

ASTR1002: Planets and The Universe.

Assignment 5: The Universe of Planet Ziggy

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In the sky there appears to be two stars that move in a curved line from the left of the sky up to the zenith. It looks at first like they are orbiting each other, with an axis much the same as Ziggy's rotational axis. If two stars were orbiting each other then they would have to be a vast distance away from each other to be separable with the naked eye and if this were the case then the rotation would take millions or even billions of years. Also for a star to be appearing to actually move, let alone this fast it would have to be moving faster than the speed of light, which is impossible! So these objects must be vastly closer to us than stars are. They may be a binary asteroid or planet system, moving in the plane of the solar system. Again the separation would have to be too great for the rotation to show greatly, even at these close distances. If they were planets then they would also have to be moving pretty quickly to appear to be moving across the sky and not in spirals around the zenith.

For objects to seem to travel across the sky so swiftly they must be either very close or very fast. Since it is improbable that there would be objects orbiting Ziggy at the fantastic speeds required, I propose that instead of just one large moon, Ziggy has three. Two smaller, swifter companions also, which until now we have not seen. These two would have to be much closer to Ziggy than the large moon, perhaps only a few hundred or thousand kilometres. These moons are also much smaller, probably captured small asteroids. The reason we see them going straight across the sky or near to it, is because of their apparent speeds. They are actually travelling in a curve and would appear to be travelling in a spiral like the large moon, if they were travelling much slower.

The sun still has not been seen, after one week on Ziggy. This supports the theories of Ziggy's axis and rotation proposed in the previous report. The appearance of the *milkstain* in the sky and not a milky way type band, suggests that we are in an elliptical galaxy which has practically no disc but a huge bulge. A telescopic view of the *milkstain* yields a view of vast numbers of stars packed very closely together, whereas the other regions of the sky do not show as many stars. There is no general glow and so there are no large clouds of glowing gas. This also supports the theory of an elliptical galaxy. The pulsing stars in the central region of the *milkstain* are RR Lyrae stars, they are like Cepheid variables however they pulse at a much faster rate, that is under 1 or 2 days. The stars observed pulsed with a period of four hours and hence they could not be Cepheid variables. RR Lyrae stars and Cepheid variables have periods proportional to their brightness because both their pulsing and their brightness (the HR diagram) are dependent on mass. We observed some very similar stars with the same pulse period in the Canopus region last year from one parsec distance and our telescopes picked up 100,000,000 (100 million) photons per second. The telescopes here picked up 1 photon per second from these stars. Since the period is the same, both stars must have the same intrinsic luminosity and using the inverse square rule we can determine the distance. The distance to the stars in the *milkstain* must be around 10,000 parsecs away because they are $\sqrt{100,000,000}$ times further away than the stars observed at one parsec. This puts Ziggy's sun at around 32,000 light-years from the *milkstain*, at the edge. For something to appear this large at such a distance, it must be a galaxy.

The *fuzzballs* seen through the most powerful telescope appear to be vast clusters of millions of stars packed densely into a small area. These resemble globular clusters in this way. Also the spectrum obtained from the brightest *fuzzball* shows a bright red end and not much blue, this is typical of globular clusters because they are so old. The *fuzzballs* are probably orbiting our galaxy, the *milkstain*. The fact that the *fuzzballs* are seen evenly throughout the sky suggests that we are close to the centre of the galaxy they are orbiting around. Although we are 32,000 light-years from the centre, the galaxy may be extremely large or the *milkstain* may not be where the *fuzzballs* are orbiting around. We may be near the centre of a close a binary galaxy system and have just not seen the other one because it is below the horizon.