What's up in Astronomy By Eric Erickson

## Offered Title: The Stars That Made Us

We are stardust…golden… billion-year-old carbon – Joni Mitchell

It's all about stars and stars are all about us. In Genesis God says, "let lights appear in the sky", and in big bang theory the age of light came as stars formed from primordial hydrogen.

The concept of our stardust beginnings is supported by centuries of observation, discovery, measurement, study, and some extrapolation. The atoms, molecules, compounds, and structures making up us and everything we know seems to come from stars. Stardust. In the story of Creation, God makes the Earth, and later Adam from the very Earth he created. From dust. Stardust? The Old Testament doesn't say but we can extrapolate.

Where does stardust come from and what is it? This we have some evidence to go on. Let's poke around in stardust.

The first stars evolved from giant hydrogen clouds about 100 million years after the big bang. Most were very massive and went supernova before our Sun existed. They started the dusting.

As Sun like (up to 10 times the Sun) stars get close to their end they have used up most available hydrogen, converting it to helium by fusion. They get bloated as their gravity is less able to contain their energy output. Expansion seems to be a common occurrence of age. This expansion is halted when energy output decreases and gravity takes control again. The core shrinks, even collapses, and this blows off a bunch of material containing hydrogen, helium, lithium, carbon, and nitrogen. This star has been making these elements via fusion for billions of years. Now it gets dispersed.

Massive stars (more than 10 times the Sun) go through the process faster, producing heavier and heavier elements until they make iron (Fe). Iron fusion actually consumes more energy than it produces, so the core undergoes a great crunch and goes boom…SUPERNOVA! These stars will produce many of the elements past iron during the supernova, all the way to rubidium (Rb).

Sun like stars frequently become white dwarf stars. If the white dwarf has a bloated close companion star the white dwarf might strip mass from the companion until the white dwarf's mass is such that it undergoes core collapse and explodes as a supernova. The elements silicon (Si) through zinc (Zn) can be produced this way.

The core of some very massive stars will become a neutron star after the supernova event. If this little (diameter of 6 miles) dense (one teaspoon weighs more than 900 Great Pyramids of Giza) star has a close companion neutron star they might end up merging and exploding as a kilonova. This event can produce elements from niobium (Nb) past uranium (U).

This is stardust. It gets recycled into new stars and planets, even us.

## What's in the Sky?

March 18; Dusk: Look to the west after sunset. A young crescent Moon, Venus, and Mercury are in a nice lineup near the horizon. Binoculars help.