to decline, too.

An echinoderm began to develop and reached its height and then declined.

Other animals were large cephalopods, starfish (echinoids) and scorpions. This is called the Age of Echinoderms because they were the most dominant animal of this time. One type of echinoderm was the most important of all: the SEA LILIES.

For a long time, people thought that the sea lilies were flowers or plants because they attached themselves to the floor of the ocean and formed large gardens. They seem to have a trunk and branch-like arms. Inside this trunk is the body of the animal, protected from its enemies by this trunk. They had long arms that waved in the current and a mouth at the center. When an animal passed by that he would like to eat, the sea lily would open its arms, wrap its arms around it tightly and pull the animal into its mouth. They always had food.

Some other animals that lived in this time were mollusks, cephalopods (kephale: head, podus: foot, headfoot) Large crabs, horseshoe crabs and starfish. All these animals consumed great amounts of calcium to make their shells, thus cleaning the water.

At the end of this period, there was a great swell of mountains.

## **C. Silurian Period**

The Silurian Period was named after the Silures. They lived in a part of England where the first fossils of this period were found.

This period seems to be short, but it is very important. The sea lilies which were so huge in the Ordovician Period decline here and disappear. Animals were still needed to consume the calcium in the oceans, so the corals arrived. They ate lots of calcium and gradually built islands. Coral was very

important. The corals began in the Silurian period. The line continues. They still exist today, but they are in danger of extinction.

During this period, we have the appearance of some very small protozoans, the Radiolaria and the first millipede.(look at the classification chart)

We've said that the Silurian Period was very important. If you look very carefully, you will see something very small. It is the first fish. The first creatures that have vertebral column. Theirs was not as hard as ours and was made of cartilage (show the child that their ears and nose are made of cartilage).

During this period some of the oceans started to dry up. Many algae found themselves dried by he sun on the shore. During this period, we see the first algae that attached itself to the mud and came up out of the water in search of a little sunlight. These were the first land plant, but plants without roots, stems and leaves. This plant had a small stem and tiny leaves, but no roots. It still had to put its feet in the water. These plants were the first mosses. (First there was algae living in the water, then mosses).

Why were plants the first living things to come out of the water? Because the air was full of Carbon Dioxide and the plants needed this. At this time, the earth still didn't have atmosphere. The atmosphere came about because the plants came out of the water. The plants used the CO<sub>2</sub> and gave off oxygen. They were making life possible for animals on earth. Maria Montessori called this their "Cosmic Work". Everything in nature has this cosmic work. She describes this as things in nature doing something very selfish being unaware that they are also doing something that helps others.

At the end of this period is the second ice age. Under it we see the disappearance of the trilobites and the sea lilies (crinoids).

#### **D. Devonian Period**

The name Devonian comes from Devon in England where the first fossils of this period were found. The period coincides with he Age of the Fishes. The most import animals of this period are fish. Some of these first fish wore a kind of armor, perhaps to protect themselves. This line of armored fish only lasts in this period. The other types of fish continue and still exist today.

We also see the appearance of an insect very similar to the modern insects of today. Although many of the ancient insects have changed, this cockroach has not changed at all. It is the oldest insect we know. The cockroaches lived in the dampness of the swamps at about the same time as the dipnoids were breathing out of water. Millipedes lived in the water.

In this period the oceans receded and seas were formed between the different areas of land. Animals and plants remained in the muddy bottoms and had to learn how to live in the new surroundings. The algae grew longer and covered themselves with little leaves. Then the swamp lands began to dry up and the plants had to put down roots in order to hold themselves upright and to go in search of water.

#### **F. Carboniferous Period**

In this period, the animals start putting their heads out of the water. Remember, there is much more land near the water. First the plants came out of the water and purified the air. As the waters continue to recede, fish can be found in the marshes who breathed out of the water. They are called dipnoids and they still exist today., although there are very few. The name dipnoid means two kinds of respiration: one for when they are under water, gills, and one for when the swamp dries up and

they must breathe air, they use transformed swim bladders. It is believed that the dipnoids are a link between the fish and the amphibian.

During this period we have the appearance of amphibians, which means two lives. They are the first animals to live completely out of water, but they must stay in damp places. In this period, the amphibians developed to become the masters of land and water, therefore it is also called the age of Amphibians. There were many of them, and if they had enemies on land, they escaped into the water and vice versa. They laid their eggs in water in vast quantities because some would be eaten. During this period, the insects also developed. The dragonflies became enormous (18 inches across).

The name Carboniferous comes from the word carbon which is coal. This black strip is labeled coal for the coal in the earth which was formed in this time. The coal was formed by the development of land plants which still had no flowers or fruit. They made great forests. The trees like the animals started out very small and grew bigger each year trying to occupy all the space possible. They had enormous trunks with small leaves bunched at the top. These plants still exist today, but they are all very small: ferns, cycads, horsetails, etc.

This period is much longer than the preceding period. There were many revolutions in the seas. Sometimes the seas would rise and cover everything. Then the forest would become a swamp. This process went on for millions of years - each time burying the trees in their upright position. Slowly, over millions of years, these trunks have been transformed into coal. Coal is nothing but wood that has become very old.

Look at the cosmic work of these plants. The trees didn't say, "We'll let the sea cover us so that we can produce coal" Like all other plants, and animals, too, the trees tried to occupy as much space as possible. This was their conscious work. However, we know that there is also their unconscious work. A great number of living things unconsciously prepare the world for those that come after them. The forests unconsciously purified the air by making oxygen and produced coal for those that came after them. "Those plants came back to life and live in our houses in the form of heat." Maria Montessori.

The brown strip under the black is labeled iron. In the same way as there were little animals who fixed calcium in their houses to purify the oceans, there were at this time, protozoa who fixed iron in their exoskeletons, absorbing the iron from the water. During this period, a great number of rocks containing iron were formed made up of the remains of these animals. (Pure iron is hard to find as it is always mixed with other elements in rocks) These rocks containing iron were called ferrous. Thus this period has been named after the two layers: carbon (coal) ferrous (iron) combined to make the name Carboniferous.

## **G. Permian Period**

This is the last period of the Paleozoic Era. The name Permian comes from a part of Russia: a little town called Perm which is situated at the foot of the Ural Mountains where the first fossils of this period were found.

This was a very cold period as we can see by the symbol of the glaciers. The great big amphibians disappeared or returned to the water. Only smaller ones survived.

Something new appears in this period. It is very small. It is the first reptiles, the first animals who had learned to live completely on land. These animals were not afraid of the sun, as the amphibians were. Their bodies were covered by a thick skin that protected them from the sun. In fact, reptiles really like the sun, and they actually sunbathe. Instead of depositing their eggs in the water, the reptiles laid their eggs on land where the sun could warm them.

Immediately after their appearance, they became very big. The first big ones were herbivorous as there were so many plants to eat. Since they had no enemies, they soon became masters of the land. They multiplied and grew larger until they were truly giants.

There were many volcanoes and changes in the continents. Seas were cut off from the oceans, enclosed by land and they dried up. They left behind great salt deposits which were the beginnings of the deserts.

During this time, the first insects underwent metamorphosis. It was their way to overcome the cold. They were born in the spring and grew bigger during the summer. When the cold came, they enclosed themselves in a protection in which they spent their winter months. In the spring, they hatched out, looking different from before, but enabling them to travel, mate and lay eggs again.

By this time, there were many different plants and animals on the land and in the sea. The Paleozoic Era came to an end.

## **H. Mesozoic Era**

The Mesozoic is the beginning of the age of reptiles. It is made up of three periods: the Triassic, the Jurassic, and the Cretaceous.

The Era is brown to symbolize the earth.

Reptiles that arrived during the Permian Period were found everywhere at this time in the water, in the air and on land. Some were carnivorous; others were still herbivorous. The reptiles had become very big, as big as houses, and they continued to be the lords of the earth.

They were strange-looking animals. These reptiles always had such very small heads on enormous bodies. The reptile had small brains in his tiny head, a spinal cord which extended the length of his great body, and at the end of his long tail was another little brain (actually a nerve ganglia). His body was so big that the tiny brain on his head could not take care of the end of his tail - so he had two.

We can tell that some of the reptiles were carnivorous by their terribly sharp teeth. Flying reptiles appeared. Some had wings and also feathers. These were called pterosaurs. It is believed that birds descended from this reptile. Still others returned to the water, some taking the shape of fish.

Plants also progressed. For the first time, we have conifers, pines and fir trees. These plants still had no flowers, but they had pollen, which when blown in the wind to the female plant, produced eggs, or seeds.

During this point, we see the appearance of the first mammals, the monotremes (the platypus). These animals still lay eggs, but they nourish their young with milk.

The age of reptiles is very long and has been divided into three periods: Triassic, Jurassic, Cretaceous. The name Triassic means rock sediments that have been divided into three strata. Jurassic comes from the Jura mountains where the first fossils were found. Cretaceous comes from a word meaning chalk because most fossils from this period were found in chalk deposits.

At the end of this age, plants had real flowers. The insects of which there were many at this time, fertilized the plants by carrying pollen on their wings as they flew from flower to flower drinking nectar, then dropping pollen onto the stamen of the female plant.

The earth was covered by ice at the end of this period. During this glacial period, all the great big reptiles disappeared. Some people think there was a great meteor shower during this period as well which changed the climate of the earth and made it impossible for the great reptiles to live.

Another animal existed during the time of the reptiles. It was small and was probably afraid to come out during the day. But it had warm blood and was able to sleep in the day and stay awake at night when the reptiles weren't around. This little animal was alert and perhaps clever and was able to survive the meteor or glacial period.

These little animals, the mammals, developed dramatically. Like all the other animals before them, they became numerous and occupied the most space they possibly could. They didn't remain only on the land. Some developed wings and flew; some transformed their limbs and returned to the sea.

Birds were also developing. In the beginning, most of these animals were very different from the mammals as we know them. Gradually they changed and acquired the forms as they are familiar to us. We can compare this horse to the modern horse. Some other animals that are similar to the ones we know were fish, birds, amphibians and whales.

The age of Mammals is divided into four periods. All of the names have about the same meaning for all these contain "-cene", which comes from the Greek *kainos*, meaning new.

During this time, the only reptile survivors were crocodiles, lizards, snakes and turtles. Out of hiding places crept the mammals. During the Paleocene, they were small brained, large jawed, clumsy and inefficient. Some passed into extinction. This is when the hooved mammals appeared.

**Eocene** means new. These descendants differed from the Paleocene. Lemurs and huge eyed tarsiers and the first monkeys made their appearance in Africa and S. America. Ancestors of the modern mammals such as the camel, horse and rhinoceros were during this time. They were very small: the camel was the size of a rabbit, the horse, the size of a fox, the rhino as big as a dog.

**Oligocene** means newer. These animals began to grow much bigger and take an important leap forward as in the whales, rhinoceros. The plant life took over cliffs and mountains, making a carpet of trees and grass.

**Miocene** means even newer. A creature called the Ramapithecus branched off from the ape line. This is one of the very primitive ancestors of modern humans.

and **Pliocene** means newest. The descendant Australopithecus became a human-ape, a border-line human being.

Throughout this Cenozoic Era, mammals were the dominant life force. Some of these animals developed grasping movements and binocular vision. Their babies were born dependent. Therefore, mammals gave their babies milk to nourish them during this era.

The red line is **The Neozoic Era**, the time of humanity and modern life.

We can see on the Timeline of Life that there were millions and millions of years of life on earth before humans appeared.

### **Notes:**

This timeline is a key - an impressionistic lesson.

Don't make it too complicated and don't be afraid to say "I don't know". The children will return to this for other lessons.

Have fossil specimens.

You can put animal specimens and class animals in evolutionary sequence under the timeline.

Don't put up the timeline until you are presenting it.

They have a strong interest in this work, so don't wait too long.

## The Study of Early Humans

### **Presentation of the Hand Chart**

#### **Materials:**

...Black strip of cloth 10' x 1', the last half inch is red.

...The black is to give the sensorial impression of "nothingness."

...The scale is 100,000 years per foot.

...The hand holding the stone tool is the approximate time that humans developed tools. The entire length of the strip represents the time humans have been on earth (1 million years).

...The red 1/2 inch is recorded history beginning about 4,000 BC.

#### **Presentation:**

Roll out the black strip. Say something like..."humans are now learning to walk, finding things,"... "WAIT!" "Something has happened. It took humans all this time to develop tools." "For a long time, humans continued to develop and change and after a long time, humans developed writing as represented by the small red strip."

#### **Follow up:**

Have discussions with the interested children on the following subjects:

...What does it mean to be human?

...How did the development of the hand influence the development of tool making and writing?

It is not necessary for them to arrive at any specific conclusion, merely to have considered the questions.

### **Early Humans: First Timeline**

#### **Materials:**

...The Prepared Timeline beginning about 500,000 years ago up to 1 AD.

...As much appropriate fossil material as you have.

...As many appropriate illustrations as you have.

#### **Presentation 1:**

Explain that there were earlier hominid examples, but this time line begins with Homo habilis, "The Toolmakers." If you met one of these "men" today, you would not think it looked very human. They were only four to four and a half feet tall. They weighed less than 60 pounds. They had low brows and protruding jaws.

But, they did something no other creature had ever done before - they picked up a rock and used it to help with their work. Scientists have found actual examples.

Homo habilis, lived in small groups and one factor in their ability to survive was their ability to work together. They established home bases where they would camp for a while rather than roam.

The picture of the man eating raw meat is to represent the fact that these early hominids did not have fire. They did not have a language with words. They communicated with grunts, screams and meaningful gestures.

**Follow up:**

- This is a great place to stop and direct a play between two groups of Homo habilis bands. The children must not speak words. They must gesture and grimace while uttering growls, hoots, groans, grunts and screams. The children love to do this! Don't forget that the dominant males will probably form a defiant protective shield in front of the females, adolescents and children. (Assure the students that they will perform this play with their clothes on. Some may be reluctant as they think they will have to remove all their clothes.)
- Find examples of Homo habilis in pictures by different artists. Have the children discuss the differences and figure out what is speculative and what is known.
- A child can draw or copy scenes.
- Information cards should be available for research. NOTE: Older books will have little or no information of Homo habilis in them.

**Presentation 2:**

Homo erectus, "The Upright Man" was short (five feet tall). Their skulls were thicker than modern humans but compared with earlier hominids, their heads and brains were considerably larger and their faces were flatter.

The hand of H. erectus was becoming more dexterous with the pincer grip of thumb and fingers supplanting the power grip of H. habilis. Because of this, they were able to fashion large hand axes that functioned as cleavers.

Perhaps the greatest achievement of these people was their use of fire, which may have been related to the ice age. With fire, they were able to cook wooden spear points to harden them enough to jab into much larger animals with much tougher skin. Fire also served to keep the people warm night and day and to keep predators away at night.

Although these people originated in Africa, they could carry fire with them and were able to move into the temperate regions of the world including China and Germany. [very important NOTE: First person to discover the remains of H. erectus was a Dutch man named Eugene Dubois.] H. erectus hunted in larger groups and used fire to drive animals into swamps or off cliffs. By cooking their food, their jaw muscles and teeth were able to diminish in size, allowing the brain size to increase.

While the vocal apparatus of H. erectus would not allow much vocalization, it is possible that a few sounds were used to "name" individuals or objects (NOUNS).

H. erectus built the first shelters recognized as such. There is no evidence that they made clothing, but those living in the temperate climates probably wore animal skin capes during the winter at least.

**Follow up:**

- Similar to that for Homo habilis.
- Using a carefully tended briquette grill outside, the children can harden wooden points. Have the children scrape the bark from freshly cut saplings. The toasting must be done carefully so that no charcoal (which is soft and crumbly) forms. If it does, use it with your history of writing activity!
- You may be able to find a local archeologist or Native American who is adept at chipping flint tools. A visit from such a person is always a treat for everybody.

**Presentation 3:**

Homo neanderthalensis, take their name from the little valley in Germany where they were discovered. They were very powerful with strong muscles and thick bones. It is easy to understand why scientists mistook them for stooped, hulking brutes with a vacant expression. We now know that this is false, but this mistaken image of a "caveman" lingered for a long time - even into today in some people's minds.

Their skulls were low in front with a heavy ridge of bone above their eyes. They barely had any chin at all. They had a brain capacity greater than modern humans. This does not mean they were smarter than we are. Intelligence depends on size and organization of the brain. Studies show that their vision was probably better than ours, but their language was not as developed and they couldn't think ahead as well as we do.

The Neanderthals were great hunters. They hunted large animals such as mammoth and woolly rhinoceros with little more than fire hardened wooden spears. There is no evidence that they used stone spear points, but they did chip stone scrapers off flint cores.

Neanderthals buried their dead, including small children, with food and tools, probably indicating some kind of religion. This practice has contributed to the numerous skeletons in museums and to a greater knowledge of the customs of the Neanderthal. There is evidence that they cared for sick and elderly members of their clans. They used animal skins as clothes and may even have used certain plants for medicine. They continued the tradition of building simple shelters. There are indications of huts made from saplings built inside some of the European cave sites. About 30,000 years ago, the Neanderthals died off and the cause remains a mystery, but we have a clear idea of what came next, the Cro-Magnons.

**Follow up:**

Similar to those after the other early hominids. Just adjust your information and give it a go!

**Presentation 4:**

Over 100,000 years ago, a new line of humans began to develop. They were called Homo sapiens, "the wise men." These people were nicknamed Cro-Magnons after the name of the place where they were first discovered. About 30,000 years ago, the Neanderthals died out and left the Cro-Magnons as the only kind of human on earth. Today all humans, even you, belong to this species. The Cro-Magnons had brains larger than ours today. They were taller and more slender than the Neanderthals. Their faces looked much the same as ours. If you were to meet a Cro-Magnon dressed in a business suit, you would probably not notice anything strange about them. They were hunters, artists, dreamers, seekers and doers. They invented music (Scientists have found a flute dating from 32,000 years ago.), art (found in Altamira and Lascaux caves dating from about 17,000 years ago) and language.

The more people know, the faster changes occur. In the Paleolithic, it sometimes took 100,000+ years for a new way of making tools to develop. As time went on, our prehistoric ancestors learned to use fire, the wheel and the bow and arrow. The pace of change grew faster. This is still happening today. Our technology may change more in one year than did that of our prehistoric ancestors in a thousand centuries (1,000,000 years).

Prehuman and early human individuals lived for over 3 million years at the technological level characterized as the Lower Old Stone Age. The Upper Old Stone Age will span only 30,000 years, or 6 inches on our timeline. In the last two inches are contained the Middle Stone Age, the New Stone Age, the Copper and Bronze Ages and our own Modern Age.

Obviously it is time to expand the scale of the timeline so we can study these last important stages in greater detail. Unroll the Second Timeline after demonstrating the expansion of an elastic between your hands. NOTE: This timeline is 9-12 material and is usually not given in detail at 6-9.

**Follow up:**

**The Human Question.** Each species has its own special survival tools, for example: fangs, claws, speed, the ability to hide or the ability to withstand drought. Our tools are our hands and our brains. With these tools, we have the power to choose to shape the world around us. We are the only creature that has ever had that choice. The great questions that arise from this are

- How will we shape the world?
- Will we make it better, or will we destroy it?