

HEAVENLY NEWS

"Status Report on the Sun"

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When the philosophers say you cannot step into the same river twice, we know they are trying to say something deep about time and change. Sunlight is like the water in that river, ever seeming the same and yet different.

We often refer to the Sun as a small star, nothing special. In fact, heavier stars burn through their fuel faster. A star of two solar masses will be hotter and its fuel will last only one eighth as long, called an inverse cube relation. Stars of ten solar masses may last only one thousandth as long as the Sun, not long enough to evolve life as we know it. Sometimes smaller is better.

Stars shine because they are hot. When the Sun formed, it produced about 70 percent as much power as today. In the past 4.5 billion years, the Sun has used up half of its available hydrogen fuel. This pleasant phase of the Sun will continue for a long time. Over the next billion years however, solar heat output will gradually increase by another 10 percent. On Earth, the oceans will likely evaporate. The "habitable zone" around the Sun, where it is not too hot and not too cold, will move outwards.

At nine billion years of age, the solar power will increase by another 40 percent. The Earth will resemble present-day Venus with an atmosphere of carbon dioxide at a pressure of 90 atmospheres. At 11 billion years, the Sun's core power increases again. The Sun enters the red giant phase lasting another billion years. The Sun's luminosity increases by two thousand times and its diameter expands almost out to Venus. Mercury will disappear into the Sun. When the temperature reaches 100 million degrees, helium fusion in the core will begin to form carbon and oxygen. This cycle lasts another hundred million years. The Sun will be 180 times its current size.

At 12 billion years (approximately 7.5 billion years in the future) the Sun will begin a brief "planetary nebula" phase. Science predicts several pulsations of the solar core. Each pulse ejects some gas into space. The final pulse exposes the core which lights up the expanding envelope. Summer visitors to the Community Observatory may recall seeing the ghostly Ring Nebula, an expanding shell of gas around an expired star called a white dwarf. Stars like the Sun, up to eight solar masses, will go through this same life cycle. In the final stage as a white dwarf, the Sun will gradually cool down, an Earth-sized diamond ball of carbon and oxygen.

Back in the present, these are truly the good old days of the Sun and planet Earth. Stephen Hawking has written, "I don't think the human race will survive the next thousand years, unless we spread into space. There are too many accidents that can befall life on a single planet." So, by Hawking's reckoning, the next million years of the Sun's evolution are not the main cause of concern, let alone the next hundred million years. By that time, if humans are still around, they will have a "Plan B." And it is good to know there is still plenty of time to visit the

Community Observatory at the El Dorado Center of Folsom Lake College in Placerville, open 7:30 to 9:30 p.m. Friday through Sunday. For information about the Observatory, closure notices and driving directions please go to www.communityobservatory.com. You may also call the observatory directly for weekend closure notices at (530) 344-5707.