

# Scientists hope to illuminate universe's dark side

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By Irene Klotz

CAPE CANAVERAL, Florida (Reuters) - Everything scientists now know about the cosmos, from the Big Bang to black holes, has come from measurements of light rays.

But Mother Nature speaks in particles too, and until now their instruments have been largely deaf to her second tongue.

A device due to launch aboard the space shuttle Endeavour from Florida on Friday is designed to give scientists their first detailed study of the electrically charged particles streaming through the cosmos.

The Alpha Magnetic Spectrometer, or AMS, could reshape modern understandings of the universe, much the same way that the Hubble Space Telescope pioneered new frontiers in astronomy, including the startling discovery that the universe's rate of expansion is speeding up.

"Charged cosmic rays are a nearly unexplored region of science," said Massachusetts Institute of Technology physicist Samuel Ting, a Nobel laureate who heads the 600-member team that developed the \$2 billion AMS.

The pictures painted by AMS, which was assembled at the CERN physics research center near Geneva, could bring to light the universe's so-called dark matter -- material that is so far unaccounted for but necessary to explain what is observable.

Stars, planets, gas, dust and other detectable phenomena account for less than 10 percent of the matter that is believed to exist. Without dark matter or some other phenomenon, the galaxies would be unable to hold themselves together.

Although by definition dark matter cannot be directly detected, studies show colliding dark particles should leave telltale footprints in the form of positrons, a type of normal-matter particle.

Scientists have gotten hints of excess positrons, which could stem from dark matter collisions, from predecessor space-borne instruments. But only AMS, which will be attached to the outside of the International Space Station and operated for as long as the station remains in orbit, will be able to make enough measurements to provide proof.

The devices need to operate in space because Earth's atmosphere shields the planet from cosmic rays, which would be deadly to life.

**"THE SEEDS FOR ALL THE GALAXIES"**

"Most of the structure of the universe is caused by dark, not ordinary, matter. The seeds for all the galaxies, even our own, come from it," said Josephy Lykken, a theoretical physicist at the Fermi National Accelerator Laboratory who is not on the AMS team.

"Once we figure out its properties, we may see it is important for a whole lot of other things. It might eventually have practical implications."

"This is a very exciting moment for basic science," said Rolf Heuer, director general of CERN, the European Organization for Nuclear Research which is best known for its Large Hadron Collider, the LHC.

"We expect interesting complementarities between the AMS and the LHC. They look at similar questions from different angles, giving us parallel ways of addressing some of the universe's mysteries," Heuer added.

AMS will also address the mystery of antimatter, particles that scientists believe were created along with normal matter during the birth of the universe about 13.7 billion years ago.

"If the universe began with the Big Bang, before the Big Bang there was vacuum. Nothing existed. After the Big Bang, there must be equal amounts of matter and antimatter, otherwise you would not have come from a vacuum," Ting said.

The heart of AMS is a two-ton magnet that will corral incoming charged particles through five different types of detectors. Information will be analyzed by 650 onboard microprocessors and relayed back to scientists on the ground.

NASA flew an AMS prototype on the shuttle Discovery in 1998. The instrument lost its ride after the 2003 Columbia accident, but Ting personally lobbied Congress for an extra shuttle flight to deliver the AMS to the station.

It is the last major piece of equipment that will be delivered by the shuttles, which are being retired after a final cargo run to the station this summer.

For Ting, who tapped the resources of 60 research institutes in 16 countries to get the device built, the most exciting aspect is what he cannot even imagine. "Experts' opinions are based on existing knowledge. To discover something new is to destroy existing knowledge," he said.

Endeavour's launch is scheduled for 3:47 p.m. EDT (1947 GMT) Friday from the Kennedy Space Center in Florida.

(Additional reporting by [Robert Evans](#) in Geneva, Editing by Tom Brown and [Laura MacInnis](#))



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