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Empty space

'Give up creation as space-time, historic reality, and all that is left is what Simone Weil called uncreatedness. It is not that something does not exist, but that it just stands there, autonomous to itself, without solutions and without answers.

Once one removes the createdness of all things, meaning and categories can only be some sort of leap, with or without drugs, into an irrational world. Modern man's blackness, therefore, rests primarily upon his losing the reality of the createdness of all things (all things except the personal God who always has been).'

Francis A Schaeffer
Genesis in space and time,
Hodder and Stoughton,
London. 1972, p. 30.

Fast stars challenge big bang origin for dwarf galaxies

Rod Bernitt

Our Galaxy is a member of a group of at least 30 galaxies called the Local Group, which extends more than three million light years across space. Over half are 'small', or dwarfs, less than 6,000 light years in diameter. These dwarf galaxies contain stars that are moving away from each other at high velocities, as shown by their measured radial velocities.

Stars have what is known as *space velocity*, or movement in space with respect to our sun. Space velocity has two components: (i) radial velocity (toward or away from us) and (ii) proper motion (at right angles to our line of sight).

Proper motion is measured by comparing the position of stars on two different photographic images of the same region of the sky taken at least a decade apart. However the Local Group dwarf galaxies are too far away for us to observe changes in proper motion, so we can measure only radial velocities.

The radial velocities for the dwarfs are obtained by analysing the spectra of various stars found in them. Astronomers assume that the Doppler shift applies and interpret blue shifts as indicating motion toward the earth and red shifts indicating motion away from the earth. If, as some have challenged (e.g. Halton Arp,[1] Barry Setterfield[2]), redshifts are not the result of motion away from Earth, or 3D space expanding as in the big bang cosmology, this could significantly affect the interpretation of radial velocity measurements commonly used today in astronomy. But the Doppler interpretation of spectral shifts seems to be valid for the stars in dwarf galaxies.

After astronomers have measured the radial velocity of a number of stars in a dwarf galaxy, they can work out how fast the stars are moving relative to each other. Surprisingly, many stars in the dwarf galaxies in the Local Group are moving away from each other at speeds close to 10–12 km/s.

Astronomers recognise that, at face value, these *high velocity dispersion stars* indicate that they have not been moving through the dwarfs for billions of years. These stars could pose a major problem to big bang cosmology and the Hubble age of the universe.

For astronomers who are committed to the big bang model and a universe billions of years old, these high velocity stars are a major problem. At these speeds, the stars should have dispersed in 100 Ma, which, compared with the supposed 15,000 Ma age of the universe, is a short time. How is it possible that the dwarf galaxies still contain such speedy stars? The answer, we are told, is 'dark matter'.

The only way that the stars could still be held inside the dwarf galaxies and not have escaped billions of years ago is if there is something holding them together. The proposal is that the dwarf galaxy contains a huge amount of additional mass that, except for its gravitational force, is entirely invisible and undetectable. This simple approach is based upon Newton's 1st Law of Motion. Using this law and a dispersion velocity of 12 km/s, the stars would travel about 4,000 light years from their homes in only 100 Ma. The dark matter needs to surround and permeate the dwarfs to retain the speedy stars for billions of years.

Astronomers researching the Local Group dwarfs use the M/L (mass-to-light) ratio, where both parameters are quoted in solar units (for the Sun, M/L = 1.0). The M/L ratio is an interpretation based upon stellar velocities measured in the galaxies, assuming that the galaxies still exist after billions of years because they are gravitationally bound. The higher the mass-to-light-ratio, the greater the amount of dark matter needed to keep the galaxy together. However, the high M/L ratios could be used to support a very young dynamical age for the Local Group dwarfs instead. Perhaps dwarf galaxies that exhibit large M/L ratios with