

The irrepressible Stephen Hawking says black holes are not that black, they glow!

Do black holes radiate?

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Black holes are how the heaviest stars end up, when they 'collapse into themselves, under their own weight'.

Birth and death of stars

A star sets out as an expanse of interstellar gas that draws together due to gravity. As it falls in, and its component particles get closer, it heats up, till it sets off a 'nuclear fire', basically turning into a giant hydrogen bomb, just like our own sun.

After some eons of the nuclear fire heating the star, the energy created can be so great that the star expands again. The expansion would go on even past the point when the star has cooled and then, gravity draws the star in again. This would cause heating, which would set the star expanding, and so on. Till it really caves in to crush the particles together so hard that they go off in a colossal explosion, as a 'supernova'.

Now, when this supernova caves in, the nuclear fuel is over and the collapse is not slowed down. And if the mass, to start with, was more than about 1.4 times our sun, gravity could crush the mass so hard that protons and electrons merge into neutrons and what is left is just a mass of neutrons. Neutrons can get really close together, and the star gets so dense that even light cannot escape!

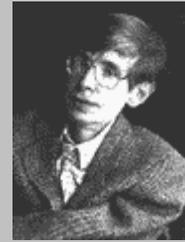
Vicinity of black holes

Now, the matter in any proximity of such a thing also gets sucked in and it speeds up to stupendous velocities as it approaches the surface. The heat generated, due to friction, raises temperatures to such levels, and charged particles are so accelerated, that the energy radiated is largely in X Rays.

In fact, it is with by this telltale X radiation from a black spot in space that we deduce that a black hole is holed up there! And the effect that gravity has on light itself can be studied in these X rays, to verify the most esoteric realms of General Relativity.

Hawking's Radiation is different!

This X - radiation is only from the vicinity of the black hole and in fact is rather conventional and not a step forward in the understanding things about the black hole itself. But Stephen Hawking went one further and said there was an 'intrinsic radiation' from black holes. This radiation should be there even if there were no matter around the black hole!



Just as Relativity has succeeded at the cosmic scale, Quantum Mechanics is unquestioned at the sub-atomic level. One thing that QM says is that it is possible for even events that violate the conservation of energy to occur. An example is radioactivity, where a particle trapped inside a nucleus just 'escapes', like a golf ball rolling out of the hole!

Likewise, QM says, pairs of particles and 'antiparticles' spring forth from nothingness, to rejoin and annihilate, soon after. But if there were a black hole in the vicinity, it might gobble up one of the 'pair' and the other, widowed, as it were, would stream forth, to balance the fact that a particle has crossed the 'event horizon' at the black hole's surface!
