PROFILE GREGORY BENFORD

Frozen Species, Deep Time, And Marauding Black Holes

It all goes with the territory for Gregory Benford, a mild-mannered professor who doubles as the working physicist's science-fiction writer

IRVINE, CALIFORNIA—Few physicists have adjectives devoted to them, but Gregory Benford does. It's "Benfordesque," as in this review of his latest novel: "*Eater* is Benford's most Benfordesque book in quite a while." Yes, *Eater* has it all—bickering astrophysicists, useless bureaucrats, a love triangle, a smart but vindictive black hole, and a dying astronaut who downloads her brain into a space probe. Welcome to what one friend calls the "weird but stimulating mind" of Greg Benford.

Benford's mind isn't easy to summarize. Its contents include straight physics, such as his studies of relativistic electron beams here at the University of California (UC). His theoretical work extends to pulsars, the cores of active galaxies, and other lairs of turbulent jets. Currently, he and his colleagues are exploring whether microwave beams could propel sails of ultralight carbon fibers in space.

Then there are Benford's papers in journals typically read by biologists and climatologists. For instance, he once urged conservationists to collect random species from threatened habitats and freeze them until future biologists figure out what to do. He recently advocated dumping corn stalks and other crop wastes into the sea to remove carbon dioxide from the atmosphere. He also works on communicating with aliens—both out there and here on Earth, where civilizations of the far future will struggle to interpret anything we've left behind.

Most people, though, know Benford's name from the big block letters on the covers of his science-fiction (SF) novels. He's written 20 so far, including the million-selling *Timescape*, his classic tale of messages across time that won the prestigious Nebula Award in 1980. Another hit novel, *Cosm*, told of baby universes trapped at UC Irvine's physics department and the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory on Long Island.

Most recently there's *Eater*, in which the aforementioned astronaut-spaceship and her brilliant husband, back on Earth, zap a nasty black hole into oblivion before it devours the world's best minds. In the hands of a hack, such a story would come off as downright silly. But Benford is recognized as one of the top writers of "hard SF," which he describes as "fiction with a scrupulous regard for the process, world view, and results of scientific inquiry." Thus, *Eater* mixes astrophysics seminars in jealousy-riddled departments and diagrams of the warped magnetic fields around black holes with death-ray shoot-'em-up cosmic action sequences.

So much fun is *Eater*, in fact, that the Fox television network has optioned it as a 4-hour miniseries. But don't expect to see space-time manifolds or electromagnetic field equations; Benford doubts much science will survive the transition to the tube. (The book's sole sex scene, however, undoubtedly will.)

Wired. Gregory Benford's electron beams once drew power from these capacitors, but his writing taps a deeper source.

Benford's fans and his professorial colleagues think that he deserves his reputation as the SF voice of the working physicist. "There are very few others who can put as much science into their fiction," says artificial-intelligence guru Marvin Minsky of the Massachusetts Institute of Technology (MIT) in Cambridge. "And he is certainly unsurpassed in depicting the academic scenes." Adds Benford's close friend at UC Irvine, evolutionary biologist Michael Rose, "The big challenge in fiction is how to make academics interesting, because we aren't. Greg does that."

Chiral twins

Conversations with Benford whirl as unpredictably as his SF plots. He's genial and confident at age 60, delighted to tackle any imaginable topic. He's equally likely to refer to books by William Faulkner and to covers of *MAD* magazine. Names drop constantly: Dinner with Arthur C. Clarke leads to introducing Kurt Vonnegut at a speech leads to Isaac Asimov's agoraphobia. He loves to interject the word "duh," usually to make a dramatic point about the cluelessness of the powers that be. It's no surprise that his office is an eruption of books and papers, calmly centered only by a framed portrait of the Milky Way by his friend, space artist Jon Lomberg.

Through it all, key facts emerge about his life. For one, he and his brother Jim—president of Microwave Sciences Inc. in Lafayette, California—aren't just identical twins, they're "chiral twins, the rarest kind," Benford says. Greg is right-handed whereas Jim is left-handed, they have birthmarks on opposite cheeks, and their peppered gray hair spirals in opposite directions. They didn't part until Greg earned his Ph.D. in physics at UC San Diego 2 years before Jim, but they still collaborate.

The twins grew up in rural Alabama near Mobile, close to E. O. Wilson's boyhood home of a decade earlier. But whereas Wilson became a famed Harvard biologist, the Benfords turned to physics. Three things did the trick, Greg Benford recalls. Their father's Army assignments in Japan, Germany, and Atlanta exposed the boys to "completely alien environments" far from the verdure of home. They grew to adore SF, launching a mimeographed publication called *Void* at age 13 that grew into one of the great fanzines of the 1950s and 1960s. Most critically, Greg read *Atoms in the Family*, Laura Fermi's ode to her husband, physicist Enrico Fermi. "This vision of a life spent pursuing deep aspects of reality entranced me," Benford recalls.

The reality of Benford's first job, at Lawrence Radiation Laboratory (now Lawrence Livermore National Laboratory) in California, was less entrancing. He joined a fusion research team, but few aspects of the work excited him. "I left after 4 years at

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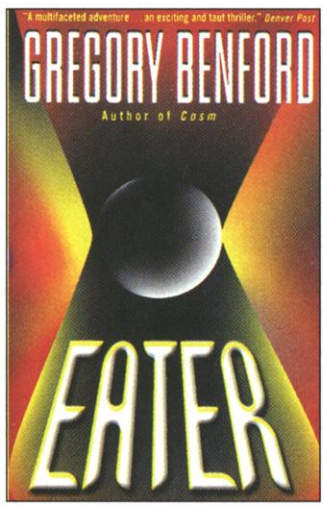
Livermore because I didn't think the conventional fusion program had a prayer of working," Benford says. He landed a faculty position at UC Irvine in 1971 and earned tenure 2 years later.

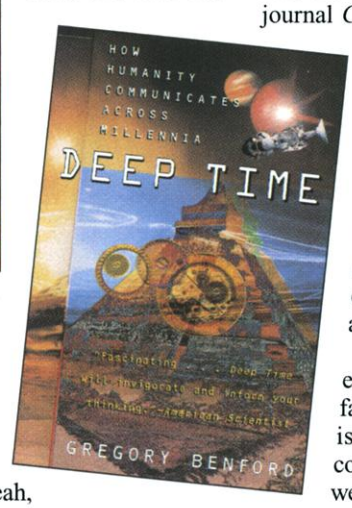
Benford's work on relativistic electron beams was solid but not groundbreaking. He's the first to admit this. "It's clear that I'm a journeyman physicist," he says. "I'm good enough to be a professor at UC, but I'm not and never will be a major figure. My work will have faded utterly 20 years after it's done. … If you want to make a lasting contribution, you'd better worry about what persists. And you realize that astonishingly little does."

Although Benford doesn't put himself in the rarefied company of Asimov, Clarke, Robert Heinlein, and Ray Bradbury, he is gratified that his writing may postdate him. It started with a short-story contest in 1965, for which he won second prize and a lifetime subscription to *Fantasy and Science Fiction*. More short stories followed, then a stream of novels, including his "galactic center" series of six books. They feature complex machine societies at the Milky Way's core, shaped by Benford's conversations with MIT's Minsky.

Scientists are among Benford's most avid readers. "The science is usually great, but he has a darker streak," says UC Berkeley astronomer Gibor Basri, who teaches *Timescape* in an undergraduate seminar on SF. "Some of his books made me feel a little claustrophobic and depressed." Basri's reaction comes as no surprise to Benford. "I've never enjoyed trotting around in the head of a bright-eyed, perpetual optimist," he wrote in a short autobiography published in 1997. "This may reveal more about me than I wish, but there it is."

A scientist fan base also has hazards, because setting a hard SF novel in a real place can blur the line between fiction and truth. Physicist John Cramer of the University of Washington, Seattle, who has written two SF books, notes that researchers at RHIC weren't too pleased with *Cosm*. Administrators come across as goons, and some of the physics pushes the boundaries of plausibility —including the guts of the experiment that spawns the new universes.





No pulp. Benford's books include an SF thriller (*above*) and a treatise on communication.

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Library of life

Those criticisms pale next to the slings and arrows that fly when Benford invades other fields.

Consider his "library of life" idea, published in the *Proceedings of the National Academy of Sciences* in 1992. Benford felt that a radical plan was needed to spur people to preserve as many endangered species as possible. Randomized freezing was his solution—a plan that reporters immediately dubbed "Noah's freezer." His abstract urged vigorous debate, and that's exactly what ensued. Benford organized a National Academy of Sciences workshop at Irvine 2 years later—a physicist calling ecologists to arms.

Microbial geneticist Mark Martin of Occidental College in Los Angeles recalls the mood there. "If you live every day with a terrible problem, like the loss of species and biodiversity, and someone who has never worked on the issue says, 'I have a solution,' your first response is 'Yeah, yeah, right,' " Martin says. "Conservation biologists were tolerant and amused by him, but he got everyone talking."

Benford hasn't pursued the idea further. "I realized this issue could turn into a career, and I already had one," he says. Still, he's dismayed that scientists have not yet succeeded in making people aware of what we're doing to life on this planet. "Biologists can't shout loudly enough to penetrate to the public that in a mere human lifetime, we might eliminate one-third of the species," Benford says. "There's an astonishing silence, an unacknowledged fatalism. People don't have much hope beyond 30 years."

The challenge of looking centuries or millennia down the road runs throughout Benford's only nonfiction book, *Deep Time*, published in 1999. The book is about communicating words, images, and ideas across eons. "Without noticing it, we have come to act not only over immense scales of space, but through time" as well, he says. "We're not yet wise enough to appreciate our newfound powers."

Earth as a message

The closing act of *Deep Time* is called "Stewards of the Earth." Our ultimate message to our descendants will be the condition of our planet hundreds of generations hence, Benford says. Given civilization's pace of change, he thinks geoengineering is inevitable. The simplest step, he believes, is to raise the planet's albedo—the proportion of light it reflects into space—by a percent or so. "We know this works locally," Benford says. "I mean, *duh*. There's a reason why houses in the Mediterranean are all white. It's no big mystery." And yet no agency has taken any measures to make rooftops and roads lighter or, more dramatically, to explore increasing cloud cover over the oceans.

Another tractable option is storing carbon anywhere but in the air. Benford dove into this topic in the April 2001 issue of the journal *Climatic Change*. He and engineer Robert Metzger of the Georgia Institute of Technology in Atlanta proposed that laborers collect discarded parts of crops, ship them to the Gulf of Mexico, and dump them in deep water. That could capture as much as 12% of the annual carbon emissions in the United States, they estimated, as most of the residues are now left to rot.

Benford's top boss at UC Irvine encourages such efforts. "On the face of it, one would say maybe this is just another physicist trying to come in and show how the rest of us were stupid," says chancellor Ralph Cicerone, an atmospheric scientist. "But Greg is paying his dues. He has been trying to think through carbon sequestration carefully and quantitatively, far beyond the order-of-magnitude arguments some other physicists have made about climate change."

Cicerone acknowledges that Benford may not receive due credit within UC's reward system for his nonphysics research. His prolific SF career doesn't help, either. "There's a supposition that to be concerned about the larger social place of physics is marginal," Benford says. "To do so by writing fiction—people automatically think it's suspect." Benford did surmount the university's tough academic grade of Professor VI this year, but only after a campuswide committee overturned his department's rejection. "In a fairer analysis, he might have achieved that level some time ago," says physicist Gaurang Yodh of UC Irvine.

For his part, Benford doesn't care about campus politics. "What I wanted was a life in the sciences, and I got it," he says. And much more, as millions of readers can attest.

–ROBERT IRION