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Inconceivably Dense Neutron Star Hurtling Towards Us!

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There are two states we love as children - the outrageously large and the ridiculously small. Later on, when we become adults, these Alice in Wonderland extremes tend to worry us. A ball bearing is all very well if it's the size of a marble and comes out of a car wheel but one that is twenty kilometres in diameter and hurtling through the air could test us.

Seen through a telescope, an object that size would appear diminutive but if one was up there oneself one might well think differently. What would you do if you were in space and saw one coming towards you at 390 000 kilometres per hour? I asked a friend. I'd run she said - quite sensibly I thought.

The latest news from the Hubble Space Telescope is that such an object is indeed streaking across space in our general direction but don't hold your breath - its going to miss us by 170 light years and that's only in 300 000 years time.

It is what is called a neutron star and it is the closest one yet discovered by astronomers.

Neutron stars are created when the inner core of a star more than eight times the mass of our sun collapses. There is an explosion of cosmic proportions - equal in light output say to that of a billion stars. It is called a supernova.

About one million years ago, a massive star in a binary star system in the constellation Scorpius exploded as a supernova, releasing its companion star, an ultra-hot, blue star now known as Zeta Ophiuchus which is zooming away from the same region as the neutron star which is coming our way. Because at that time of the explosion, the neutron star and Zeta Ophiuchus were in about the same location in space, it is thought that the neutron star may be the remnant of the star that went supernova.

What is left after such an explosion is a dead and unimaginably dense star of 10 to 20km in diameter.

The figures defy comprehension. A pinhead of such a star would weigh one million tons . A golfball's worth would drop straight through your hand (forget about how it came to be there) and punch a hole through the earth as if it was cheese, coming to rest at the centre. A neutron star is not comprised of matter in the sense that we know it. What we generally regard as solid is almost entirely (99.999999%) comprised of space. The atoms out of which the kitchen chair is constituted are one part dense matter to 100 000 parts empty space. We can sit on it without going through it because we are of equivalent density - mostly empty space.

When the core of a supernova implodes, the gravity is so immense that the dense matter in all the atoms - the protons, neutrons and electrons - is compressed together and the empty space 'squeezed out'. The result is a star reduced a thousand trillion times in volume, that is, 10 trillion times denser than steel and comprised entirely of neutrons. Its surface would be so smooth that a speck of dust on it would be like a mountain.

If it were any more dense, if the parent star were any larger, it would probably be a black hole.

The value to astronomers of this neutron star is that it is neither accompanied by a companion nor is it pulsing through spinning action (some neutron stars spin up to a thousand times per second.) This allows them to study its surface emission without the interference of emissions from other sources.

Astronomers say the neutron star's present location is 200 light years away. It is nearly a 100 million times too faint for the naked eye but something as bright as a billion stars is another story. If you keep your eyes glued to the sky for long enough you are sure to eventually see a supernova . But don't be surprised if it disappears . It might have become a black hole rather than a neutron star in which case, unlike the famous Cheshire cat, it won't leave any smile to show you where it last was.