

## THE FIRST WHITE DWARF

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Once upon a time (like 3,000 years ago), stargazers in the Euphrates Valley saw animals in the sky, and also men and even women: The Ram, The Lion, The Herdsman, The Virgin, and so on. Centuries later, astronomers were crediting the Iraqui (of old) with vivid imaginations. The names of the constellation did not bear a very close resemblance to the animals or people they were supposed to represent. At last, in 1718, Halley (of comet fame) pointed out that stars in a constellation were moving with respect to one another, and distorting the figures in the sky. He compared the position of some stars, as seen in his day, with their positions as listed in a catalogue compiled in Alexandria about 150 A.D. Stars were not fixed. Each had its own proper motion. Two stars in the same constellation could be moving in different directions and at different rates. The rates were slow. The greatest change that he detected was equal to about the diameter of the moon, in the course of nearly 1600 years.

To measure the proper motion of a star called for long, continuous, tedious and accurate observations, - something right up the alley of 19th century German astronomers. One of these, F. W. Bessel inherited observations made on Sirius, the brightest star in our sky.



To these he added his own. The motion of Sirius had baffled astronomers. It seemed to be changing its direction of displacement. Bessel, with 88 years of records at his disposal, pointed out that Sirius was not following a straight and narrow path. It seemed to be staggering from side to side. He suggested that it had an unseen companion, and that they were revolving one about the other. Seven years later, in 1851, C.A.F. Peters, another German, showed that the sinuous path of Sirius could be accounted for if there were two stars, Sirius A and Sirius B, revolving about their center of mass and if (again) Sirius B was 250,000 times the mass of our Earth, and distant from Sirius A 20 times the distance from our Earth to the Sun.

Sirius B was never seen until 1862. In that year, Alvan Clark, one of an American firm of telescope makers, was testing an 18-inch refractor built for a client. He turned the telescope towards Sirius. There was Sirius A and Sirius B.

In the second decade of this century, stars were classified according to their luminosity, mass and spectra. Sirius B became the typical White Dwarf, - old, weak in hydrogen, strong in metals, less luminous than stars of equal mass. An old star has used up most of its nuclear energy.

Its outward pressure is less than its inward pull of gravity. It contracts and becomes very dense. A cubic inch of Sirius B would weigh about a ton on Earth. White Dwarfs are the most solid substances we have laid eyes upon. If there be heavier stars, like neutron stars, we cannot see them, and can judge of their existence only from their effects.

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