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 then bizarre stars. The first time I was aware of this idea being expounded was in a 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 / m^3), 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 a 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

this star would have much of the net angular momentum, that 10^7 to 10^9 stars had about the original daughter bizarre star before they were consumed by the bizarre star. This original daughter bizarre star formed the nucleation site for galaxy formation. This formation process will be discussed later.

If the concentric charge regions of the bizarre star atmosphere rotate at the same angular frequency as the star, there will be a substantial net current flow which will generate a substantial magnetic field. The net effective current flow comes from the electrons being further out from the surface of the star and therefore traveling around the star's center at a higher velocity. The strength of the magnetic field will be a strong function of star size, rotation rate, and rate of matter in fall to the bizarre star. This could well be the source of galactic magnetic fields.

In general relativity we are tempted to allow the mass of an object to increase without bound until and beyond gravitational collapse and closure. This I believe to be an error. The problem is that general relativity allows or assumes the possibility of a continuous increase in matter density with no regard to the fact that matter density has to be manifested in actual matter substructure. An example is quarks coupled together to form a nucleus. If there is a density beyond which matter substructure do not exist, then matter may decouple into a photon "gas" . And this is what I believe actually happens in nature. If this be true then there is a density (pressure) limit which would limit the size of bizarre star. And it would limit its size in a very violent way as illustrated in Figure 2 and 3 . Perhaps as much as one tenth of the mass of bizarre star may be converted into a photon "gas" whose explosive expansion supplies the kinetic energy for the newly formed escaping daughter bizarre stars and associated expanding plasma and degenerate matter debris. Degenerate matter debris (perhaps neutron stars) of around 10^3 to 10^4 solar masses could, while leaving the galactic core, take with it 10^3 to 10^5 stars in semi - stable orbits which, over a few tens of millions of years, will settle into the apparently nearly stable orbits of stars in observed globular clusters. However, a small percentage of the stars will be consumed by the central "star". These globular clusters formed by this process would initially orbit the galactic core with fairly eccentric orbits.

Some rather large electromotive forces will be generated by the expanding plasma "compressing" the magnetic field of the former bizarre star's surface region. And again when the magnetic field collapses. How many trillions of volts of potential difference will charged particles in the vicinity of a detonating bizarre star experience ? To what kinetic energy will charged particles be accelerated by the changing magnetic field in the region in between the two escaping polar daughter bizarre stars ? An exploding bizarre star could well be the source of ultra high energy cosmic rays.

There are some quasars that are so close together in the sky and so nearly identical that there has been speculation that they are really two images of the same object. The two images being generated by a gravitational lens effect caused by the gravity of intervening galaxies located along the line of sight. However, If the bizarre star self destruction mode has merit, it would seem more likely that what is observed is two nearly identical daughter bizarre stars with many tens of millions of captured galactic core stars (young quasars) traveling away from each other at right angles to our line of sight. The mass of the daughter bizarre stars could contribute a large percentage of the observed quasar red shift through the gravitational red shift mechanism, if the great bulk of the quasar line emission radiation is generated in a nearly equal potential gravitational field region near the star surface (see Figure 1). Such a gravitational field region should exist at the surface of young daughter bizarre stars do to their relatively small deformation do to their relatively small angular momentum at an early age. Such a gravitationally red shifted intense radiation source could then have its light made into a diffuse source by dust scattering of the radiation over the several tens of parsecs of dust surrounding the bizarre star (see Figures 4 and 5). This dust coming from the tens of thousands to tens of millions of stars consumed / dispersed by the bizarre star's gravity field. The other component of the red shift would be of a Doppler nature.

The coupled magnetic fields of the two escaping daughter bizarre stars would explain the extended strong radio sources associated with many galaxies, particularly peculiar galaxies that look like their center has been "blown" out and have two or more quasars or strong radio sources "sandwiching" them (see Figure 3). The changing magnetic field strength in between the diverging daughter bizarre stars would supply the electromotive force and magnetic field needed to drive and confine the charged particles that produce the observed synchrotron radiation. It would also provide the electromotive force to accelerate charged particles in the interstellar media of the galactic plane. This would cause galaxy wide ionization of interstellar gas caused by collisions with these accelerated particles. Also, the matter - anti - matter plasma created in the exploding bizarre star core would explain the electron - positron annihilation