

THE TECHNICAL CORNER

BIZARRE STARS

Currently there is much speculation about the possibility of galaxies, in general, having a super massive star or stars at their core. I call them bizarre stars. The first time I was aware of this idea being expounded was in an article I read in my adolescence (around 1960). I have been unable to locate this article so I cannot give credit to the author who also suggested that the self - destruction of these stars would explain some of the observed peculiar galaxies, such as M 82, which look as though their centers have had a great explosion occur in them. This author also suggested that such an explosion would give birth to two new massive stars (daughter bizarre stars) that would proceed off in opposite directions.

In 1969 I attended a lecture by Dr. Halton Arp, who made a convincing statistical argument showing a connection or association between anomalous quasar findings and peculiarly disturbed galaxies. After this lecture it was clear to me that these massive star explosions could explain the association of quasars with peculiar galaxies. In this article I, too, am going to speculate freely about the possible existence and consequences of such stars. I will try to make a plausible qualitative argument that the existence and self - destruction of these stars would qualitatively explain:

- 1) The source of high energy cosmic rays.
- 2) The source of quasars.
- 3) The source of the gravitational lens effect.
- 4) The source of galactic magnetic fields.
- 5) Why viable quasars are relatively nearby.
- 6) Why black holes should not exist.
- 7) The source of high intensity broad band electromagnetic radiation coming from galactic cores.
- 8) Galaxy - wide interstellar gas ionization in some galaxies.
- 9) The source of some globular clusters.
- 10) The source of extended galactic synchrotron radiation.
- 11) The source of observed electron and positron annihilation gamma rays.
- 12) The type, relative age, and evolution of many galaxy types.

I am going to consider a bizarre star mass in the 10^7 to 10^9 solar mass range. A classical gravity field acceleration calculation for such a mass range, assuming a spherical mass of five times nuclear matter density (10^{18} kg / m³), gives an acceleration range of 4×10^{13} earth g's to 2×10^{14} earth g's at the star surface. We have obviously entered the domain of general relativity. However, classical calculations will serve to give qualitative results. A classical gravitational potential energy to kinetic energy conversion for a proton free - falling from far away gives a range of 10 Tev to 150 Tev (a Tev is 10^{12} electron volts energy) at the star surface for the star masses listed above. Free falling electrons from far away obtain a range of kinetic energy of approximately 5 Gev to 75 Gev (a Gev is 10^9 electron volts energy) at the star surface. However, we should not expect simple free fall of free particles. Instead we should expect each particle to make a large number of inelastic collisions on its way to the star surface. If we assume approximate equipartition of energy in the star atmosphere at the star surface, then electron mean energy will be near that of the protons and be in the several Gev range. This in turn would cause a rapid electron loss from the star charging it to a very high positive voltage. However, such a voltage would capture back the electrons. So there must be a state of dynamic equilibrium where there are two diffuse concentric spheroidal charge regions near the star surface (gravitationally captured ambipolar diffusion). The electric potential difference between these two regions should be in the several Gev range. Such a region would be an ultra strong source of broad band electromagnetic radiation (see Figure 1). The top of this net charge displacement region should be an ultra strong emitter of Hydrogen Balmer and Lyman emissions. I am assuming here that a continuous supply of matter is being consumed by the bizarre star. Perhaps several solar masses per year may be common for a bizarre star at the core of a young quasar.

The bizarre star should not be spherical in general. It potentially could have a large angular momentum and be a spheroid as shown in Figure 1. This spheroidal deformation could be large because