STARS GREATER THAN 8 SOLAR MASSES

--the evolution of stars whose mass is greater than 8 solar masses is similar to the evolution of stars whose mass is less than 8 solar masses. There are differences, though.

--larger stars burn much faster and, as a consequence, live shorter lives

--there will be more and more shells of fusion happening around the core during times of non-fusion compression of the core

--in fact, toward the end of a really large star's life there will be shells outside the core fusing. In order from outer to inner:

hydrogen, helium, carbon, oxygen, neon, magnesium and silicon

--as the core gets hotter, the time it takes for the core to exhaust its fuel gets less and less.

--specifically, a star 20 times more massive than the sun burns hydrogen at its core for 10 million years,

--then burns helium for one million years,

--then burns oxygen for one year,

--then burns silicon for a week,

--and finally takes only a day to produce its iron core

--really large stars can fuse elements in its core all the way up to but no further than iron

--the end comes when the core of a really big star become iron

--so how do large stars die?

- --as the elements that have produced iron in the core begin to run out, gravity once again takes over and the core begins to collapse

- --when the core temperature reaches 10 billion degrees Kelvin, photon energies are high enough to break core atoms into smaller atoms, then break those smaller atoms into their elementary components (protons, neutrons, etc.)

- --with these elementary particles at super high density, electrons are forced into protons making neutron, giving off neutrinos in the process

  - --note that the density at this point is about the density you would have if you compressing 1000 Nimitz sized aircraft carriers in the volume of a marble

--the collapse continues unfettered until neutrons in the core begin to bump into one another

--as the collapse slows, it overshoots equilibrium (it only takes about half a second from the beginning of the collapse to this point)

--in a way that is not yet completely understood, the rebound that occurs when this overshoot is corrected blows the outer section of the star outward in what is called a supernova

--when a supernova explosion of this type occurs, the star can give off as much as 100 times the total energy the star produced in its entire lifetime

--in 1054, Native American Indians observed a supernova that the Chinese also observed. The Chinese recorded that the light from the event was viewable *in the daytime* for two weeks.

--during a supernova, all energies needed to produce all of the elements larger than iron is available

--the material that is blown outward is called a *supernova remnant*

(go to the Web and look at photos)