



Geology, Relatives, and Time

Life Skills:

- Thinking & Reasoning
- Communication

Time Frame:

30 Minutes

Group Size:

Entire Class

Summary:

Using a simple three or four generation family tree, students will construct a relatives time tree that mimics the major divisions of the geologic time scale (Precambrian, Paleozoic, Mesozoic, and Cenozoic).

National Science Education Standards:

Content Standard D: Earth and Space Science, grades 9-12
The Origin and Evolution of the Earth System (relative time)

Main Curriculum Tie:

Idaho 8-9.ES.4.1.2 Identify methods used to estimate geologic time.

Utah 8.IS.III.3a Identify assumptions scientists make to determine relative time.

Wyoming 5-8.ES&PS.9 The Earth's History: Student's systematize the Earth's history in terms of geologic evidence, comparing past and present Earth processes and identifying catastrophic events and fossil evidence.

Intended Learning Outcomes:

- Use science process and thinking skills.
- Demonstrate understanding of science concepts and principles.
- Communicate effectively using scientific language and reasoning.

Materials:

- Simple three or four generation family tree prepared by each student
- Geologic time scale

Background For Teachers:

In any science, a common lexicon is essential for ease of communication among peers. Geology is no exception; but being an historical as well as a descriptive science, it is important to have a universal understanding of time. The geologic time scale provides geologists the world over with a shared time reference. You might say that the geologic time scale is to geoscientists what the periodic table of elements is to chemists.

The geologic time scale is divided into eons, eras, periods, and epochs with eons being the longest time divisions and epochs the shortest. Many of the period names have historical precedents dating back to the 18th and 19th centuries when outcrops of rock across Europe were being systematically mapped using the rules of relative timekeeping (original horizontality, original continuity, superposition, cross-cutting relationships and faunal succession). In accordance with these rules, the geologic time scale is arranged so the oldest time divisions are at the bottom and the youngest are at the top. It was not until the twentieth century that absolute ages could be assigned to the geologic time scale using radiometric dating techniques. Even now these absolute dates occasionally undergo minor revision.

By contrast a family tree can be divided into generations with the grandparents representing the roots; parents, aunts and uncles the trunk; siblings and cousins the branches; and sons, daughters, nieces and nephews the leaves. Events like births and marriages can be used to further sub-divide the generations much as periods are a subdivision of eras. And just as radiometric dating techniques

provide absolute ages for the geologic time scale, birth and death certificates and marriage licenses document our family trees.

Instructional Procedures:

1. As a homework assignment, each student with the help of a parent should prepare a simple three or four generation maternal or paternal family tree. Provide students with an example from page 4 or 5.
2. Display a simplified geologic time scale (See example on page 3) showing only the Precambrian, and the Paleozoic, Mesozoic and Cenozoic eras. Ask students if they notice anything in common between the era names (Answer: they all end in the suffix *-zoic*). Ask them if this suffix reminds them of any word they are familiar with (Most likely answer: zoo). Continue the discussion explaining that *zoo* and *-zoic* have the same word origin, the Greek word *zoon* meaning animal. Now explain that the prefixes *paleo-*, *meso-* and *ceno-* are also derived from the Greek language; *palaios* meaning ancient or old, *messos* meaning middle, and *kainos* meaning new or recent respectively.
3. Display a copy of your family tree.
4. Have students transform their family trees to mimic the simplified geologic time scale equating generations to eras. They should develop a scientific sounding name for each generation. See pages 6-7 for examples.
5. Display a copy of the geologic time scale showing eons, eras, periods and epochs (see example on pages 8).

generation- the average amount of time between the birth of an individual and the birth of its offspring, e.g. the birth of a father or mother and the birth of a first son, or daughter.

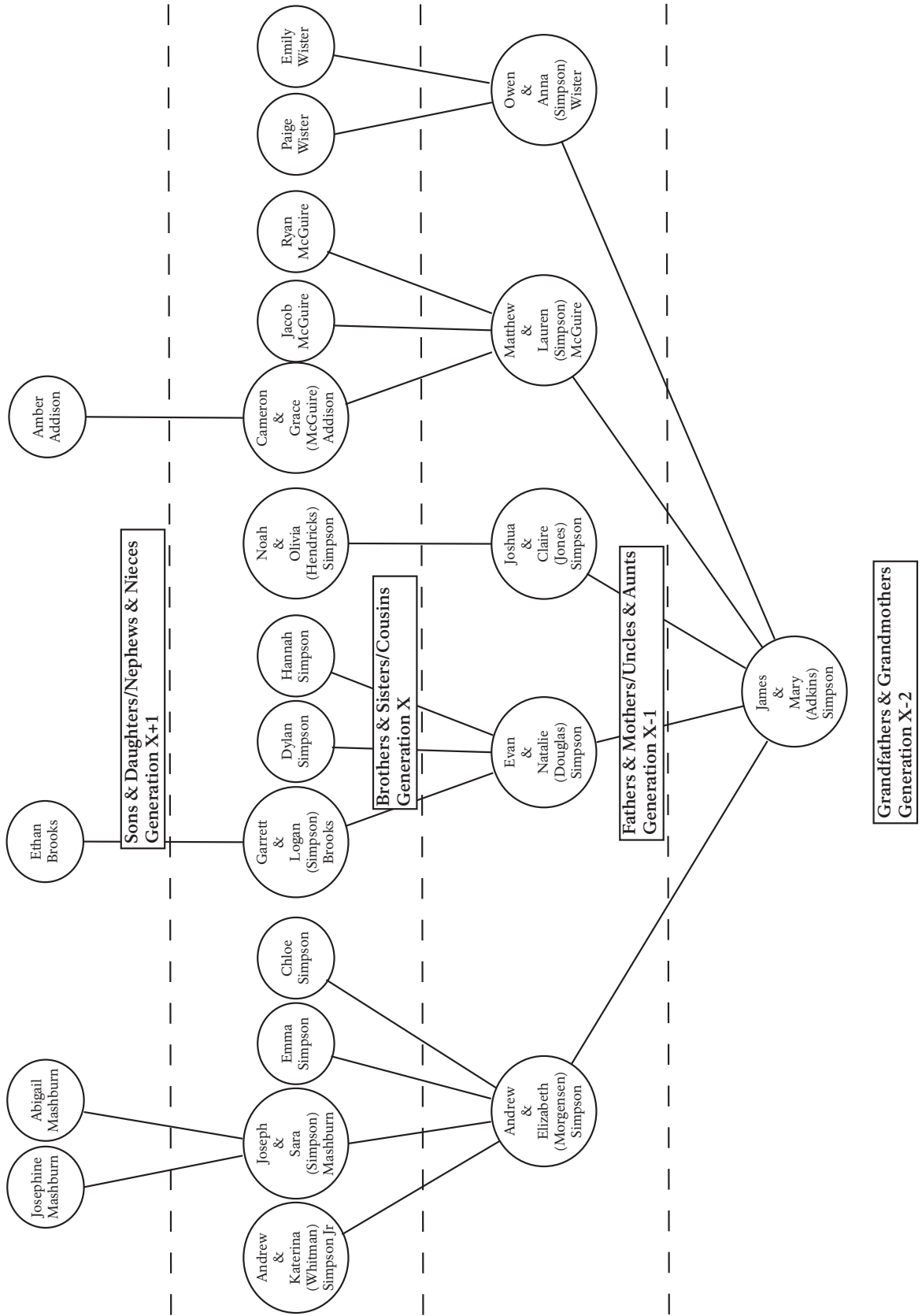
Assessment Plan:

1. Geologists refer to the history of past events and life preserved in the rocks of Earth as the geologic record. Write a short family history, a family record, detailing the most significant events in the lives of your immediate relatives.
2. Take a closer look at your family time tree and the geologic time scale. Notice how a generation of your family time tree equates to an era, one of the longest divisions of geologic time, but that the geologic time scale also contains several smaller subdivisions of time called periods, epochs and ages. These individual time intervals often mark significant events in Earth history such as the appearance or disappearance of a biological organism (preserved as fossils) in the geologic record. Review what you have written about in your family record. How would you subdivide the generations (eras) of your family time scale into smaller time increments like the periods on the geologic time scale?
3. Prepare a My Relatives Time Scale of your extended family (grandparents, parents, brothers, sisters, nieces and nephews). Remember that the oldest event should be recorded at the bottom followed by progressively younger events. Remember relative time units often mark the first appearance of a biologic organism. This would be similar to what event in your life?
4. Take another look at the geologic time scale. Notice that an absolute (numerical) age has been assigned to the beginning of each eon, era, period, epoch and age. These have been determined by a variety of methods, the most common of which is the radiometric dating of igneous rocks. Think of radiometric dating methods as providing a birth certificate for the rock, much like the one issued to your parents when you were born. Geologic ages are recorded in years before present, so that the Precambrian began 4,567 million years ago. Assign an age to the beginning of each era and period of your family time scale. See page 9 for an example.

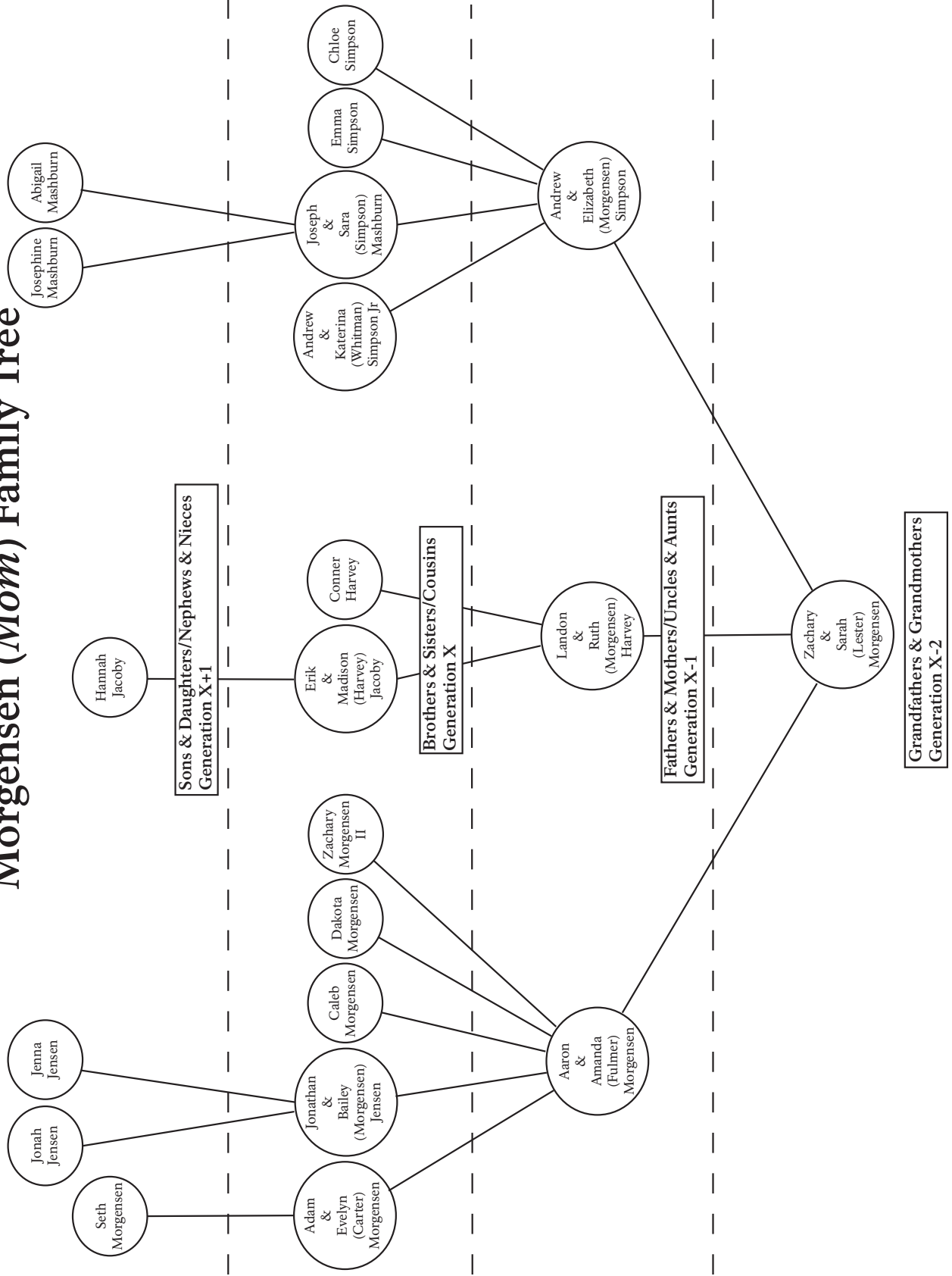
Geologic Time

Major Time Divisions	Millions of Years Ago	% of Total Time	All Time= 365 Days
Cenozoic Age of Mammals	65.5	1.43%	Dec. 26
Mesozoic Age of Dinosaurs	251	4.06%	Dec. 11
Paleozoic	542	6.37%	Nov. 18
Precambrian	4567	88.13%	Jan. 1

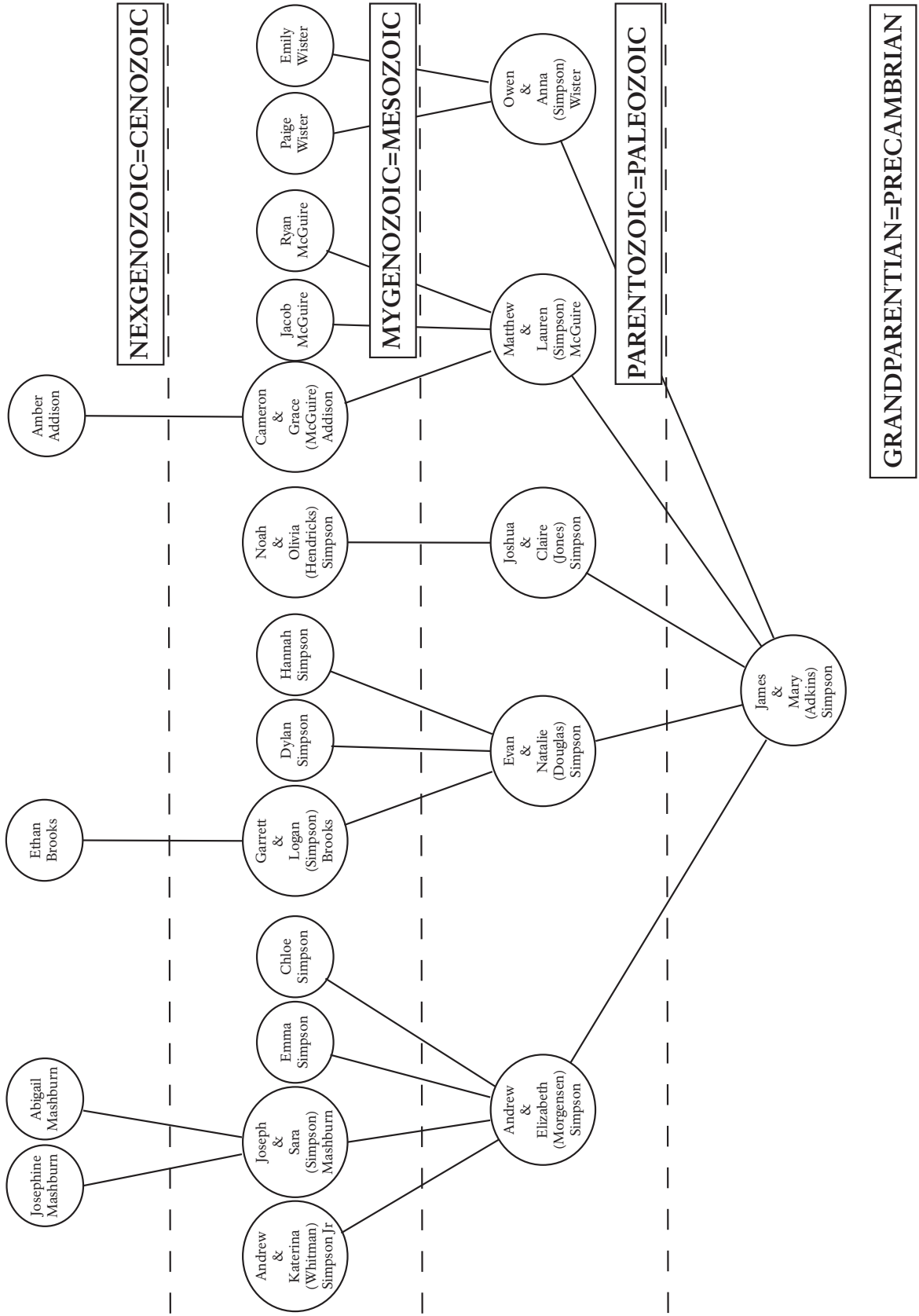
Simpson (Dad) Family Tree



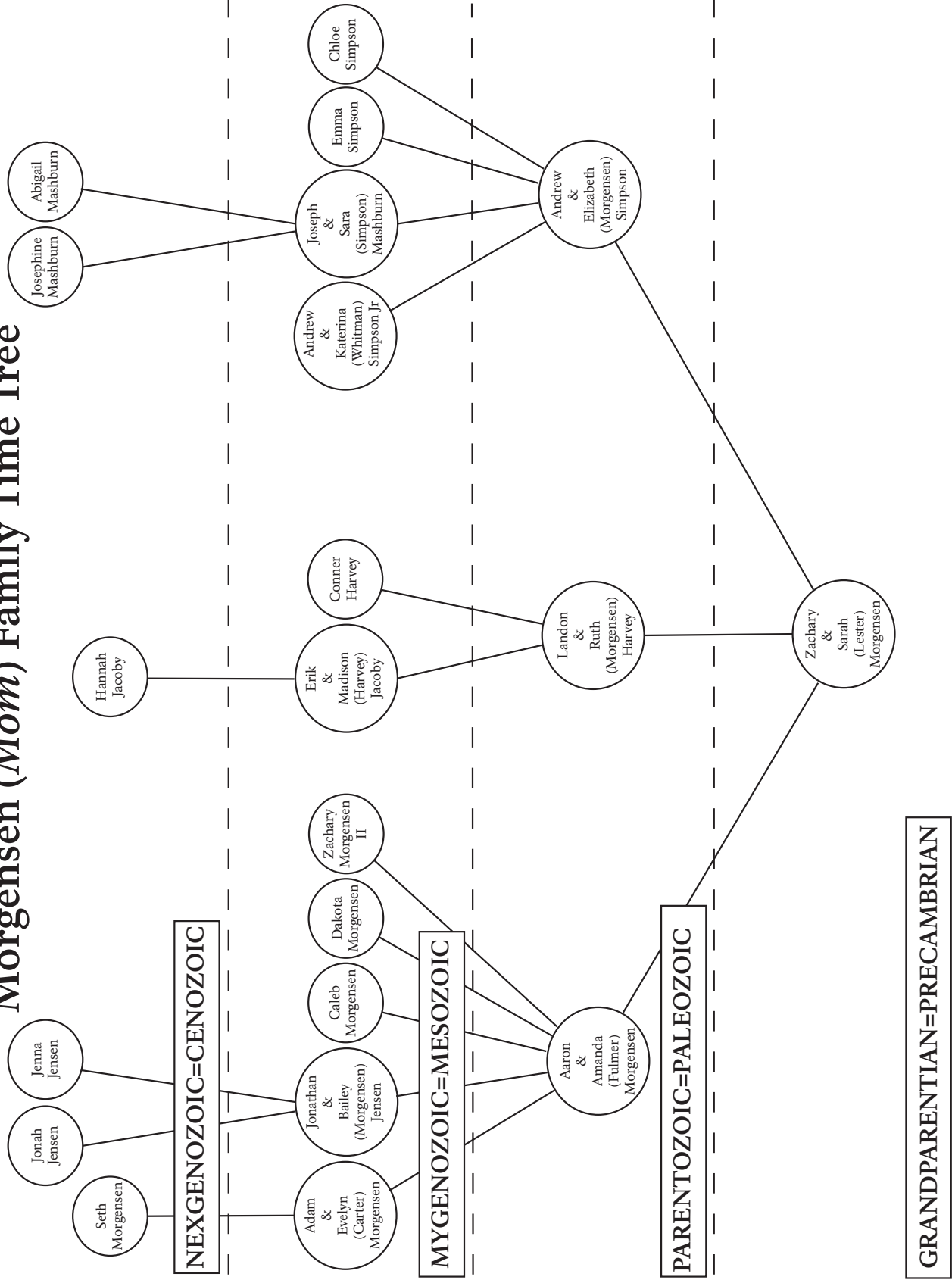
Morgensen (Mom) Family Tree



Simpson (Dad) Family Time Tree



Morgensen (Mom) Family Time Tree



Geologic Time Scale 2008*

Geologic Time		EON	ERA	PERIOD	EPOCH	Millions of Years Ago
Cenozoic	Phanerozoic	Cenozoic	Quaternary	Holocene	0.0117	
				Pleistocene	2.588	
			Neogene	Pliocene	5.332	
				Miocene	23.03	
			Paleogene	Oligocene	33.9	
				Eocene	55.8	
				Paleocene	65.5	
			Mesozoic	Mesozoic	Cretaceous	145.5
					Jurassic	199.6
Triassic	251					
Paleozoic	Paleozoic	Permian	299			
		Carboniferous	359.2			
		Devonian	416			
		Silurian	443.7			
		Ordovician	488.3			
		Cambrian	542			
Precambrian	Proterozoic	2500				
	Archean	4000				
	Hadean	4567				

*Based on "The Concise Geologic Time Scale" by J.G. Ogg, G. Ogg and F.M. Gradstein (2008)

My Relatives Time Scale

		Years Before Present
2009		
	Abigailian <i>Abigail Mashburn (niece) born 2008</i>	
	2008	1
Nexgenozoic	Simpsonwhitmanian <i>Brother Andrew married 2007</i>	
	2007B	2
	Josephinian <i>Josephine Mashburn (niece) born 2007</i>	
2007	2007A	2
	Mashburnsimpsonian <i>Sister Sara married 2005</i>	
	2005	4
	Chloesian <i>Chloe Simpson born 1995</i>	
	1995	14
Mygenozoic	Emmassic <i>Emma Simpson (sister) born 1990</i>	
	1990	19
	Sarassic <i>Sara Simpson (sister) born 1987</i>	
	1987	22
	Andrewjuniorian <i>Andrew Simpson Jr (brother) born 1986</i>	
1986	1986	23
	Simpsonmorgensenian <i>Parents married 1985</i>	
	1985	24
	Elizabethian <i>Elizabeth Morgensen (mother) born 1967</i>	
	1967	42
	Andrewian <i>Andrew Simpson (father) born 1956</i>	
1956	1956	53
	Simpsonadkinsian <i>Grandparents married 1955</i>	
	1955	54
	Jamesian <i>James Simpson (grandfather) born 1935</i>	
	1935	74
	Maryan <i>Mary Adkins (grandmother) born 1934</i>	
1934	1934	75
	Grandparentian	