

# The Life Symphony

for any number of instrumentalists or vocalists  
the more the merrier

commissioned by the  
Alberta Heritage Foundation for Medical Research

realization of Fourth and Fifth Movement  
performed on synthesizer and recorded  
May 1994

by

Stephen Hansen Smythe

Revised and scored  
March 1997

Reorganized and rescored  
September 2006

Dedicated to  
**Stephen Jay Gould**

Alexander Agassiz Professor of Zoology and Professor of  
Geology at Harvard  
Curator for Invertebrate Paleontology in Harvard's Museum of  
Comparative Zoology

The first performance of this work began about 4.5 billion years ago, using amino acids and proteins as instruments. This performance is continuing at a rate of one second per second. For the convenience of musicians and audiences, it is suggested that other performances of this symphony use sounds from musical instruments to simulate the development of life, at a scale of one second to three million years. Very roughly, pitch should be inversely proportional to size of organism (lower notes imply larger beings).

The piece is divided into five movements, segueing seamlessly into each other. I owe an intellectual debt to Dr. Stephen L. Gillett for providing me with the unifying principle underlying the divisions between movements: in his article *The Fifth Biorevolution* (in Analog Science Fiction and Fact, September 2004) he spoke of four preeminent biorevolutions, and I have chosen these as the divisions between movements. A previous version of this piece had four movements: no life, prokaryotic life, eukaryotic life, and metazoans.

The first movement corresponds to that period after the formation of the Earth but before the advent of life. The second movement starts with the emergence of life, the third with the invention of oxygen-releasing photosynthesis, the fourth with the development of multicellular life, and the fifth with the colonization of land. Each movement's sounds continue through the following ones, and divisions between the movements can be adjusted at the whim of the conductor, or in response to new scientific information. But what about the dinosaurs? Go ahead, play dinosauroid themes. Let them get killed off during the fifth movement at the 1478-second mark. Let the birds, their descendants, fly. Let the mammalian megafauna of the last sixty million years stampede. It's just that their impact just doesn't rate with the changes above.

The conductor is to keep track of time, but is not to feel bound to follow the precise timings indicated within the piece. The conductor may, ad libitum, indicate random environmental change events (asteroid strike, solar flare, volcanism, atmospheric composition change, etc.), and add events brought to light by newly discovered evidence. A few known extinctions are noted with // in the score.

Ideally this piece is NOT to sound like random bleeps and blatts. All living things act and react to each other and their environment, and the players are to do the same by improvising melodic or harmonic material, and reacting to what other players are playing (join in, drown them out, play chords together, steal material and vary it, etc.). A few players may play the same material for a long time, but most will play melodies or harmonies that will never be repeated. When the conductor indicates an environmental change event, the player is obliged to react to it, but the player judges how - whether the player's material is killed off entirely, or whether it simply suffers a subito decrescendo and then grows louder again. If a player's theme is killed by the conductor, or dies of other causes (such as aggressive themes from other players), the player should begin a new theme within a few seconds.

The audience is to be provided with copies of either the score or this summary, and is expected to experience the entire symphony as a single performance event. Since earlier movements do not feature nearly so much action as later ones, it is suggested that the audience read the score during this time, so they know how to interpret what they're hearing. Another acceptable option is for a narrator, at appropriate times, to interject brief summaries of the biological changes being musically depicted..

My primary source for the timeline in the final two movements was Discovering Dinosaurs in the American Museum of Natural History, by Mark A. Norell, Eugene S. Gaffney, and Lowell Dingus. However, I owe the debt of inspiration for the complete work to twenty years of reading Stephen Jay Gould's reflections on natural history, and especially to his book Wonderful Life, W.W. Norton & Company, New York, NY; 1989.

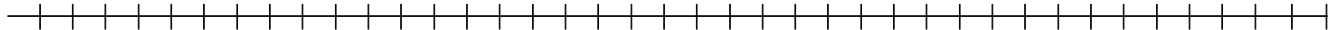
# I - No Known Life

## Tacet

The Earth's crust was not entirely solid, and was likely being bombarded by debris from space. The moon formed during this period, possibly as the result of the collision of Earth with another significantly sized planetary body. The development of life is unlikely under such conditions, and even had it occurred, all fossil traces would have been obliterated. The earliest fossils date from around 3.85 billion years ago. It appears, however, that life developed within 100 million years of the planet cooling enough for organic molecules to evolve.

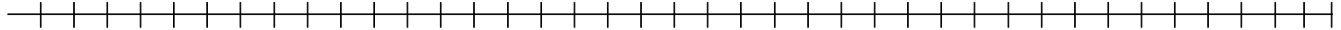
1 second = 3 million years

4500 my BCE



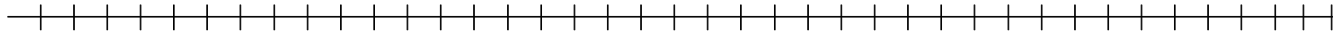
40 seconds

4380 my BCE



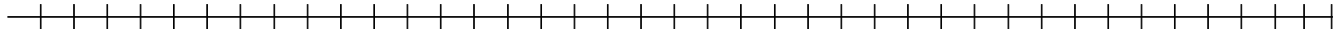
80 seconds

4260 my BCE



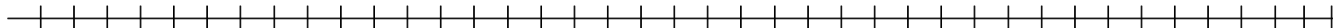
120 seconds

4140 my BCE



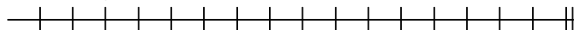
160 seconds

4020 my BCE



200 seconds

3900 my BCE

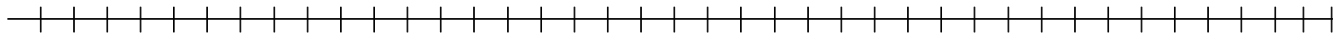


## II - Prokaryotic Life

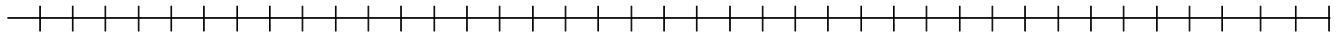
A single, simple, high pitch gradually becomes more complex, with richer harmonics, parallel octaves and fifths, and slowly moving frequency. This pitch continues to change slowly throughout the piece. A bank of oscillators could create such a tone, or a group of flutes, clarinets or other high instruments in a relay.

The emergence of tiny replicators had a profound effect upon the rocks. They are responsible for catalyzing diagenesis (how sediments change into sedimentary rock) and biomineralization (both passive, such as stromatolites formed from algal mats, and active, such as the creation of crystals as a direct result of cellular activity).

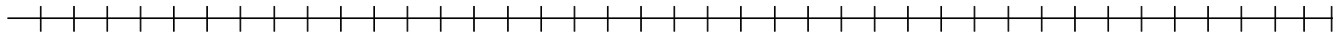
217 seconds  
3849 my BCE



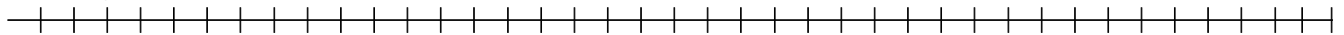
257 seconds  
3729 my BCE



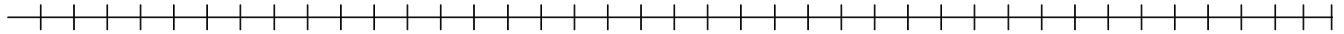
297 seconds  
3609 my BCE



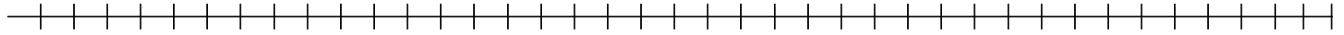
337 seconds  
3489 my BCE



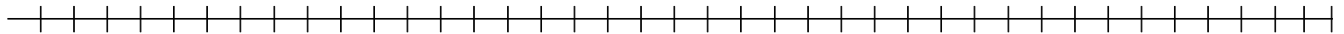
377 seconds  
3369 my BCE



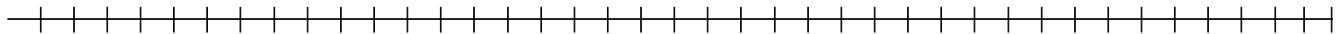
417 seconds  
3249 my BCE



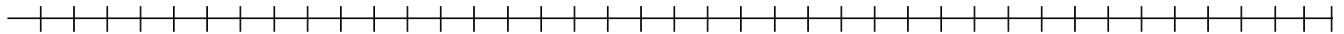
457 seconds  
3129 my BCE



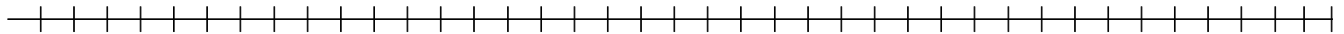
497 seconds  
3009 my BCE



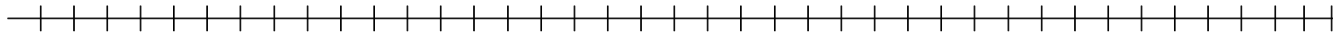
537 seconds  
2889 my BCE



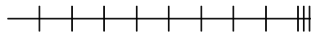
577 seconds  
2769 my BCE



617 seconds  
2649 my BCE



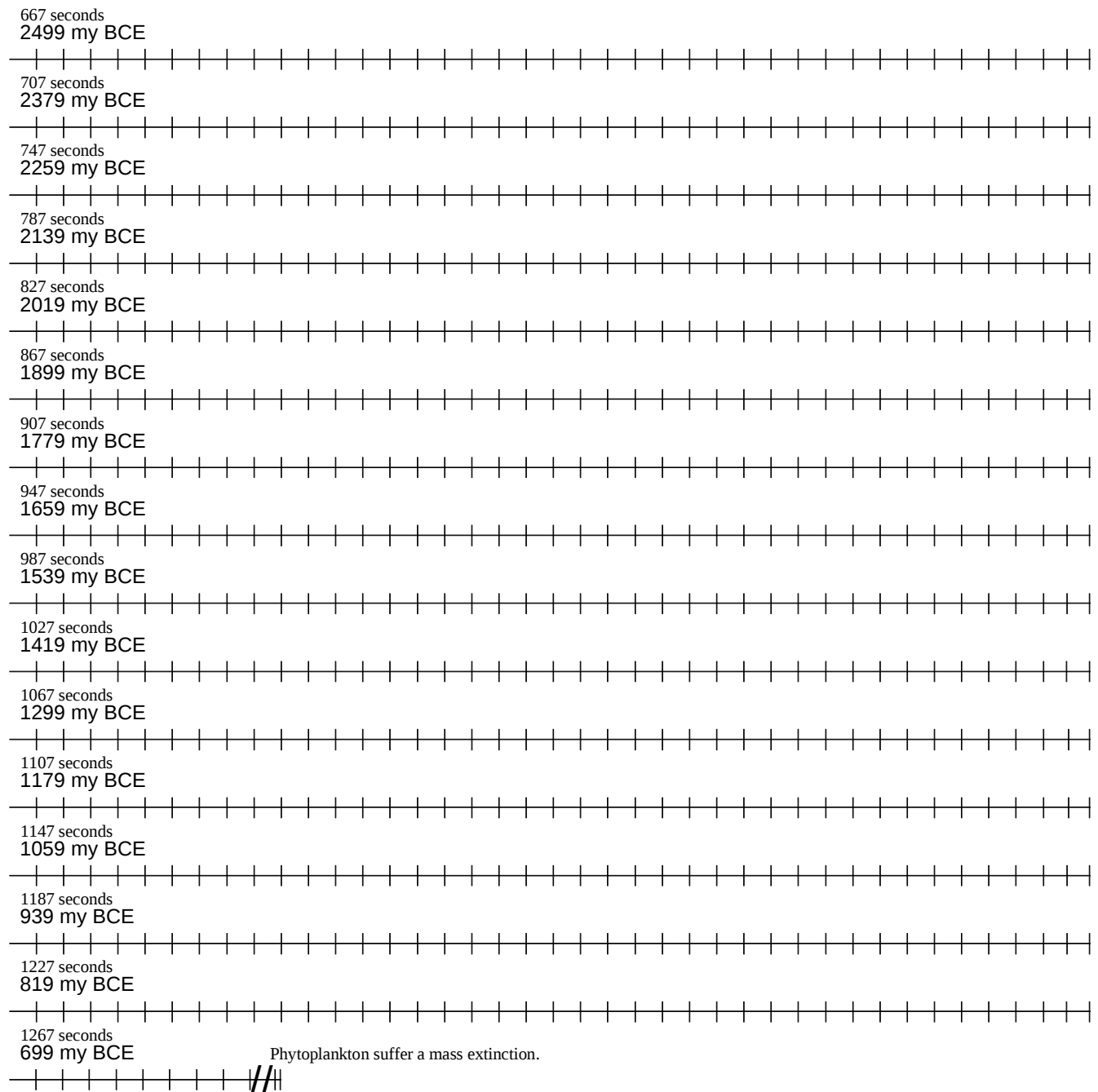
657 seconds  
2529 my BCE



# III - Oxygen-releasing Photosynthesis

The tone from the previous movement is joined by other high tones at slightly different pitches and timbres. Start with dissonances so close that you can hear the "beats" between them. The volume and dissonance increases as more and more high tones are added to the mix, at greater and greater distance from the original tones. As the movement progresses, these pitches are to become slowly less dissonant, ending with clusters which are perfect intervals away from each other. A rack of oscillators would work for this, or all the high-register instruments in the orchestra: violins, flutes, etc.

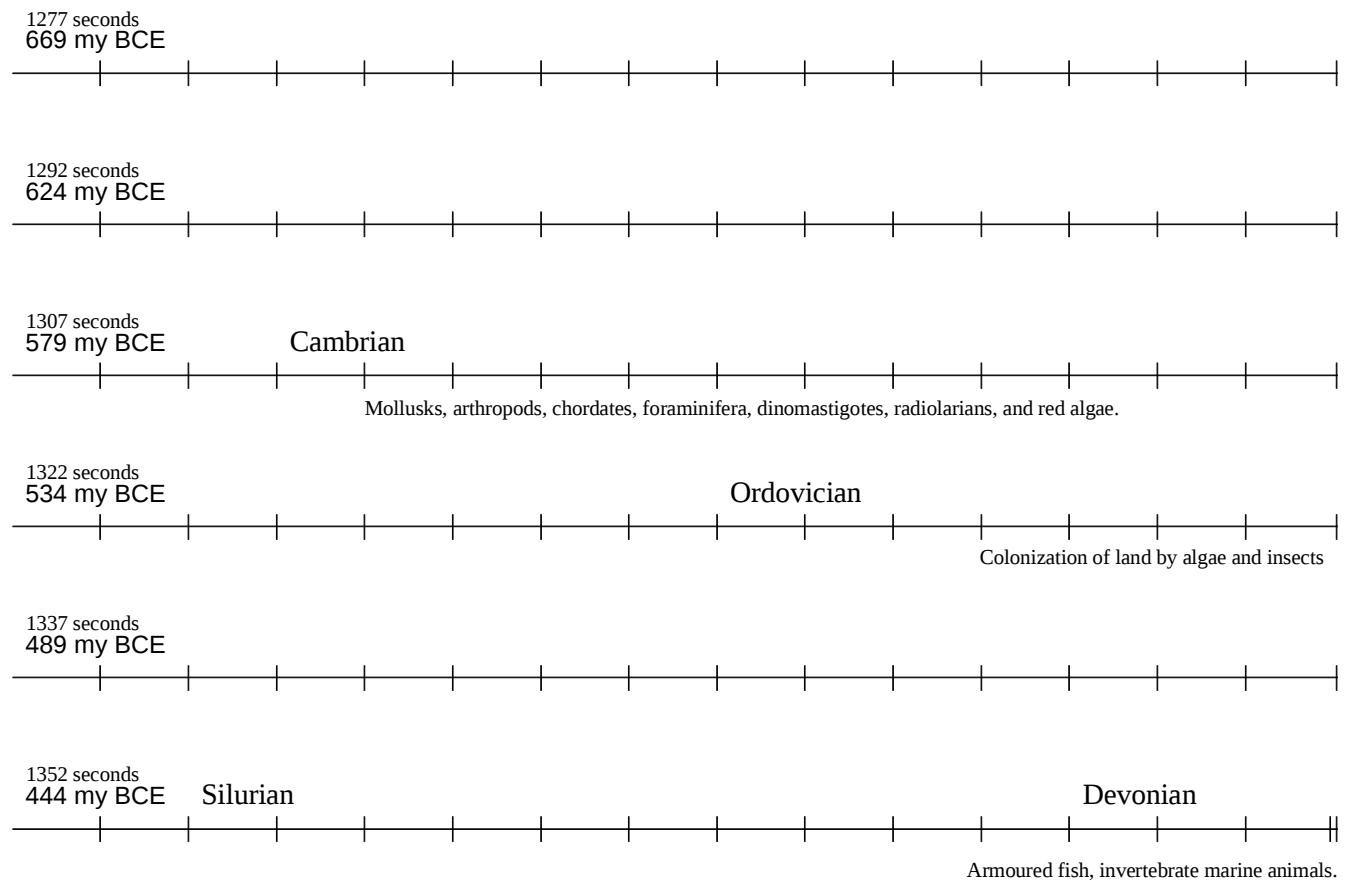
This movement, I think, has the most environmental impact. As more organisms learned how to extract hydrogen from water, dumping the toxic byproduct oxygen into the atmosphere, the water chemistry changed, rocks corroded, the globe chilled, and organisms which could not adapt to the new poison were exterminated. Also, the earliest eukaryotes (nucleated cells) developed during this period, some including symbiotic bacteria, so players should attempt to incorporate Second Movement pitches into their own themes. It appears that phytoplankton suffered an extinction event around 670 million years B.C.E., at the end of this movement. Could it have been caused by the rise of metazoan life in the next movement?



# IV - Metazoan Life

Full orchestra (with the exception of one section to be reserved for entrance in the fifth movement), with competing and contrasting themes as described in the introduction.

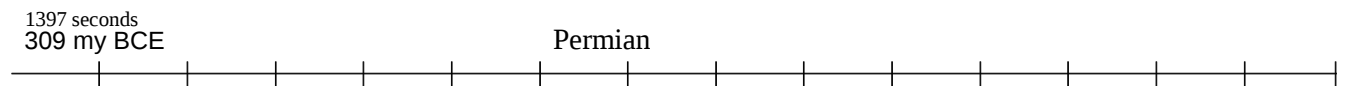
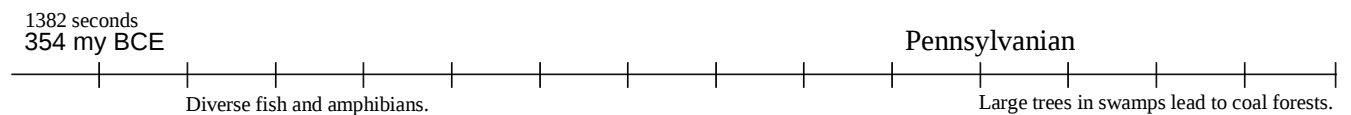
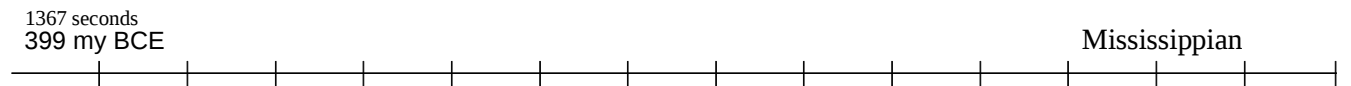
Remains of the earliest multicelled creatures can be found in deposits known as the Ediacara, dating from around 670 million years ago. Players should begin to experiment with tiny musical phrases, high in pitch, and work their way downward. The Cambrian "explosion" of about 550 million years ago may not be an explosion at all, just the appearance of one, based on a fossil record that records hard body parts much better than softer ones. Whether it was fast or slow, however, there ended up being a greater variety of basic body plans (phyla) than at any time in the history of life since. At the time scale of this piece, players will suddenly begin playing wildly different themes, but "sudden" is a relative term. Something that took several millions of years for life will only take a couple of seconds for the musicians.



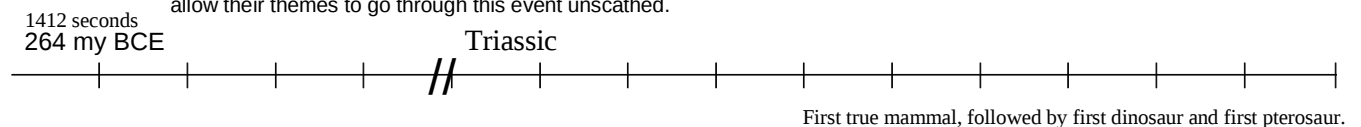
# V - Land Colonization

The orchestral section held back in the fourth movement is now allowed to play, using the same rules as the rest of the orchestra.

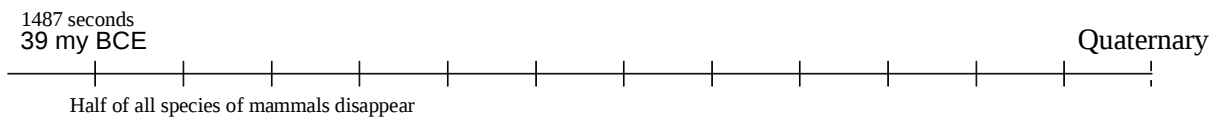
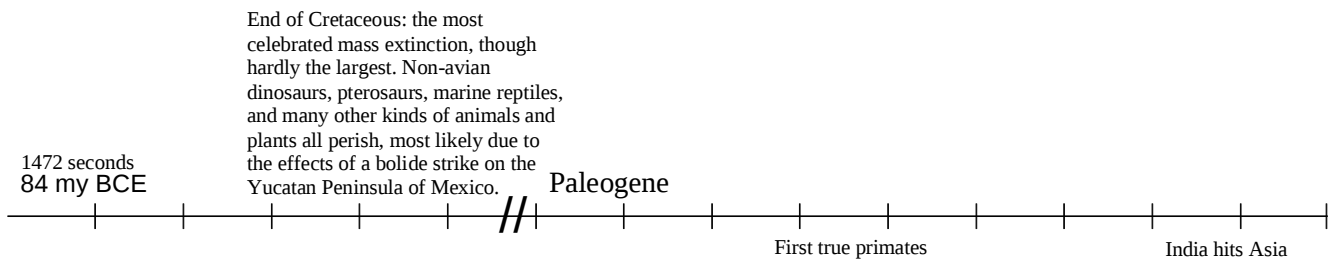
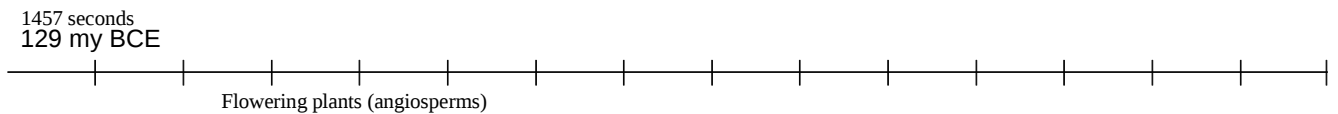
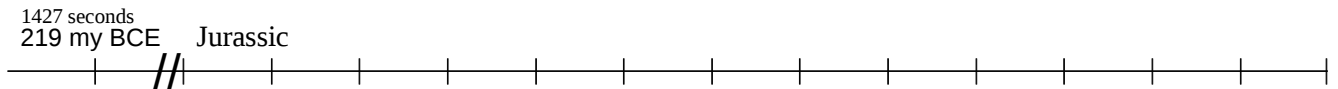
Forests and prairies and jungles grow for the first time, adding more oxygen, causing altered weathering, more global cooling, and possibly ocean eutrophication caused by vast algal blooms from nutrient runoff.



End Permian: the greatest extinction in history occurred, destroying 95% of all known species, 82% of marine genera. Most likely cause: the impact of an immense bolide in Wilkes Land in Antarctica, which may even have instigated the breakup of the supercontinent Gondwana. Only a very few players should allow their themes to go through this event unscathed.



End Triassic: 53% marine genera disappeared; 80% of marine species, and half of all reptile families.  
Suspected causes: severe volcanism, global warming.



An unplayably short sixth movement may be added, if you feel that the implications of the appearance of technical intelligence are potentially as ecology-shifting as any of the preceding biorevolutions. However, the musicians are on no account to try to come to a cadence at the end of the fifth movement, and the conductor is simply to signal an abrupt cutoff with no musical resolution at the 1500 second mark (25 minutes). The piece does not have a predictable ending, or knowable length. Whether we're living at the beginning of the sixth movement or not only time will tell. Perhaps by the time our sun becomes a red giant and incinerates Earth, life will long since have spread beyond.