Long-Awaited Cosmic-Ray Detector May Be Shelved

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When Samuel Ting, the Nobel Prize-winning particle physicist, proposed back in 1995 to use the International Space Station to plumb the depths of the universe for antimatter, it was hailed by NASA as good news for the station, which suffered from the perception that it had no scientific use.

Dr. Ting's mission had undeniable heft. His experiment would sift cosmic rays, the high energy particles from the Sun, other stars and even galaxies whizzing through outer space, with unprecedented sensitivity and precision, opening in effect a new window on the universe. By looking for the evil twin opposites of ordinary matter, he and his collaborators hoped to shed light on why the universe appears to be made overwhelmingly of matter, although the laws of physics, including Einstein's E=mc2, suggest that matter and antimatter should have been born in equal amounts in the Big Bang. Are there reservoirs of antimatter somewhere way out in space?

The discovery of a few antigold nuclei or antihelium ions streaming from an antistar in some distant antigalaxy would rock science, but even if they didn't find antimatter, Dr. Ting and his team argued that they might detect signals from the mysterious dark matter that accounts for 25 percent of the universe, or see some other significant surprise.

"You don't know what you are going to get," he told Science magazine in 1996.

Now, after more than 10 years and $1.5 billion, the 15,000-pound detector is nearly ready for the cosmos, the product of 500 scientists from 56 institutions and 16 countries, including China and Taiwan, welded together by Dr. Ting's organizational energy. The Alpha Magnetic Spectrometer, as it is known, is one of the most expensive scientific experiments ever built. A blue-ribbon panel of physicists appointed by the Energy Department affirmed last fall that the instrument had the potential to make "fundamental new discoveries." By the end of next year, the project's managers expect to ship it to the Kennedy Space Center.

The only hitch is that NASA says it no longer has the space to fly its once-prized project. The experiment was dropped from the space shuttle manifest after the Columbia burned up in 2003 and NASA shifted gear and decided to retire the shuttles by 2010. All the remaining flights are booked, either to finish the space station or to revisit the Hubble Space Telescope.

So absent a change of heart by NASA, or the infusion of more money, Dr. Ting's experiment could languish for all eternity in a NASA clean room.

"I hope that's not true," Dr. Ting said by telephone from CERN, the nuclear laboratory outside Geneva where the detector is being assembled, adding that as a particle physicist he reported to the Department of Energy, not NASA. "My responsibility is to build the detector."

He added, "I hope it gets used, otherwise it would not be good for everyone."

Beyond the experiment itself, the standoff represents a clash between two of the more strong-willed and brilliant leaders of Big Science in America: Dr. Ting of the Massachusetts Institute of Technology, who is known for his autocratic management style and obsession with detail, and Michael D. Griffin, the NASA administrator, who has shown himself willing to make tough calls in reshaping the space program away from the shuttle and toward the Moon and Mars.

"The loss of Columbia was a huge loss for the entire United States space program aside from the deaths of seven people," Dr. Griffin said recently in an interview.

"Sam is the one guy we deal with who has not accepted this with reasonable grace," he said. "He continues to insist that he is a special case. I'm sorry, but he's not."

On another level, many scientists say, the standoff is a test of American credibility in international science. NASA signed an "implementing arrangement" with the Department of Energy in 1995, agreeing to fly the Alpha experiment on the station if the department built it. It was on the basis of that document, and a 1998 memorandum of understanding signed by representatives of some two dozen institutions around the world, Dr. Ting says, that scientists from Europe and Asia were able to raise money from their governments for the detector.

George Smoot, a physicist at the University of California, Berkeley, and Nobel laureate himself, who served on the blue-ribbon review panel, said, "The real issue is does NASA stand up to its commitments to the D.O.E. and the rest of the world?"

Barry Barish of the California Institute of Technology, who led the recent review, said, "It's a crime to make that kind of investment and then walk away from it."

Paradoxically, NASA has cited international commitments as a reason to complete the space station. Mark Sistilli, NASA's project manager for the experiment, noted that it too is "a major, major international project." He emphasized that it had not been canceled and that NASA would continue to get the experiment ready just in case.

The Department of Energy declined to comment.

Dr. Ting, who won the Nobel in 1976 for his part in discovering the so-called J/Psi particle in 1974, conceived the idea for his space antimatter experiment in 1993 after the United States canceled a giant particle accelerator, the Superconducting Supercollider, narrowing the options for traditional high-energy physics on the Earth.

Dr. Ting decided to look instead to the sky. "The highest energy particles are only produced with cosmic rays," he said. "No matter how large an accelerator you have, you can never compete with cosmic rays."

For Daniel S. Goldin, NASA's administrator at the time, Dr. Ting's idea was heaven-sent, and he put it on the fast track to space. Not only would it add cutting-edge science to the space station, but it would cost NASA little beyond a pair of shuttle flights. Under the agreement, the Department of Energy was responsible for building and testing the detector. Indeed, the vast bulk of the $1.5 billion for the project, Dr. Ting said, came from Europe and Asia.

The heart of his experiment is the two-ton magnet. Its field, 20,000 times as strong as that at the Earth's surface, is produced by current flowing through superconducting coils cooled to 1.8 degrees Kelvin above absolute zero. That was what took 12 years and cost so much money, Dr. Ting said.

A magnet is essential because charged cosmic rays bend direction in a magnetic field. By measuring the degree and direction of the bend, physicists can identify the cosmic particles. Protons and antiprotons would bend in opposite directions.

The problem, Dr. Ting said, is that magnets in orbit tend to rotate to stay aligned with the Earth's own magnetic field as they go around the Earth. That would wreck the experiment.

"It took us some time to design a magnet that won't turn," he said.

Dr. Ting's group flew a prototype of their experiment successfully on the shuttle in 1998. The second flight was to be three years on the space station. But delays in the shuttle schedule and the Columbia disaster intervened. Last year an Italian-led collaboration launched a smaller cosmic ray satellite named Pamela that has begun to nibble away at some of the science the Alpha spectrometer was supposed to do.

By the time Dr. Griffin became NASA administrator in April 2005, however, the experiment, he said, had been dropped from the shuttle manifest.

A few months after taking office, he received a briefing from Dr. Ting. Dr. Griffin was unmoved about the use of the shuttle. "It essentially uses up most of a shuttle flight," he said of the experiment. "Without adding a flight, we don't have the payload."

But he subsequently asked Mr. Sistilli to look into alternative ways to get the experiment to space. But the possibilities, ranging from launching it on an unmanned rocket and leaving it parked in space until the shuttle could pick it up, to making it into a free-flying satellite, would cost anywhere from $225 million to $1 billion, Mr. Sistilli said. Asked who would pay, Mr. Sistilli said, "That's the big question."

NASA, he said, is still pondering what to do. "The science and the international commitment are something you can't ignore," Mr. Sistilli said. "Stay tuned."