History of Life

by

Chris M. Halvorson

The Urantia Book gives a detailed overview of the historical geology of our planet, Urantia (see Papers 57–61). Any systematic presentation of historical geology is built upon the framework of a geologic time scale, a partitioning of the entire span of geologic time into a hierarchical set of divisions, tied to a sequence of absolute dates. The geologic time scale implied by the overview in *The Urantia Book* is shown in the chart on the next page.

Some aspects of the partitioning and nomenclature in geologic time scales do not have universal agreement among geologists. The system that is used in this paper is a harmonization of the system in *The Urantia Book*, systems in common use, and an overriding desire for consistency. The Cryptozoic Eon is often referred to as simply Precambrian Time, with the Archeozoic and Azoic Eras labeled the Archean and the Hadean, respectively. Herein, all eons and eras are referred to by those names that end in the suffix "-zoic", meaning "life". (The literal meanings of the eon, era, and epoch names are shown parenthetically.) This choice makes the nomenclature uniform, and it emphasizes the fact that the universe was created to be inhabited. Urantian geologic time embodies the history of life on this planet.

In common usage, the boundaries of the periods in the Cryptozoic are rather arbitrary. The overview of history in *The Urantia Book* supplies the requisite information to make these boundaries much more definitive. Consequently, the Neoproterozoic is defined to be equivalent to the Vendian, which is usually considered to be only the most recent portion of the Proterozoic. There are a few other minor boundary issues. The Mississippian and Pennsylvanian Periods of the Paleozoic are combined into one period, the Carboniferous, in *The Urantia Book*; and the Paleocene Epoch is included in the Eocene. Both of these approaches are used by some geologists, as well. In fact, there are many different sets of boundary definitions for the epochs in the Cenozoic. Most commonly, the beginning boundary of the Pliocene is chosen at a more recent date than in *The Urantia Book*, and the earlier ages are designated as the Late Miocene. The beginning dates for the Pleistocene and the Holocene reflect the clarified chronology of the ice ages that is presented in *The Urantia Book*. Usually the beginning of the Holocene Epoch is set at about 10 000 years ago, which is roughly the beginning of the Neolithic, whereas 35 000 years ago is near the beginning of the Upper Paleolithic.

The most pronounced difference between the geologic time scale of *The Urantia Book* and those in common use is the sequence of absolute dates. The dates in *The Urantia Book* are the actual recorded historical dates, but the dates in common use are radiometric dates. The rightmost column in the chart gives the approximate ratio between these two sequences of dates. The first clue to understanding why there is a difference between actual and radiometric dates is inserted into the chronological presentation in *The Urantia Book*, namely, Paper 58, section 3.

Geologic Time Scale

Eon	Era	Period	Epoch	Approximate Beginning Date [years ago]	Radiometric-to-Actual Date Ratio*
Phanerozoic (visible life)	Cenozoic (recent life)	Quaternary	Holocene (wholly recent)	35 000	1.0
			Pleistocene (most recent)	2 100 000	1.0
		Tertiary	Pliocene (more recent)	12 000 000	1.0
			Miocene (less recent)	25 000 000	1.0
			Oligocene (scarcely recent)	35 000 000	1.0
			Eocene (early recent)	45 000 000	1.2
			Paleocene (remotely recent)	50 000 000	1.3
	Mesozoic (middle life)	Cretaceous		100 000 000	1.4
		Jurassic		124 000 000	1.6
		Triassic		150 000 000	1.6
	Paleozoic (early life)	Permian		180 000 000	1.6
		Pennsylvanian		210 000 000	1.6
		Mississippian		226 000 000	1.6
		Devonian		275 000 000	1.5
		Silurian		300 000 000	1.5
		Ordovician		350 000 000	1.4
		Cambrian		400 000 000	1.4
Cryptozoic (hidden life)	Proterozoic (former life)	Neoproterozoic		450 000 000	1.4
		Mesoproterozoic		500 000 000	2.0
		Paleoproterozoic		550 000 000	4.0
	Archeozoic (ancient life)	Late		750 000 000	4.0
		Middle		850 000 000	4.0
		Early		1 000 000 000	4.0
	Azoic (without life)	Late		1 500 000 000	—
		Middle		3 000 000 000	—
		Early		4 500 000 000	—

* There is no single set of standardized radiometric dates, and any given set has inherent uncertainties; therefore, the date ratio compares an average radiometric date to the approximate actual date that is given in *The Urantia Book*. A precise comparison is not possible. (There are no radiometric dates corresponding to the beginnings of the Azoic periods.)

It is not a coincidence that this section is immediately prior to the overview of the Proterozoic, where the largest change in the date ratio occurs. The section is about the "spatial environment", in particular, the presence of subelectronic energy activities in the environment (cf., 42:5.5, Paper:section.paragraph), and how these energies do not directly affect the evolution of life, but are nonetheless essential to it. The usefulness of natural radioactive decay as an accurate dating method hinges on the common assumption that the rate of decay is constant over time. That assumption is incorrect. Radioactivity is a reflection of the existence of the subelectronic domain of physical reality (42:4.12); it is affected by the environment, which is a function of both space and time. An atom is not an isolated physical system; there is no vacuum (42:4.6). Radioactivity is proportional to subelectronic activity (42:4.5,7). Hence, both mutation and radiometric dating are indirectly affected by the spatial environment.

The Master Physical Controllers, specifically, the energy transformers (29:4.15–18), have regulated radioactivity (42:4.10) over the span of geologic time, according to the evolution plan of the Life Carriers. In the past, the rates of radioactive decay were greater than the present rates. Therefore, radiometric dates, which are determined by assessing the degree of decay, overestimate the crystallization age of a mineral in a rock, especially if the mineral was formed in the remote past. For the oldest rocks on the surface of the earth, the radiometric dates are about four times greater than the actual dates. The oldest rocks that have been discovered so far are the Acasta Gneisses in northwestern Canada near Great Slave Lake, with a radiometric age of 4.03 billion years. Mineral grains of zircon in sedimentary rocks in west-central Australia have a radiometric age of 4.4 billion years. The oldest dated moon rocks have an age of 4.5 billion years. (The moon reached its present size just prior to the earth.) The oldest lead deposits are dated at 4.54 billion years, and the oldest meteorites at 4.58 billion years. These oldest radiometric dates correspond to actual dates from 1.01 to 1.15 billion years ago, which agrees with the statement in *The Urantia Book*: "Urantia is more than one billion years old on its surface" (57:7.3).

The sun was born 6 billion years ago; and by 5 billion years ago, it was an isolated variable star with a period of three and one-half days. Over the course of one million years, beginning 4.5 billion years ago, the Angona system passed by the sun and initiated the formation of the solar system. This event marks the beginning of the Azoic Era. By about 3.0 billion years ago, the embryonic stage of development was completed; so the solar system was registered and given the name *Monmatia*, marking the beginning of the Middle Azoic. Monmatia literally means "the mother place of man", which is correlated with the name *Urantia*, "(y)our heavenly place". Over the next 1.5 billion years, meteors rained down upon the earth and the moon. The transition from the meteoric age to the volcanic age occurred 1.5 billion years ago, when the earth was two thirds its present size and the moon was nearly complete. This is the beginning of the Late Azoic.

About 1 000 000 000 years ago, having nearly reached its current size, the earth "was placed upon the physical registries of Nebadon and given its name". This is the literal beginning of *Urantia* history, the beginning of the Archeozoic Era. Approximately 950 000 000 years ago, "Urantia was assigned to the system of Satania for planetary administration and was placed on the life registry of Norlatiadek". This life registration marks the initiation of the construction of the material organizations for life by the Master Physical Controllers, specifically, the primary associators (29:4.25–27), who were the first beings to arrive on the planet. The ancient life on the planet was prokaryotic. Prokaryotes (bacteria, cyanobacteria, archaebacteria, mitochondria, and chloroplasts) are living machines, single-celled power plants; so their association with the power beings (viz., the Master Physical Controllers) is only natural. In fact, the energy transformers and the primary associators both store and release energy, analogous to the storage and release of energy by prokaryotes via ATP (adenosine triphosphate). Also, the secondary dissociators (29:4.28) function much like the bacteria involved in the decomposition of organic matter.

When the first Life Carriers came to Urantia 900 000 000 years ago, their presence activated the lifeless material forms, of the completed original prokaryotes, with living vitality (cf., 36:6.3). Living vitality is the first phase of life animation. Prokaryotes cannot access the second phase, the reproductive spark; hence, they multiply by simple fission (DNA replication and cell division), rather than sexual reproduction, the meiosis and mitosis of eukaryotes. The oldest cyanobacteria fossils have a radiometric date of 3.5 billion years ago, corresponding to an actual date of 875 000 000 years ago. As a result of the activation of prokaryotic life: "[Urantia] was accorded full universe status. Soon thereafter it was registered in the records of the minor and the major sector headquarters planets of the superuniverse; and before this age was over, Urantia had found entry on the planetary-life registry of Uversa."

The Middle Archeozoic begins 850 000 000 years ago, with the real stabilization of a crust, global convection in the mantle, and a core of heavier elements at the center of the earth. This date is also marked by the initial functioning of the magnetic poles. The beginning of the Late Archeozoic, 750 000 000 years ago, is marked by the initiation of the north-south and east-west cracking of the single land mass, the start of continental drift. As the continents separated, large shallow seas formed in the breaks. When these seas reached the proper state of development, they harbored "the inauguration of the evolutionary cycle" (58:1.2).

Eukaryotic life is designed for evolution, and 550 000 000 years ago the Life Carriers implanted the first single-celled eukaryotes in the seas of Urantia. This eukaryotic plant life was organized *in situ* and was built upon the foundation of the prokaryotic life that had already been established on the planet; in particular, chloroplasts are prokaryotes. The establishment of eukaryotic life marks the beginning of the Proterozoic Era. The oldest fossil of a macroscopic organism is radiometrically dated to be 2.1 billion years old, corresponding to an actual date of

548 000 000 years ago. The oldest relatively clear evidence of eukaryotes is dated to be about 1.8 billion years old, implying an actual age of 540 000 000 years. Both of these dates agree nicely with the date that *The Urantia Book* gives for the beginning of the Proterozoic. In addition, geologists date the beginning of the transition to an oxygen atmosphere at 2.2 billion years ago, which is precisely an actual date of 550 000 000 years ago.

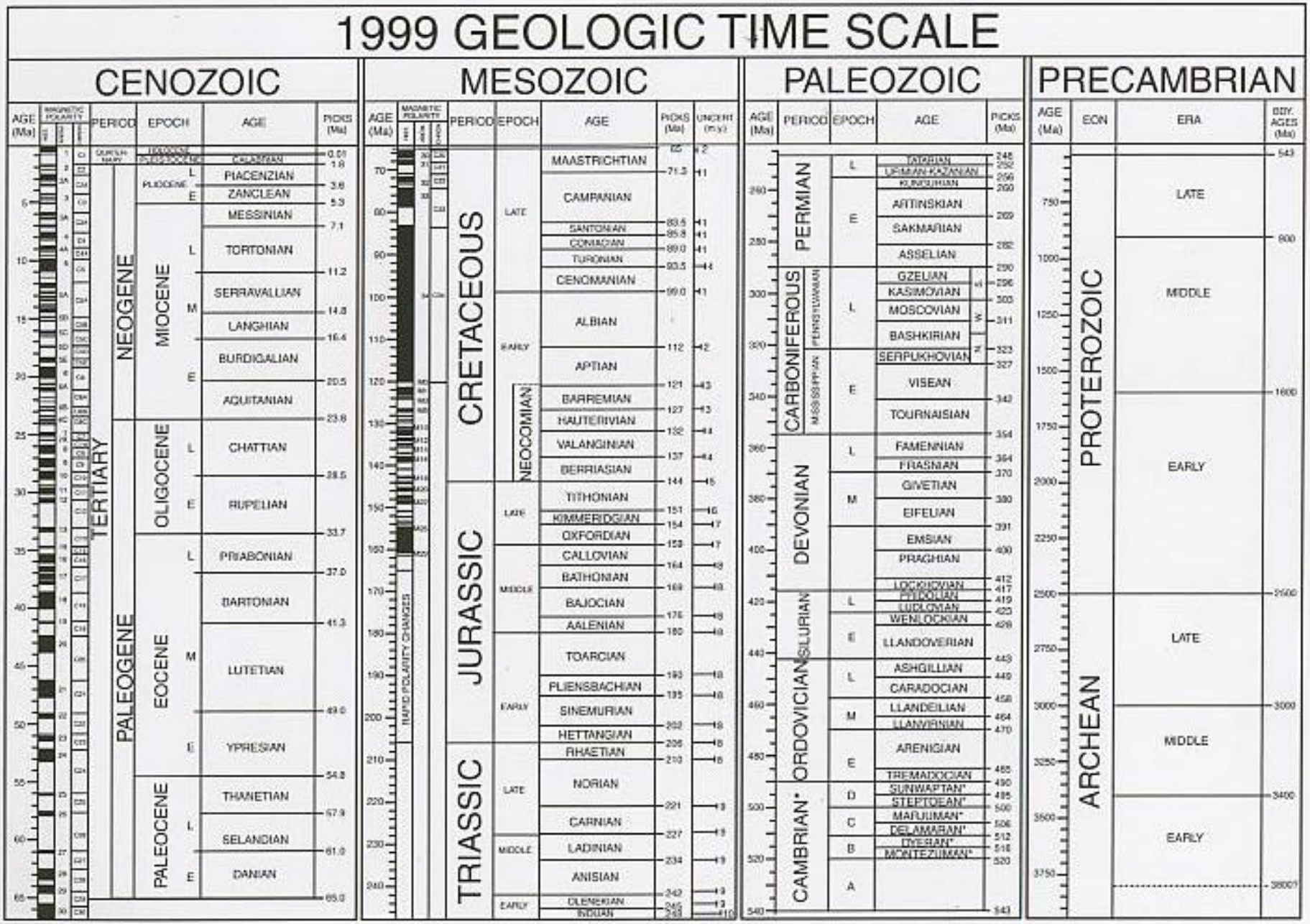
The Master Physical Controllers began to decrease radioactivity subsequent to the implantation of eukaryotic life. By 500 000 000 years ago, the corresponding radiometric date is 1.0 billion years ago, rather than 2.0 billion years ago. This is the time of the transition from the predominance of cyanobacteria to the dominance of algae and other eukaryotic plant life. This transition marks the end of the Paleoproterozoic and the beginning of the Mesoproterozoic. Radioactivity continued to be decreased until the advent of animal life 450 000 000 years ago, marking the beginning of the Neoproterozoic. There were, and continue to be, many forms of life between those that can be classified as either true plants or true animals; and these forms of life evolved *gradually* from plants. However, there was a final, *sudden* transition to a protozoan (literally, "first animal") from an animallike borderland organism (65:2.2–4).

The occurrence of "suddenlies" in evolution demonstrates that there is a purposeful force behind the evolutionary process. Consider a flexible plastic ruler held between your hands. As you slowly press your hands together, the ruler, at first, bends "plastically". This is like a *gradual* phase of evolution. Eventually, however, the ruler snaps. This is analogous to a *sudden* evolutionary transition. Such two-phase behavior is the typical response of a physical system to the slow, progressive application of an external force or influence.

Based on the date ratio in the geologic time scale, notice that the energy transformers established control over the spatial environment prior to the first sudden evolutionary transition, and then regulated that environment about a roughly uniform subelectronic activity level for many subsequent ages. Over the course of the Paleozoic and well into the Mesozoic, the date ratio shows a small, and perhaps steady, increase. Then, coincident with the first experimental mammals (60:1.11, 60:3.21), the date ratio begins to decrease. The decline continues until the date ratio reaches unity, prior to the evolution of modern types of mammals during the Oligocene Epoch of the Cenozoic. From that point on, radiometric dates are a fairly good estimate of actual dates.

As a consequence of the clarification in *The Urantia Book* of the absolute dates of the geologic time scale, the roles of the Master Physical Controllers and the Life Carriers, and the existence of the sudden transitions in evolution, the history of life on our planet can finally be contemplated from a logical framework. All that comes from the First Source and Center of all things and beings is inherently logical. God and his "hosts of hands" are behind the unfolding of life. Evolution truly is "creativity in time" (105:6.5).

1999 GEOLOGIC TIME SCALE



*International ages have not been established. These are regional (Laurentian) only. Boundary Picks were based on dating techniques and fossil records as of 1999. Paleomagnetic attributions have errors, Please ignore the paleomagnetic scale.

Sources for nomenclature and ages: Primarily from Gradstein, F., and Ogg, J., 1996, *Episodes*, v. 19, nos. 1 & 2; Gradstein, F., et al., 1995, SEPM Special Pub. 54, p. 95–126; Berggren, W. A., et al., 1995, SEPM Special Pub. 54, p. 129–212; Cambrian and basal Ordovician ages adapted from Landing, E., 1998, *Canadian Journal of Earth Sciences*, v. 35, p. 329–338; and Davidek, K., et al., 1998, *Geological Magazine*, v. 135, p. 305–309. Cambrian age names from Palmer, A. R., 1998, *Canadian Journal of Earth Sciences*, v. 35, p. 323–328.

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(mya = million years ago)

Phanerozoic Eon (543 mya to present)	Cenozoic Era (65 mya to today)	Quaternary (1.8 mya to today) Holocene (10,000 years to today) Pleistocene (1.8 mya to 10,000 yrs) Tertiary (65 to 1.8 mya) Pliocene (5.3 to 1.8 mya) Miocene (23.8 to 5.3 mya) Oligocene (33.7 to 23.8 mya) Eocene (54.8 to 33.7 mya) Paleocene (65 to 54.8 mya)
	Mesozoic Era (248 to 65 mya)	Cretaceous (144 to 65 mya) Jurassic (206 to 144 mya) Triassic (248 to 206 mya)
	Paleozoic Era (543 to 248 mya)	Permian (290 to 248 mya) Carboniferous (354 to 290 mya) Pennsylvanian (323 to 290 mya) Mississippian (354 to 323 mya) Devonian (417 to 354 mya) Silurian (443 to 417 mya) Ordovician (490 to 443 mya) Cambrian (543 to 490 mya) Tommotian (530 to 527 mya)
Precambrian Time (4,500 to 543 mya)	Proterozoic Era (2500 to 543 mya)	Neoproterozoic (900 to 543 mya) Vendian (650 to 543 mya) Mesoproterozoic (1600 to 900 mya) Paleoproterozoic (2500 to 1600 mya)
	Archaean (3800 to 2500 mya)	
	Hadean (4500 to 3800 mya)	
