

Discovery/New Frontiers Missions

How did our solar system form and evolve? What other Earth-like planets exist outside our solar system? What's the makeup of the planet Pluto? Those are just some of the questions NASA's Discovery and New Frontiers Programs are venturing to answer. NASA fuels discoveries that make the world smarter, healthier and safer.

The Discovery and New Frontiers Program Office at NASA's Marshall Space Flight Center in Huntsville, Ala., manages these two exciting programs for NASA Headquarters' Science Mission Directorate. The Marshall Program Office assists with program management, technology planning, systems assessment, flight assurance and public outreach. The Marshall Center also assures the availability of the technical expertise to quickly assess needs and manage the support structure to provide oversight to these missions.

The Discovery Program includes focused scientific investigations that complement NASA's larger planetary exploration missions. Its goal is to launch numerous small missions with a fast development phase — each for considerably less than the cost of larger missions. Of the Discovery Program's 12 missions to date, two are operational, or active, three are under development for flight, three have completed operations but are still undergoing data analysis, and four have been completed.

Among the active missions is the Mercury Surface Space Environment Geochemistry and Ranging mission, or MESSENGER, launched in August 2004 to study the planet Mercury. The spacecraft will fly by the planet Venus twice, once in October 2006 and again in June 2007. It will then fly by Mercury three times beginning in January 2008, before

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Artist concept of New Horizons, the first mission to explore Pluto and its moons.



Artist concept of Deep impact, a mission that offered the first look inside a comet.

starting a yearlong orbit of that planet in 2011. MESSENGER will provide the first images of the entire planet and collect detailed information on Mercury's composition. The mission is managed for NASA by the Johns Hopkins University Applied Physics Laboratory in Laurel, Md.

ASPERA-3, another active mission, is a Discovery Mission of Opportunity. Missions of Opportunity are not complete Discovery missions, but rather are one piece of a larger mission. It gives the U.S. scientific community the opportunity to participate in non-NASA missions by providing funding for a science instrument or hardware components of a science instrument. ASPERA-3 is one of seven scientific instruments aboard the Mars Express spacecraft, a European Space Agency mission that launched from Russia in June 2003 and arrived at Mars six months later. ASPERA-3 is studying the interaction between the solar wind and the atmosphere of Mars and characterizing the plasma and neutral gas environment in the near-Mars space. Discovery funded two sensors on the instrument, which was developed by the Swedish Institute of Space Physics.

A Discovery mission under development is the Dawn project, which will visit the two oldest asteroids in our solar system. Set for launch in June 2007, the Dawn spacecraft will reach the asteroid Vesta in 2011 and the asteroid Ceres in 2015. The surfaces of the two asteroids are believed to contain a snapshot of conditions present in the solar system's first 10 million years. This mission is managed by the Jet Propulsion Laboratory in Pasadena, Calif.

Another future Discovery mission — the Kepler mission — is designed to find Earth-sized planets in orbit around other stars outside of our own solar system. Planned for launch in the autumn of 2008, Kepler will monitor 100,000 stars similar to our sun for four years. The mission is jointly managed by the NASA Ames Research Center in Moffett Field, Calif., and the Jet Propulsion Laboratory.

A third Discovery mission under development is a Mission of Opportunity called Moon Mineralogy Mapper (M3). It is an instrument to fly aboard the Indian Space Research Organization's Chandrayaan-1 mission. It will characterize and map the mineral composition of the moon and provide an assessment of lunar resources at high spatial resolution. It is scheduled for launch in September 2007 and has a mission duration of two years.

Discovery's two sample return missions brought back to Earth NASA's first extraterrestrial samples since the Apollo program ended in the early 1970s. After it launched in August 2001, Genesis traveled a million miles toward the sun to collect atoms of solar wind. The mission's goal was to learn what the sun is made of and if the Earth and other planets are made of the same materials. Genesis collected solar wind samples for two years, then returned them to Earth in September 2004. The sample return capsule's parachute systems failed to deploy, and the capsule crashed into the Utah desert. Despite the mishap, the Genesis science team is getting significant science results. The mission is managed by the Jet Propulsion Laboratory.

The second sample return mission is Stardust – the first spacecraft dedicated solely to studying a comet. Launched in February 1999, Stardust passed within 149 miles of the coma of comet Wild 2 in January 2004, taking detailed images of the comet's surface. Using an amazing substance called aerogel, the spacecraft collected hundreds of particles of comet dust. The samples were returned to Earth in January 2006. Scientists are extracting grains of comet dust and sending them to select investigators worldwide. Early analyses have revealed a remarkable range of minerals. Preliminary data suggest the comet is a mix of stardust grains from other stars as well as materials formed in our solar system. The mission is managed by the Jet Propulsion Laboratory.

Deep Impact is the third mission which is still analyzing considerable data. The mission, launched in January 2005, sent a large copper projectile into the path of a comet on July 4, 2005. The impact with comet Tempel 1 formed a crater, with ice and dust debris ejecting from the crater. The flyby spacecraft, which released the impactor, took spectacular images of sunlight reflecting off the ejected material. The dramatic brightening slowly faded as the debris dissipated into space and fell back onto the comet. Instruments onboard the spacecraft, along with a large number of space- and ground-based telescopes, collected data on the never-before-seen materials that may hold clues to the structure of a comet. The Jet Propulsion Laboratory manages this mission.

Four Discovery missions have been completed, including Mars Pathfinder, Near Earth Asteroid Rendezvous (NEAR), Lunar Prospector, and the Comet Nucleus Tour (CONTOUR).

The New Frontiers Program was created to explore our solar system with frequent, medium-class spacecraft missions. Added to the NASA budget in 2003, New Frontiers builds on the innovation of NASA's Discovery and Explorer Programs by identifying and selecting missions that cannot be accomplished within Discovery's cost and time guidelines. The missions in the program will tackle specific solar system exploration goals identified as top priorities by consensus of the planetary community. New Frontiers also permits the use of radio-isotope power systems to provide on-board power.

The first New Frontiers mission, New Horizons, launched in January 2006. It will explore Pluto, its moons, and the area known as the Kuiper Belt. Traveling at approximately 36,000 mph, New Horizons is the fastest spacecraft ever launched. In a trip that will take almost 10 years, the spacecraft will study the small, icy worlds drifting around the sun, a billion miles past Neptune, in an effort to better understand the distant reaches of our solar system. The Johns Hopkins University Applied Physics Laboratory manages the mission.

In 2005 NASA selected its second New Frontiers mission, Juno – a mission to Jupiter. With a highly instrumented spacecraft placed in polar orbit, the mission will investigate the existence of an ice-rock core, determine the global water and ammonia abundance in the atmosphere of Jupiter, study convection and deep wind profiles in the atmosphere, and investigate the magnetic field and polar magnetosphere. Juno is expected to launch in 2011. The mission is managed by the Jet Propulsion Laboratory.

The Discovery and New Frontiers Program Office was established at the Marshall Center in 2004.

For more information on the Discovery and New Frontiers Program visit:

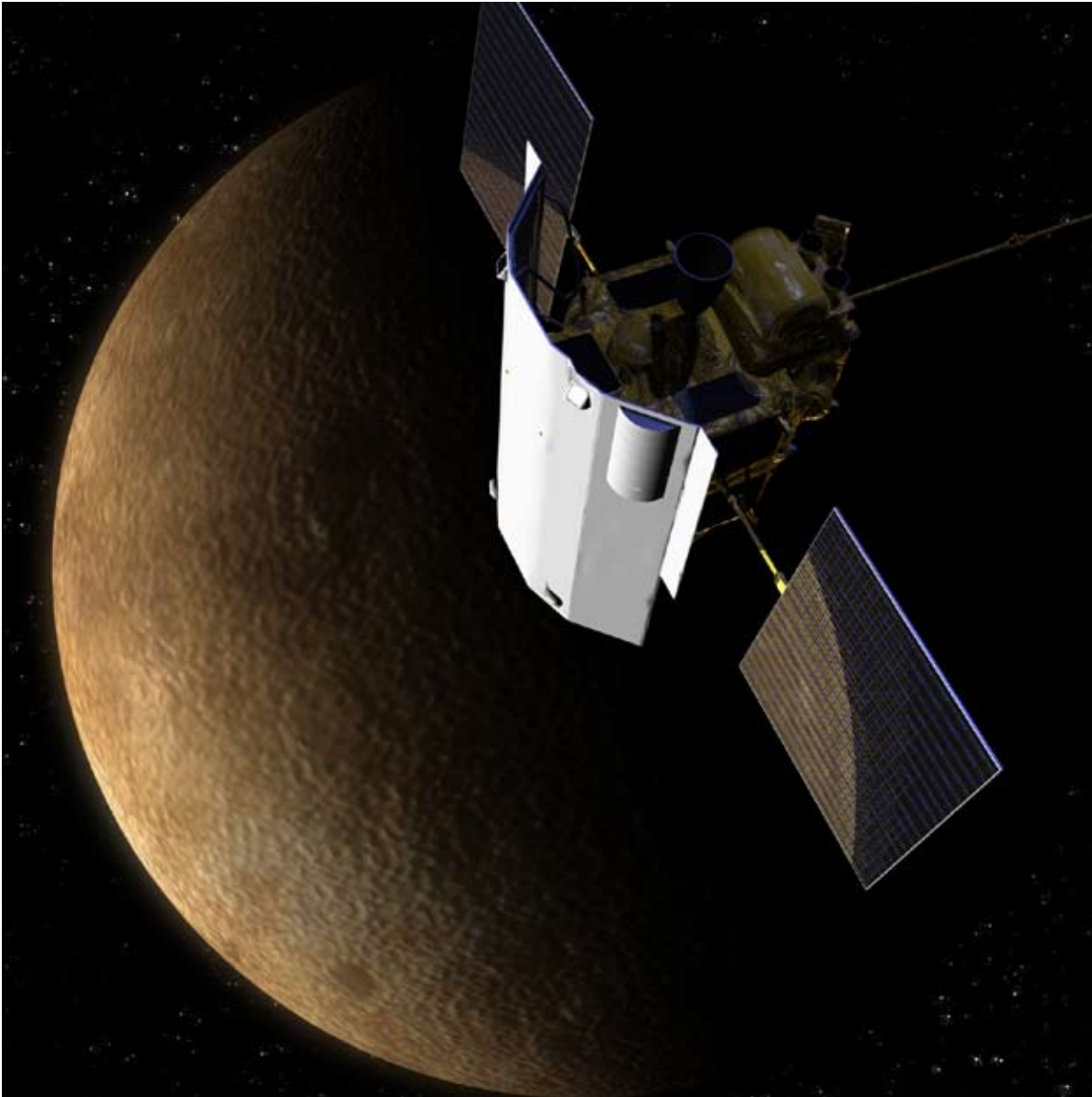
<http://discoverynewfrontiers.nasa.gov>

or

<http://www.nasa.gov/centers/marshall/news/discovery/index.html>

For information about NASA and agency programs on the Web, visit:

<http://www.nasa.gov/home>



Artist concept of MESSENGER, a mission to study Mercury, the least-explored terrestrial planet in our solar system.

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