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FUSE to search for universe's oldest secrets

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CAPE CANAVERAL, Fla. - NASA's newest space telescope is set for launch this week on an archeological expedition to uncover a fossilized record of the birth of the universe.

Mounted atop a Boeing Delta 2 rocket, the $120 million telescope will search out the chemical remnants of the Big Bang, the primordial explosion scientists think created the universe 12 to 15 billion years ago.

Targeting stars, galaxies and the gasses swirling between them, the 1.5-ton telescope is expected to provide information on the elemental make-up of the universe just moments after it began.

That, in turn, will help astronomers understand how stars are born, how galaxies evolve, and the way in which chemicals were first created and then distributed throughout the universe.

"I think we're all like horses at the gate," said Andrea Dupree, an astronomer with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "We just can hardly wait" to get started.

Riding atop the Delta on Thursday will be NASA's Far Ultraviolet Spectroscopic Explorer, a telescope-toting satellite known as FUSE. The launch window is 11:39 a.m. to 12:57 p.m. EDT (1539-1657 GMT).

Standing 18 feet tall and weighing more than 3,000 pounds, the spacecraft carries a sophisticated spectrograph - a device which breaks ultraviolet light into component colors.

Those colors reveal the chemical make-up of objects being targeted by the telescope and the interstellar gasses between them.

FUSE's archeological dig will center on the beginning of time. In this case, the sought-after fossils are evidence of a hydrogen isotope - deuterium - created solely in the Big Bang.

Spewed out into interstellar space, it is constantly consumed by stars as they are born, evolve and eventually destroyed in supernovae explosions.

These explosions re-seed interstellar space with new generations of stars, which then continue to deplete the universe's stock of deuterium.

By studying stars in the Milky Way and nearby galaxies with FUSE, project scientists intend to determine how fast deuterium is disappearing from the cosmos.

Getting a good handle on the rate of consumption will enable them to mathematically work backward, pinning down the amount of deuterium and other matter present just after the Big Bang.

As a result, astronomers will be able to tackle some of the most important questions in cosmology, such as:

- What were conditions like in the minutes following the Big Bang?
- How were the elements that make up all matter distributed throughout galaxies, and how did that distribution affect the way in which galaxies evolve?
- How do stars and planets form from the matter embedded in interstellar gasses?
- Do the Milky Way and other galaxies have vast cosmic fountains that spew out hot gasses and matter, ultimately giving birth to sun-like stars and planetary systems?

"These problems are important for cosmology," said George Sonneborn, project scientist at NASA's Goddard Space Flight Center in Greenbelt, Md. "And scientists around the world anxiously await the opportunity to see the results that come out of the mission."

They've already been waiting a long time.

NASA initially approved the mission as an in-house project in the mid-1980s. The intent was to develop a $300 million shuttle-launched telescope that would build on data gathered by a predecessor spacecraft launched in 1972.

Money for the mission, however, dried up in the wake of the 1986 Challenger accident, and scientists were told to come up with a cheaper way to carry out the project.

The end result is FUSE, which will be the first of its class to be designed, managed and operated entirely by a college, in this case Johns Hopkins University in Baltimore, Md.

Total cost: $214 million, including $120 million to develop the spacecraft and $80 million to launch and operate the telescope for three years.

The Canadian and French space agencies also are contributing $7 million each to the effort.

In an era of dwindling budgets, the mission is seen as a pathfinder for other 21st century scientific expeditions in space. And if the FUSE spacecraft operates as advertised, look for NASA and the academic world to team up more and more frequently.

"This is the wave of the future," said Johns Hopkins project manager Dennis McCarthy, who left NASA in 1994 to work on the mission.

"Many professors around the world now understand that NASA wants these missions done outside their gates, so they're becoming very creative. And they are looking at FUSE to show them the way."
