

### Offered Title: The Sun Will Die

"All Things Must Pass", arguably some of the best work of George Harrison, also describes changes all things go through.

Our Sun, a seemingly everlasting presence, is changing, it's always changing. It will pass, changing from the life-giving orb in our sky to a life-threatening monster, to a burnt-out cinder.

Don't worry, the Sun's "monstership" takes place in 5+ billion years.

Our Sun was born around 4.6 billion years ago as hydrogen in a molecular cloud condensed and started rotating. Hydrogen atoms have mass and mass is linked with gravity and gravity induces rotation. When dense enough, hydrogen fusion started, and it lit up the cloud as a new star.

Stars are born in litters, so our Sun probably had siblings. It is likely our Sun was part of an open star cluster, and as happens with them, the sibs went their own ways and the cluster is no more.

Early on our Sun was a hot, blue-white star (like in the Pleiades open cluster) but after a few hundred million years settled down to its current steady production of energy. It's now called a "main sequence" star, 4 billion years into its 10-billion-year midlife. Its stability is due to the balance of gravity, squeezing its hydrogen together, and the fusion energy produced as a result, pushing outward.

This balance is not perfect however, as fusion pressure seems to have a slight upper hand and causes our Sun to increase energy output slowly. In a billion years the Sun's output could be 10% greater than now and Earth will be hot. The oceans might be gone. I suspect we will have skedaddled way before this.

Eventually the Sun will be in the throes of violent push-pull episodes as fusion sources hydrogen, then helium, then carbon, finally oxygen become depleted. Gravity and fusion will be on a teeter totter ride with one dominating for a while, then the other. The result, our Sun bloats, becoming a monster, swallowing Mercury, Venus, and maybe Earth. Also, some of the Sun's mass will be blown off and speed away as multiple shells of gas.

Finally, our Sun hits the wall... iron. It takes more energy to fuse iron than is produced by that fusion so fusion ceases. The Sun will then become a small (Earth size), white hot, dense ball of atomic particles... a White Dwarf. The blown off shells of gas, still moving outward, are illuminated by the white-hot Sun remnant. Viewed in a telescope from a distance it all appears spherical, like a planet. We earthlings call it a planetary nebula.

It will eventually (maybe a trillion years?) cool and become a cold, dark, hulk... a Black Dwarf.

Dead.

### What's in the Sky?

The Perseid meteor shower peaks on the evening of August 12<sup>th</sup>. After 9pm (even better after midnight) grab your chaise lounge, zero gravity chair, or just a blanket. Have a refreshment and look in the north-northeastern sky.