

Condensed from
"THE DRAGONS OF EDEEN"

A Cosmic Calendar

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JANUARY-NOVEMBER	
January 1	Big Bang
May 1	Origin of the Milky Way galaxy
September 9	Origin of the solar system
September 14	Formation of Earth
September 25	Origin of life on Earth
October 9	Date of oldest fossils
November 1	Invention of sex (by micro-organisms)
November 12	Oldest fossil photosynthetic plants
November 15	First cells with nuclei

information on archeological, paleontological and geological events; and astrophysical theory provides data on the ages of planetary surfaces, stars, and the Milky Way galaxy, as well as an estimate of the time that has elapsed since the earliest event about which we have any record—the Big Bang explosion, which may have been the beginning of the universe.

The most instructive way I know to express this cosmic chronology is to imagine the 15-billion-year lifetime of the universe (or at least its present incarnation since the Big Bang) compressed into the span of a single year. Thus foreshortened, every *billion years* of Earth history corresponds to about 24 *days* of our "cosmic year." I present this cosmic calendar in three forms: major dates in the January-to-November period; a daily calendar for December; and a close-up look at the late hours of New Year's Eve.

The construction of such tables and calendars is inevitably humbling. For example, it is disconcerting to find that in such a cosmic year

DECEMBER

Monday 1	Significant oxygen atmosphere begins to develop on Earth
Friday 5	Extensive vulcanism and channel formation on Mars
Tuesday 16	First worms
Wednesday 17	Precambrian Period ends; Paleozoic Era and Cambrian Period begin; invertebrates flourish
Thursday 18	Ordovician Period; first fish, first vertebrates
Friday 19	Silurian Period; first vascular plants; plants begin colonization of land
Saturday 20	Devonian Period begins; first insects; animals begin colonization of land
Sunday 21	First amphibians; first winged insects
Monday 22	Carboniferous Period; first trees; first reptiles
Tuesday 23	Permian Period begins; first dinosaurs
Wednesday 24	Triassic Period; first mammals
Friday 26	Jurassic Period; first birds
Saturday 27	Cretaceous Period; first flowers; dinosaurs become extinct
Sunday 28	Mesozoic Era ends; Cenozoic Era and Tertiary Period begin; first primates
Monday 29	Early evolution of frontal lobes in the brains of primates—first hominids; giant mammals flourish
Tuesday 30	End of the Pliocene Period
Wednesday 31	

Earth does not condense out of interstellar matter until mid-September; dinosaurs emerge on Christmas Eve; men and women originate at 10:30 p.m. on New Year's Eve; all of recorded history occupies the last ten seconds of December 31; and the

DECEMBER 31.

10:30 p.m.	First humans
11:00 p.m.	Widespread use of stone tools
11:46 p.m.	Domestication of fire by Peking man
11:56 p.m.	Beginning of most recent glacial period
11:59 p.m.	Extensive cave painting in Europe
11:59:20 p.m.	Invention of agriculture
11:59:51 p.m.	Invention of the alphabet
11:59:53 p.m.	Bronze metallurgy; Mycenaean culture; Trojan War; invention of the compass
11:59:55 p.m.	Particulate Athens; birth of Buddha
11:59:56 p.m.	Euclidean geometry; Archimedeian physics; Roman Empire; birth of Christ
11:59:58 p.m.	Mayan civilization; Song Dynasty China; Byzantine Empire; Mongol invasion; Crusades
11:59:59 p.m.	Renaissance in Europe; voyages of discovery from Europe and from Ming Dynasty China; emergence of the experimental method in science
Now:	Widespread development of science and technology
The first second of New Year's Day	emergence of a global culture; acquisition of the means for self-destruction of the human species; first steps in spacecraft planetary exploration and the search for extraterrestrial intelligence

time from the waning of the Middle Ages to the present occupies little more than one second.

Yet, despite the insignificance of the instant we humans have so far occupied in cosmic time, it is clear that what happens on and near Earth at the beginning of the second cosmic year will depend very much on the scientific wisdom and the distinctly human sensitivity of mankind.