

+ BLACK HOLES AND FASCINATIONS

SINCE the expression "black hole" was coined by the theoretical physicist John Wheeler in 1967 these objects have fascinated scientists, the public and Hollywood scriptwriters alike.

A black hole is an object that is so massive that even light cannot escape its awesome gravity. Thought to be the remains of collapsed stars, they have inspired many myths. Television and films have portrayed them as time-travelling tunnels to another dimension (not) or as cosmic vacuum cleaners sucking up everything in sight (actually, they only dine on material within the vicinity.)

Physics also finds them hard to swallow. In the mid 1970s, Stephen Hawking combined the theory of the very big (general relativity) with that of the very small (quantum mechanics) to

show that black holes evaporate away in a steady stream of featureless radiation. But once a black hole has evaporated, there is a puzzle to do with the fate of the arrangement of particles and energies in the black hole, which can be thought of as information. Where has the information about it gone? Because this violates a basic tenet of science - that information cannot be destroyed - it has come to be known as the black hole information paradox.

In a paper published in a recent issue of Physical Review Letters, Prof Sam Braunstein, of the University of York and Dr Arun Pati, of Sainik School, Bhubaneswar, India, have revisited the paradox to show that quantum information cannot be "hidden" or in Braunstein's words, "quantum information can run but it can't hide". Once again, that

leaves physicists scratching their heads. "The conflict between the Quantum Mechanical and General Relativistic descriptions of black holes is actually much worse than the original description of the black hole information paradox made out," said Prof Braunstein. "Hawking's paradox applies not just to the end-life of a black hole when it's shrunk to a microscopic size (where you would think quantum mechanics holds sway) but even for the monster black holes that are now believed to be at the centre of virtually every galaxy."

That underlines the need for current physics theory to be updated or replaced, perhaps with a new blend of relativity and quantum mechanics, called quantum gravity. "Has physics vanished down a black hole?" asked Prof Braunstein.