The young faint Sun paradox and the age of the solar system

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According to theory, the Sun derives energy by the thermonuclear conversion of hydrogen into helium, deep inside its core. There is convincing evidence that the Sun is getting at least half of its energy by this method. Such a thermonuclear source could power the Sun for nearly 10 billion years. Most scientists think that the Sun (along with the rest of the solar system) is about 4.6 billion years old, which means it would have exhausted approximately half its 'life'.

Over the Sun's lifetime, the thermonuclear reactions would, according to theory, gradually change the composition of the core of the Sun and alter the Sun's overall physical structure. Because of this process, the Sun would gradually grow brighter with age. Thus, if the Sun is indeed 4.6 billion years old, it should have brightened by nearly 40% over this time.[1]

Evolutionists maintain that life appeared on the Earth around 3.8 billion years ago. Since then, the Sun would have brightened about 25%,[2] though there is some uncertainty in that figure.[3] This would appear to present a temperature problem for the evolution of life and the Earth. With the current hand-wringing over global warming, one would expect that such a large difference in the solar output would have greatly increased the Earth's temperature over billions of years. Yet most biologists and geologists believe that the Earth has experienced a nearly constant average temperature over the past 4.6 billion years, with perhaps warmer conditions prevailing early on.[4] The problem of how the Sun could have increased in brightness while the Earth maintained a constant temperature is called the 'early faint Sun paradox'.

Just how great is the problem? A simple calculation can be made assuming that, over time, there has been no change in the Earth's reflectivity or the ability of the Earth to radiate heat. While this approach is almost certainly unrealistic, it is useful to illustrate the problem. With these assumptions, we find that a 25% increase in solar luminosity increases the average temperature of the Earth by about 18ºC. Since the current average temperature of the Earth is 15ºC, the average temperature of the Earth 3.8 billion years ago would have been below freezing (-3°C). Thus when life supposedly was just beginning, much of the Earth would have been frozen.

Even with such a low average temperature some tropical portions of the Earth may have remained ice-free. Naturally, evolutionists could argue that life developed in the warmer areas and then held on until the Earth warmed. However, there are at least two problems with this.

1. Most geologists seem to insist that over the past 3.8 billion years the average temperature of the Earth has not changed that much. If anything, temperatures before 2.5 billion years ago would have been warmer.
2. If the Earth had ever been mostly covered with ice year round, then its average temperature would have been even cooler than the -3ºC mentioned above. The increased ice cover would increase the reflectivity of the Earth, reducing the heat absorbed from the Sun. This is a common problem with the popular idea of multiple ice ages —once one commences in earnest, the increased reflectivity due to additional ice cover leads to decreased solar heat absorption that is difficult to reverse toward a warmer climate. (The Oard model of a single post-Flood Ice Age caused by warm oceans and volcanic dust in the atmosphere does not have this problem.[5] As the volcanic dust eventually dissipated, the oceans provided the heat to melt back much of the ice cover.)

How do evolutionists resolve the early faint Sun paradox? Most assume that the early atmosphere of the Earth had more greenhouse gases than the current atmosphere. This would have kept the Earth warm despite the Sun being less luminous at the time. As the Sun increased in brightness, the amount of greenhouse gases in the atmosphere is supposed to have decreased in such a way as to exactly cancel the increased heat received from the Sun. In other words, as the Sun evolved, the Earth's atmosphere also evolved to cancel out the effect of the increased solar luminosity. The evolution of life is supposed to have played a role in this evolution of the atmosphere.

Clearly, such evolution of the Earth's atmosphere would require a very delicate balancing act. While there is some tolerance for deviation, any prolonged deviation from ideal conditions could have led to catastrophic heating or cooling from which

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The Sun. As the Sun ages, it increases in brightness and produces more heat. If the Sun is as old as is claimed by mainstream scientists, 3.8 billion years ago the Earth would have had an average temperature of -3°C.

the Earth might not have recovered. Venus and Mars are possibly examples of each of these scenarios.

Planetary scientists think that while the Earth and Venus are very similar, Venus' closer proximity to the Sun gave that planet an initial temperature higher than that of the Earth that led to a runaway greenhouse effect. As a result, today Venus has the hottest surface temperature in the solar system. Conversely, Mars is a very cold planet today, yet there is abundant evidence that, early in its history, liquid water once flowed on its surface, indicating that Mars was much warmer. Most researchers say this happened about 3.8 billion years ago. However, at that time the Sun would have been 25% fainter than today. Therefore, the early faint Sun paradox provides a very different problem for Mars: why was that planet much warmer when the Sun was at its faintest?

With the obviously disastrous results on our nearest planetary neighbours, how did the Earth avoid a similar fate? How did the Earth's atmosphere manage to evolve in such a delicate fashion? One possibility is that it just happened that way. The geological and biological processes removed greenhouse gases at exactly the same average rate to compensate for the increased solar luminosity. What would be the probability of this happening by chance?

Because the evolution of such a delicate balance is so improbable, some have suggested that the Earth's biosphere behaves as a giant single organism. This pantheistic idea, seriously proposed by scientist James Lovelock, has been dubbed the Gaia hypothesis, after the goddess of the Earth. Repelled by the teleological connotations, many scientists reject the Gaia hypothesis, opting for the appeal to chance.

Of course, another logical possibility is that the solar system is only thousands of years old. In this case, there is no paradox to explain because the Sun has not been around long enough to increase much in luminosity. Many may object that we know that the Sun is 4.6 billion years old, but that is not true. There is no direct way of measuring the age of the Sun. Our understanding of the Sun's structure does not permit a precise calculation of how bright a 'zero age' Sun should be compared with a 4.6-billion-year-old Sun. All that we can conclude is that the older Sun should be brighter than the younger Sun. The 4.6-billion-year age comes from the alleged age of meteorites, and it is assumed that the Sun is the same age. Of course creationists reject the billion-year age for meteorites as well.

So, the early faint Sun paradox is evidence that the Sun, and therefore the solar system, is young and consistent with the 6,000-year age of the solar system as recorded by Biblical chronology.

References

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Billion-fold acceleration of radioactivity demonstrated in laboratory

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Owing to the significance of its information, this article was pre-posted on the AiG website (http://www.answersingenesis.org/docs2001/0321acc_beta_decay.asp), on 21 March, 2001. It is reprinted here with a few statements of additional information. Since its appearance on the AiG website, this article has been widely quoted and relied upon, in word and in print, sometimes without proper attribution to its source.

Our understanding of ostensibly long-lived radioactive 'clocks', in the light of the Creationist-Diluvialist paradigm, must necessarily consider both geologic and physical factors. Among the latter are decay-rate changes, and these may include a variety of superimposed processes occurring at the same or at different times in the several-thousand year history of the universe.

Up to now, creationist research has summarized evidences of small decay-rate changes, as well as theoretical analyses suggestive of the possibility of more extreme changes in radioactive decay rates (the latter usually dependent upon corresponding changes in fundamental physical constants).[1]

Here I report the experimental demonstration of radioactive decay-rate acceleration by an astonishing nine orders of magnitude. It requires special conditions but, in and of itself, no alteration of known physical constants.

This acceleration can occur under beta (negatron) decay. During β decay itself, a neutron changes into a proton, electron and electron-antineutrino, and the electron is expelled as a negative beta particle (β^-—often written without the negative sign, but sometimes it is necessary to distinguish it from