Diamonds in the sky

Richard Dubinsky

Our sun is an average star, about 5 billion years old (middle-aged as stars go) and should last for a total of 10 billion years. More massive stars have shorter lifetimes since they burn up more quickly while lighter stars can last up to a trillion years.

Stars are powered by the burning of hydrogen within them. The combustion is nuclear rather than chemical. An atom of helium is the product of the reaction of four hydrogen atoms. The hydrogen loses mass in the process and converts directly into energy in the centre of the star. The end of the star comes when the hydrogen supply runs out.

outer layers

The star starts to expand its nuclear reaction from the centre to begin consuming the hydrogen in the outer layers. This results in a significant swelling of the star due to the tremendous amounts of energy produced in the outer layers — similar to a slow acting fusion bomb. Expanded stars such as this are cooler and are red in colour. They can expand over a hundred times their normal size and consume planets that happen to be near them. This phase of their life may last up to a billion years, but the end is inevitable.

Once all the hydrogen has been consumed and changed to helium, the star cannot generate sufficient energy to balance its own weight and it rapidly shrinks. Once this contraction starts it proceeds very rapidly and the star implodes. This causes tremendous pressures to build up in the same way that deisel fuel heats up when it is compressed. Extremely high temperatures are generated, high enough to start another fusion reaction in the core which precipitates the conversion of the helium into carbon. New energy bursts from the core and causes the star to swell into another giant sphere.

cosmic jewels

If the star is no more than four times the mass of the sun another contraction occurs, however the internal energy is not sufficient to fuse carbon into heavier elements. Under these conditions it cools off. Its colour changes from a brilliant white to yellow, then red and finally it becomes black like a cinder cast from a roaring fire.

It is possible that the internal pressures and temperatures have caused the carbon to be transformed into diamond. The star may really be a diamond in the sky but its brilliance has been lost; its internal fires have at last succumbed to a quiet stellar death. We believe that billions of these dead stars litter our galaxy; invisible treasure chests of cosmic jewels.

Science Writers Needed

We require individuals, preferably science students to conduct interview, write science articles and do layout for a monthly science section in Excalibur. If you would like to expand your communication skills and serve a good purpose contact us.

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Science Milestones

Ann Zelechow

Sept. 20, 1519: Ferdinand Magellan begins his round the world voyage.

Sept. 22, 1791: Michael Faraday, Physicist, born.

Sept. 23, 1846 The planet Neptune was discovered by Johann Gottfried Galle and Henrich Louis d'Arrest.

Sept. 29, 1962 Alouette, worlds first domestic communications satellite launched by Canada.

My Old Flame

by E.C. Neics

Alas, twas another Saturday eve and I sat in a candle lit lounge sipping on my quinine solution and playing with my two foot wire; bare copper wire to be exact, about 2mm. thick, stripped from a 300 volt line. Several tables away sat a young lovely who smiled at me as I caught her glance. Never snobbish, I stood up, straightened my lab coat and walked over.

"May I sit down?" I queried.
"What for?" she answered.
"Simply to perform an experiment I just thought of illustrating a natural phenomenon between wire and flame."
"Very well." she replied.

"May I borrow a pencil or pen." She complied and I wound the copper wire about the pencil fifteen times in a tight coil and used the remainder as a handle. I explained, "Thousands of specks of carbon are given off by a burning candle which ususally become so hot that they glow and produce the yellow part of the flame."

I lowered the coil over the flame, which disappeared producing billows of smoke streaming from the coil.

"Copper is an excellent conductor and is now absorbing the heat and light normally produced by the flame, thus the carbon stops glowing and the flame disappears."
Removing the coil reversed the process and the flame reappeared.

"Why does that happen?" she asked.
"Ah! I said "An excellent example of Energy Transfer. I'll explain..."

Ordering another quinine water for myself and my friend, I proceeded to relate the intimacies of Thermodynamics. Needless to say, this led to more experimentation and a warming relationship.