

A graveyard of planets

A visit to the neighborhood of a dead star could give scientists an idea of what may happen, in the end, to planets, says S. Ananthanarayanan.

Scientists observing a white dwarf in the constellation Pisces see a cloud of dust around the star, which could be the remains of a comet. Are planets fated 'to dust return' too?

Fate of stars

The life story of stars is that they go through cycles of compression and expansion, due respectively to gravitation and nuclear reactions. When stars form through the coming together, through mutual gravitational attraction, of vast expanses of gas, mainly hydrogen, the star heats up, like any gas getting compressed. When it gets hot enough the hydrogen nuclei coalesce into helium nuclei, which is what happens in a hydrogen bomb, and great energy is given off.

This energy overcomes the gravitational collapse and the star explodes and expands, for millions of years. When the star expands it cools and could end up as 'red giant' – red because it is cool and a giant because it has expanded.

When the expansion stops gravity takes over and the star compresses, for more hydrogen to become helium, and later, for other elements to form. When new elements form, the heat causes expansion, followed by compression, followed by expansion and so on.

The White dwarf

Finally, when all the nuclear fuel is used up, there cannot be another expansion phase and the star settles down as a compressed, that is, small and intensely hot object – a *white* (because it is hot) *dwarf* (because it is small). Stars that have more than a certain critical mass get so dense that the force of gravity at their surface bends space itself in such a way that no light can escape from the object, which has become a *black hole*. But stars with less mass end up as white dwarves.

William Reach of the Spitzer Science Center and Marc Kuchner of NASA and the Goddard Space Flight Center used the Spitzer infra red space telescope to look for matter in orbit around the red dwarf, G-29-38, located in Pisces. What they found was a cloud of dust, rich in silicates, the material of ordinary sand, surrounding the dying star.

Planets and comets

When a star goes through the cycle of expansion and compression, many planets get scattered into interstellar space but some remain. These surviving planets fall into new orbits, generally with no relation to the original ones, and the massive tidal forces of the

star in its throes generally shreds the planets to smithereens. This happens because the part of the planet nearer the star is attracted much more strongly than the part further away, causing internal stresses, and so on.

Instances of comets, which are bundles of dirt and ice, crumbling when they get too close to the sun are regularly observed. A dramatic display in recent times was in 1994, when the comet Shoemaker Levy 9 came too close to Jupiter. The icy comet crumbled into more than a dozen fragments, all of which finally crashed into Jupiter.

The dust cloud around the white dwarf G-29-38 is believed to have come about in the same way, with the disintegration of a comet. The dust is observable in infra red because the light of the white dwarf is absorbed by the dust particles and then radiated as heat. But planets and comets are too cold to be detected. As the detectable dust particles radiate energy, which is more than they absorb, the particles finally spiral into the mother star. But the cloud has lasted millions of years. So it looks like there is a large population of planets and comets continuously getting ground up to keep the dust cloud alive!