# Black Hole Power

**by Dietrick E. Thomsen**

## Or there's a use for everything, even the navel of the universe

Critics of pure science often allege that its purity consists in attempting to discover the most useless things possible, and some pure scientists have taken pride in the total inapplicability of their work. Yet hard on their heels come the applied scientists, who are very ingenious about finding uses for things. Take James Clerk Maxwell's discovery of the laws governing electromagnetic fields. Solutions to Maxwell's equations predict the existence of electromagnetic waves. Heinrich Hertz, as a way of proving Maxwell's theory, constructed an experiment that sent and received such waves. After Hertz came Guglielmo Marconi and a chain of development that now gives us such gifts as Archie Bunker, Maude, Florida and the Waltons. Practical? Depends on your definition.

But, aha! you say. Setting up Maxwell's field theory as a straw man is a cop-out. It's like putting someone at the top of a well-greased slide and marveling at how he glides to the bottom. Well, maybe. But we are used to the applications of electromagnetic waves. Contemporaries of Maxwell and Hertz were a little slower to see them.

But let us take a very pure science: astronomy. We are now to the point where we can chip rocks off the moon and bring them back to earth, and people who are suffered to remain at large have proposed prospecting and mining expeditions to the asteroids. Yet, aside from the nearer parts of the solar system, astronomy's discoveries remain unreachable and of no practical use to anybody.

Surely this goes double for black holes, one of the sublimest flights of field-theoretical imagination. Yes, but. . . . The actual existence of black holes is still a matter of controversy, though some astronomers believe they see them, yet already three physicists from the Lawrence Livermore Laboratory, Lowell Wood, Thomas Weaver and John Nuckolls, have proposed a use for them.

Consider the black hole for a moment. It toils not, neither does it spin. It just sits there densely gravitating. It lurks in interstellar space like a spider in a web waiting for hapless bits of matter to come by for it to swallow. It will ingest anything you throw at it, and it will never give anything back.

A black hole is the condensed remnant of an exploded star. It is so dense that its gravitational field is too strong for anything to escape from it, not even light. A star, before it explodes into a supernova and leaves behind a black hole, at least gives light and inspires poets. A black hole just hangs there, cold, dark and—of and by itself—incommunicado. (Its presence can be manifested by disturbances in the surrounding space caused by its gravitational field.) Surely a black hole is the most inapplicable of all the Almighty's artifacts, the last laugh of the cosmos, the shriveled graveyard of thermodynamics.

Not quite, say Wood, Weaver and Nuckolls. The three Livermore physicists are known for their work in controlled thermonuclear fusion, specifically in experimental attempts to detonate fusion with laser beams. In the course of this work they came up with an idea for a way to make a black hole's gravitational field produce fusion. They presented it last month at a meeting on controlled fusion sponsored by the New York Academy of Sciences, and in spite of its bizarre aspects, they escaped physical attack.

Their idea began with a theoretical proposal of one of the purest of pure black hole physicists, Stephen Hawking of Cambridge University. Hawking proposes the existence of mini black holes. In the usual theory of black holes a star has to be several times as massive as the sun to become one. Hawking's mini black holes are not collapsed stars, but are objects that were formed in the big bang with which the universe is supposed to have begun. They have been hanging around ever since, pervading space. They could even inhabit our solar system quite unbeknownst to us. Since they absorb light and never give it back, we wouldn't see them. We would feel them only if we happened to get close enough to be affected by their gravity, and if they were very small, that would have to be close indeed.

Among theorists of black holes there is still controversy over whether the mini variety can exist, but, granting Hawking the benefit of the doubt, we can take the next leap with Wood, Weaver and Nuckolls.

The three Livermore physicists propose that we search out a black hole or black holes in proximity to the earth, possibly even in orbit around the earth. When we have found one, we shoot thermonuclear fuel at it, hydrogen perhaps. As the hydrogen falls toward the black hole, the black hole's gravitational field compresses it, heats it and ionizes it. Nuclear fusions begin, and the fuel sample explodes in a flash producing helium and energy. "Essentially the whole fuel mass would thus blow itself back out of the 'mouth' of the black hole, and its energy could then be converted into electricity." The energy could then be beamed back to earth, probably in the form of microwaves, a procedure that is also proposed by people who would like to have space stations gathering solar energy.

Wood, Weaver and Nuckolls call their idea "speculative" and "purely theoretical," which is a way of saying: "Wouldn't it be wonderful if. . . ." Nevertheless they also call it the "ultimate power plant" and point out that it would be totally nonpolluting and would have no moving parts except the fuel. It thus might be cheap and easy to build. They propose a search for mini black holes near the earth.

Can such a search be undertaken? Possibly. For years now NASA has been developing a space shuttle. Some Congressmen and taxpayers have thought this was an exercise in pure technology since they could see no practical use for it. Well here's one. Go and find some mini black holes and tugboat them into orbit around the earth. Build the fuel shooter and the energy collector. And ferry the fuel up for generations and generations and generations. Go to it, Cape Canaveral.

But just suppose they really found one. . . .