Bags packed, Thomas writes about view from space

By John Ira Petty

The bags were just about packed last week, and it was a good bet that Andy Thomas was ready to go.

After a productive and rewarding stay on the Russian space station Mir, Thomas is scheduled to return to Earth on June 12. If all goes as scheduled, Thomas will have spent more than 20 weeks in orbit.

His return marks the end of the Phase 1 shuttle-Mir program that has paved the way for the International Space Station and provided valuable lessons in long-duration space flight. Thomas is among seven U.S. astronauts who spent a total of almost 1,000 days aboard Mir.

Packing was no small task for Thomas. A total of 33 bags are to be returned to Earth on *Discovery.* They include U.S. science hardware, scientific samples, video, still film, tools used on space walks and Thomas' personal effects.

As with any move of that magnitude, Thomas found it a good idea to start packing early. With about two weeks left on Mir, he already had completed packing five bags and partly packed 15 others.

In the midst of that job, he had to stop to do some unpacking. With Mir 25 Commander Talgat Musabayev and Flight Engineer Nikolai Budarin, he worked to unload the Progress M-40 resupply ship which recently had docked to Mir. Among items on the Progress were letters and photos from Thomas' family, compact disks, a novel, candy and other personal items.

The vehicle also carried water, fresh food, fuel and scientific hardware for the space station as well as personal items for the Russian crew members.

Thomas found time to write another open letter home, his fifth. The topic was the view from space, and much of the letter was devoted to descriptions of the fascinatingly beautiful Earth below—its natural and human-made features—and the night sky above.

"One of the most readily visible signs of human presence, is the occurrence of contrails from aircraft in the upper atmosphere," Thomas wrote. "These are crystals of ice formed from water, a byproduct of the combustion process in the aircraft engines, and which is collected into the wake vortices of the aircraft.

"They are very long lasting, and can be seen over virtually all parts of the world as white streaks across the sky. They can be striking around cities that are major air traffic hubs, and can oftentimes be seen radiating out from these cities, like spokes in a wheel."

Thomas has been wrapping up his scientific investigations. They are a continuation of 27 studies in areas of advanced technology, Earth sciences, human life sciences, microgravity research and International Space Station risk mitigation.

As his stay drew to a close, Thomas focused on the Biotechnology System Co-Culture experiment growing three-dimensional cultures of cancer cells. The experiment will continue through the end of Thomas' mission, and be transferred to *Discovery* for return to Earth.

Thomas also has photographed changes on the Earth's surface. Some of the changes were seasonal, but others, fires in Mexico and Central America and widespread smoke from them, were caused by humans.

"As I write this, there are huge areas in Central America that are burning. A giant pall of smoke is blanketing the entire south western peninsula of the North American continent and is being carried in the winds over much of the United States and as far north as Canada."

Astronomers find 'planet' with Hubble

NASA's Hubble Space Telescope has given astronomers their first direct look at what is possibly a planet outside our solar system—one apparently that has been ejected into deep space by its parent stars.

The discovery, made by Susan Terebey of the Extrasolar Research Corporation in Pasadena, Calif., and her team using Hubble's Near Infrared Camera and Multi-Object Spectrometer, further challenges conventional theories about the birth and evolution of planets, and offers new insights into the formation of our own solar system.

Located in the sky within a star-forming region in the constellation Taurus, the object, called TMR-1C, appears to lie at the end of a strange filament of light that suggests it has apparently been flung away from the vicinity of a new pair of binary stars.

At a distance of 450 light-years, the candidate protoplanet would be 10,000 times less luminous than the Sun. If the object is a few hundred thousand years old, the same age as the new star system, then it is estimated to be 2-3 times the mass of Jupiter.

Hubble researchers estimate the odds at 2 percent that the object is instead a chance background star.

"If the results are confirmed, this discovery could be telling us gas giant planets are easy to build. It seems unlikely for us to happen to catch one flung out by the stars unless gas giant planets are common in young binary systems," Terebey said.

NASA Photo 98-04116

SIBERIAN SIM—Astronaut Bill Shepherd, right, commander of the first crew that will live aboard the International Space Station, exits a mock Soyuz spacecraft while Cosmonaut Sergei Krikalev, left, flight engineer for the first crew, looks on. The crew, which also includes Cosmonaut Yuri Gidzenko as Soyuz Commander, was participating in Soyuz winter survival training in March 1998 near Star City, Russia.

JSC founding member of Astrobiology Institute

JSC is one of 11 academic and research institutions that will be the initial members of NASA's new Astrobiology Institute as the agency launches a major component of its Origins Program.

The electronic "virtual" institute will bring together astrophysicists, biologists, chemists, physicists, planetologists and geologists to conduct interdisciplinary research on the multifaceted issue of life in the universe and its cosmic implications. It also will help to train young scientists in this emerging field.

"These initial members of NASA's Astrobiology Institute will be at the forefront of the increasingly important link between astronomy and biology, which has been a fundamental interest of mine for the past several years," said NASA Administrator Daniel S. Goldin. "The 'office hallways' of this virtual institute will be the fiber optic cables of the Next Generation Internet, and the groundbreaking research that this group generates will help guide our space exploration priorities well into the 21st century."

The initial members are: Ames Research Center, JSC and NASA's Jet Propulsion Laboratory; Harvard University, Cambridge, Mass.; University of California, Los Angeles; University of Colorado, Boulder; Arizona State University, Tempe; Pennsylvania State University, University Park; Carnegie Institution, Washington, D.C.; The Scripps Research Institute, La Jolla, Calif.; and Woods Hole Marine Biological Laboratory, Woods Hole, Mass.

NASA has developed the Origins Program with its Office of Space Science to search for signs of life in the universe. Funding for the institute will begin with $9 million in 1999 and $20 million in 2000.

Members will conduct a broad range of research on topics including: the formation of organic compounds important to the origins of life, such as from meteorites; the formation and characteristics of habitable planets; the emergence of self-replicating systems and possible pre-biotic worlds; how the Earth and life have influenced each other over time, including the evolution of ancient metabolism and the interplay of evolved oxygen; the evolution of multicellular organisms and the evolution of complex systems in simple animals; organisms in extreme environments such as hydrothermal vents; and the identification of biomarkers to determine terrestrial and extraterrestrial signatures.

JSC's principal investigator for the institute will be Dr. David McKay of the Space and Life Sciences Directorate, who in August 1996 led a team of researchers that found evidence of possible ancient life on Mars by studying a meteorite found in Antarctica. Working closely with McKay will be researchers at the University of Houston and his co-investigators from that project, Dr. Everett Gibson and Kathie Thomas-Keprta of Lockheed-Martin.

The JSC team will concentrate on identifying "biomarkers" that can be used to prove whether biology has been or is present in material samples, and to design methods for comparing them to Earth biomarkers and nonbiological markers that resemble true biomarkers.

Nobel physicist to use STS-91 instrument to search for elusive dark matter, antimatter

The Alpha Magnetic Spectrometer combines organizations around the world, top international scientists and a synergistic effort by NASA and the Energy Department in research aimed at better understanding the creation and evolution of our universe.

AMS is being taken into space for the first time in *Discovery*'s cargo bay on STS-91. After scientists see how the concept works and the hardware and operations are checked out, the detector is scheduled to spend about three years on the International Space Station.

It is the first high energy particle detector to fly in orbit.

"The theory," said John O'Fallon, director of the Division of High Energy Physics in the U.S. Department of Energy, "is that at the time of the Big Bang—the beginning of our universe—matter and anti-matter existed in equal amounts. Our world is made up of matter. So far, we haven't found the anti-matter and we need a new way of looking. That new way is the AMS."

High energy particles, "cosmic rays," were produced at the beginning of the universe. They also come from supernovae and black holes. Ground-based cosmic ray experiments, begun in the 1930s and 40s, have shown that a wide variety of particles rain down on Earth from space. They may include the particles AMS seeks, but the atmosphere scatters and absorbs them.

Particle accelerators produce and control such particles, and have brought about remarkable discoveries. AMS, a 3 1/2-ton detector put together by a scientific team representing 37 research institutions and headed by Nobel laureate and Massachusetts Institute of Technology professor Samuel Ting, uses technology developed by high energy physicists.

"Professor Ting has done a spectacular job of creating, organizing and leading the AMS international team," said O'Fallon, whose department provides more than 90 percent of federal support for U.S. high energy physics research.

"He started this project with only a vision and a concept, and then put together an international collaboration with countries from around the world to build the AMS detector, all in a very short time."

The team wants to answer two basic questions in their search for antimatter and dark matter:

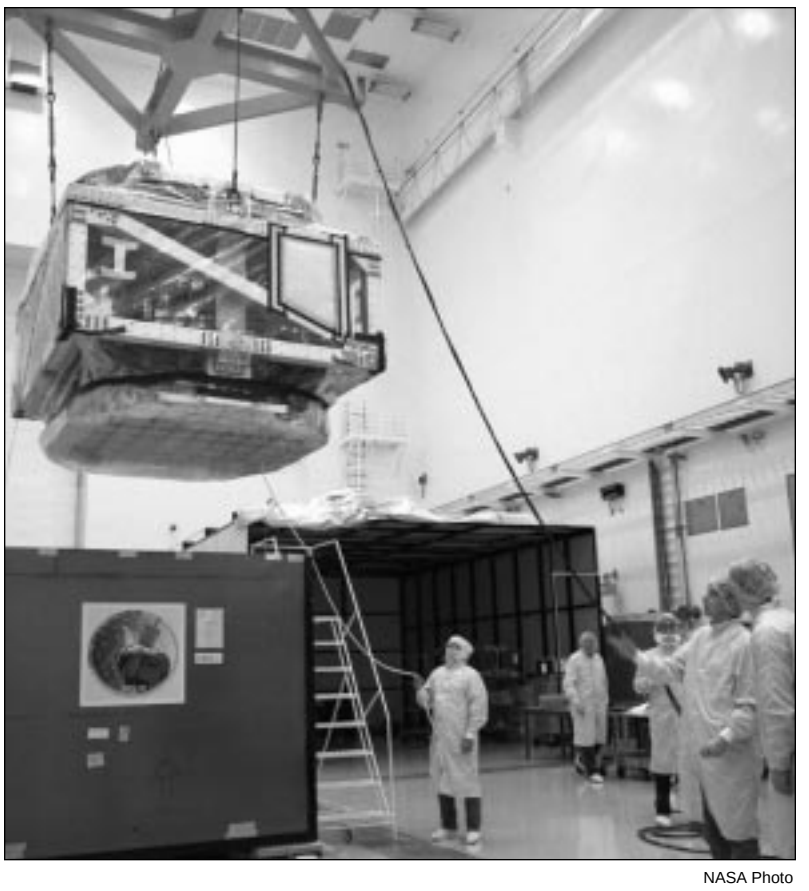
• If, under the Big Bang scenario, equal amounts of matter and antimatter were produced, and the galaxies we now see are made only of matter, where has the antimatter gone?

• Since the mass of a galaxy seems to be greater than the visible mass of all its stars, gas and dust, is there dark matter of a new kind that has not yet been discovered?

Answers from AMS may help scientists better understand the basic building blocks of matter and the forces through which they interact.

O'Fallon cited NASA for working with DOE to make the AMS project, with its aggressive schedule, a success.

"This project has brought together DOE and NASA in a very synergistic way," he said, "the best scientists and engineers from NASA working with top high energy physicists from around the world. Both agencies are needed to carry out the project."



NASA Photo

Technicians help move the Alpha Magnetic Spectrometer from its protective shipping case in Kennedy Space Center's Multi Payload Processing Facility. The STS-91 payload arrived at KSC in January and will be used on STS-91 to search for anti-matter and dark matter in space.