NASA approves construction of satellite to scan galaxies

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After eight years of study, NASA has approved the construction of an unmanned satellite that will scan the entire sky in infrared light to reveal nearby cool stars, planetary "construction zones" and the brightest galaxies in the universe. Launch of the Wide-field Infrared Survey Explorer (WISE) -- the second phase of the WISE mission -- is scheduled for late 2009. The satellite will orbit the Earth and operate for at least seven months, with data expected a few times a day.

Edward L. (Ned) Wright, UCLA professor of physics and astronomy, is WISE's principal investigator. NASA's Jet Propulsion Laboratory in Pasadena will manage the mission, with JPL's William Irace as project manager.

Like a powerful set of night-vision goggles, WISE will survey the cosmos with infrared detectors 500 times more sensitive than those used in previous survey missions.

"This mission has incredible power for discovery," Wright said. "I expect that what we find will be amazing. There is still so much we don't know."

Wright said that 99 percent of the sky has not been observed yet with this kind of sensitivity, and that the survey should be able to find and observe at least 100 million galaxies and hundreds of nearby cool stars that are currently unknown.

"Approximately two-thirds of nearby stars are too cool to be detected with visible light," Wright said. "WISE will see most of them."

He added that proto-planetary discs around stars presumably condensing into a planetary system show up in the infrared. "Several have been detected, and we will be able to see many more in the Milky Way galaxy," Wright said. "In addition, we will be able to study star-forming regions in nearby galaxies and star formation in distant galaxies."

Such extensive sky coverage means that the mission will find and catalogue all sorts of celestial eccentrics, including perhaps elusive brown dwarfs close to the Earth. Brown dwarfs, the missing link between gas giant planets like Jupiter and small, low-mass stars, are failed stars about the size of Jupiter, with a much larger mass. They can be detected best in the infrared, but even within the infrared are very difficult to detect.

"Brown dwarfs are lurking all around us," said Peter Eisenhardt, project scientist for WISE and JPL. "We believe there are more brown dwarfs than stars in the universe, but we haven't found them because they are faint."

Galaxies in the distant, or early, universe were much brighter and dustier than our Milky Way galaxy. Their dusty coats light up in infrared wavelengths.

"It's hard to find the most energetic galaxies if you don't know where to look," Eisenhardt said. "We're going to look everywhere."

WISE will also provide a complete inventory of dusty planet-forming discs around nearby stars, and find colliding galaxies that emit more light, specifically infrared light, than any other galaxies in the universe. WISE is expected to produce more than 1 million images, from which

hundreds of millions of space objects will be catalogued.

WISE may be able to confirm the existence of dark energy, which scientists believe comprises more than 70 percent of the universe, and which Albert Einstein postulated in 1917. Einstein later believed that to be a serious blunder, but it looks like he was correct, Wright said.

The cryogenic instrument will be built by the Space Dynamics Laboratory in Logan, Utah, and the spacecraft will be built by Ball Aerospace and Technologies Corporation in Boulder, Colo. Science operations and data processing will take place at the JPL/Caltech Infrared Processing and Analysis Center.

Wright; John Mather, chief scientist for the James Webb Space Telescope, and NASA's Cosmic Background Explorer (COBE) team were jointly awarded the 2006 Gruber Cosmology Prize in August for their research confirming that our universe was born in a hot Big Bang; Mather also shared the 2006 Nobel Prize in Physics. The instruments aboard COBE, launched in 1989, looked back over 13 billion years to the early universe. COBE showed that the young universe was hot, dense and almost uniform; that it contained weak fluctuations or lumps that grew into the galaxies and stars we see today; that these fluctuations were the consequence of a hot Big Bang, and that the universe is filled with diffuse radiation from previously unknown galaxies.

For more information about the WISE mission, visit wise.ssl.berkeley.edu/

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