Science

Sucking in the eighties...

Black holes going, going, gone

by Cameron Mills

Black holes are unfathomable regions of space, so dangerous and terrifying that even Captain Kirk would not dare enter. There are other men, however, who boldly investigage these nightmarish objects from a few thousand light years distance.

Dr. Werner Israel, an acclaimed U of A theoretical physicist and leading researcher in the field of gravitation, is one of them. He took some time off recently from his cerebral activities to tell me of these most bizarre objects, black holes.

After talking with Dr. Israel, who discovered the perfect spherical nature of black holes, one is reassured to learn that science is still tremendously exhilirating.

In the beginning, some ten or twenty billion years ago, there was an explosion from which the universe sprang into being. Everything, absolutely everything, Howard Cosse l's toupee, Donnie and Marie, and the CAB cafeteria, all, ultimately share the same hot, fiery ancestor.

Particles of matter streaked outward from this infinitely hot and dense fire ball, and after a few billion years began to coalesce sufficiently under the influence of their mutual gravitation to form planets and stars. A star is in essence a fantastically massive planet whose consequent internal pressure and temperature is so high that nuclear fusion has begun in the core.

A star leads a delicately balanced life. It is subject to two opposing forces.

First is the force of gravitation which seeks to collapse the star in on itself.

Opposing this is the pressure which is exerted outward from the star's burning center.

As the nuclear fusion proceeds in the star's center, hydrogen (the material of the early universe) is used up and fused into a series of more complex elements beginning with helium and ending in carbon. The end result is that the star can no longer burn the matter at its center, it's nuclear fires go out.

If the star is less than twice the mass of our sun it will contract and form a white dwarf or a more dense neutron star. However, if the star is greater than about two solar masses, the sheer bulk of the star causes a runaway gravitational collapse. The structural integrity of matter will not be sufficient to halt the contraction. As the star collapses the force of gravity seeks to pull the star's outer surface toward the center. As the star shrinks the gravitational force exerted by the star's interior on the exterior further intensifies which in turn further contracts the star, and so the process continues without limit, producing an object of infinitely small size that weighs at least twice as much as our sun; a black hole.

The force of gravity is so strong in the neighbourhood of a black hole that light cannot escape from it and as a result they are optically invisible.

In 1971 it was discovered that a massive super giant star in the constellation of Cygnus seemed to behaving erratically. From the same spot in the sky, there was observed a strong and regular pulsation of x-rays flicking on and off at about a thousand times per second.

It was inferred from this that any body rotating this quickly and flickering on each rotation must be at the most the size of a small asteroid. Yet the erratic motion of the super giant star could only be explained by a nearby object of at least ten solar masses tugging at it with the force of its gravity.

Cygnus X-1, the unseen companion to the giant star, had to have a weight of ten solar masses and yet be at most the size of an asteroid, a hundred kilometers in diameter. Cygnus X-1 is a black hole.

Black holes exist; lock up your children.