MARSBUGS:

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CONTENTS

MARS GLOBAL SURVEYOR SLIDE SHOW
By Ron Baalke

A slide show is now available on the Mars Global Surveyor home page at http://mgs-www.jpl.nasa.gov/

Mars Global Surveyor is an Mars orbiting mission due for launch in November 1996. The slide show consists of 18 images which includes the science objectives, spacecraft trajectories, and science instruments that will be used on the mission.

SCIENCE INSTRUMENTS SELECTED FOR 1998 MARS MISSIONS
NASA press release

An extremely lightweight camera and a variety of instruments designed to study daily weather patterns and the icy south pole on Mars have been selected by NASA officials to fly aboard an orbiting spacecraft and lander in late 1998. Known as the Mars Surveyor '98 Orbiter and the Mars Surveyor '98 Lander, the robotic missions will enable detailed scientific studies of the planet's atmosphere, climate, meteorology and surface volatiles such as water ice and frozen carbon dioxide. The lander will be the first mission ever sent to the poles of Mars, where it will settle on terrain that appears to consist of alternating layers of clean and dust-laden ice.

"These investigations will collect data that is fundamental to a better knowledge of the climate of Mars, both in the past and in the present," said Dr. Wesley T. Huntress Jr., associate administrator for Space Science at NASA Headquarters. "Landing in a polar region is particularly interesting and exciting. These areas probably hold the key to understanding what appear to be quasi- periodic climate fluctuations on the planet over thousands or even hundreds of thousands of years, and the nature of the orbit of Mars makes this our only

opportunity to send a mission to a pole during the next decade."

The orbiter will carry an advanced technology optical camera called the Mars Surveyor '98 Orbiter Color Imager, to be provided by Dr. Michael Malin of Malin Space Science Systems, Inc., San Diego. With a total mass of only 1 kilogram (2.2 lbs), the camera system is less than 1/20th the mass of the Mars Observer camera spare, also provided by Malin, that will fly aboard NASA's Mars Global Surveyor spacecraft, scheduled for launch in November 1996.

The camera consists of two elements: a wide-angle camera that will acquire daily weather maps of Mars with a surface resolution of 0.8 kilometers up to 7.2 kilometers (0.5 miles to 4.5 miles), and a medium-angle camera with a resolution of 40 meters (131 feet) that will study alterations in the planet's surface over time due to changing atmospheric conditions and winds.

The orbiter also will carry an atmospheric instrument called the Pressure Modulator Infrared Radiometer (PMIRR), which was selected for flight in July. PMIRR will measure temperature profiles of the Martian atmosphere and monitor its water vapor and dust content.

Malin Space Science Systems Inc. will provide another low-mass camera for the Mars '98 lander, called the Mars Surveyor '98 Descent Imager. It will produce wide-angle views of the Martian surface beginning about 10 seconds after the lander's parachute has been deployed, at approximately 8 kilometers (5 miles) in altitude, until its landing. These pictures will be used to provide a larger geographic context for local landforms around the landing zone, and to help tie together images from the orbiter with the exact landing site.

Once on the surface, the lander will power up an integrated science payload to be supplied by Dr. David Paige of the University of California at Los Angeles. Known as the Mars Volatile and Climate Surveyor, this payload achieves a mass of just 17 kilograms (37 lbs) through the use of common electronic components and other shared subsystems.

The payload includes a mast-mounted imager to take stereo photos of the surrounding landscape; a 2-meter (6.5-foot) robot arm that will dig up and deliver surface samples to a thermal and evolved gas analyzer to determine their content of ice and frozen carbon dioxide; and a mast-mounted meteorological package with sensors to record atmospheric pressure, temperature and winds. During its planned 86-day surface mission, the lander's robot arm will attempt to dig trenches in the icy polar soil and then use a small arm-mounted camera to transmit close-up pictures of any stratified layers.

"Like the exposed walls of the Grand Canyon on Earth, these layers should reveal a fascinating record of gross fluctuations in the Martian environment, telling us more about why a planet that appears to have been so wet in the past is so cold and dry now," said Huntress.

NASA is continuing discussions with the Russian Space Agency (RSA) about the possibility of Russia supplying a science instrument for the lander, in addition to hardware that the RSA is contributing for the PMIRR orbiter instrument. Options for the lander include a laser-ranging device that measures atmospheric dust and haze or an electromagnetic sounder that would map soil density variations and possible subsurface water. A final decision on these lander instruments should be made by the end of November, Huntress said.

The Mars '98 Orbiter and Lander are scheduled for separate launches aboard Med-Lite expendable launch vehicles in December 1998 and January 1999, respectively. The missions are part of NASA's Mars Surveyor program, a 10-year series of cost-capped missions to Mars featuring two launches every 26 months.

NASA LEWIS RESEARCH CENTER AND THE CLEVELAND CLINIC FOUNDATION FORM LONG-TERM COLLABORATION
NASA press release

CLEVELAND, OH -- NASA Lewis Research Center and The Cleveland Clinic Foundation today signed a Space Act Agreement, establishing a three-year relationship for cooperative research. This is the first such agreement between NASA and an academic medical center which provides an opportunity for long-term collaboration.

Under the agreement, NASA Lewis and The Cleveland Clinic Foundation's Department of Biomedical Engineering will engage in mutually beneficial research activities to develop products and technologies, and solve technological problems related to orthopedic and cardiovascular devices, medical imaging and microelectrical mechanical systems.

"This agreement brings together two of the leading scientific and technological institutions in Cleveland," said NASA Lewis Director Donald Campbell. "NASA Lewis has been and continues to be a major contributor to the Cleveland economy. Indirectly through jobs and salaries, but more directly in sharing our technological wealth and expertise that exists at the Center. This is a multiplying factor of taxpayer dollars that benefit the public through new products and services."

NASA Lewis and The Cleveland Clinic Foundation currently are collaborating to develop an artificial heart pump; a technique that places a microtexture on the surface of titanium biomedical implants; and computer assisted minimally invasive surgery, in cooperation with the Ohio Aerospace Institute and Wright Patterson Air Force Base. The Cleveland Clinic's Department of Biomedical Engineering also recently was awarded a three-year grant to study the effects of microgravity on bone strength.

"This agreement forms the basis for greatly expanded technical cooperation between NASA Lewis and The Cleveland Clinic Foundation. The goal of this joint venture is the development of innovative medical products, devices and methods to better diagnose and treat the sick," said J. Fredrick Cornhill, D. Phil., Chairman of The Cleveland Clinic Foundation's Department of Biomedical Engineering.

NASA Administrator Daniel Goldin, NASA Lewis Director Donald Campbell, The Cleveland Clinic Foundation Chairman of the Board of Governors, Floyd Loop, M.D., and Chairman of The Cleveland Clinic Foundation's Department of Biomedical Engineering, J. Fredrick Cornhill, D. Phil., participated in the signing ceremony. A number of local, state and federal government officials were also in attendance.

Since its inception in 1958, NASA has been a prime source of much of the Nation's new technology. NASA Lewis Research Center is committed to expanding its technology transfer and commercialization efforts for the benefit of the American people and for the Nation's economy. NASA Lewis Research

Center currently is engaged in over 500 cooperative efforts with industry, universities and other agencies.

Celebrating 75 years of world-class care, the Cleveland Clinic Foundation continues to advance the frontiers of medicine by providing state-of-the-art care in a multispecialty academic medical center model. Since the Cleveland Clinic's founding in 1921, clinical and hospital care have been integrated with research and education in a private, non-profit group practice, which has distinguished the Cleveland Clinic in American medicine.

NASA SCIENTISTS GAIN INSIGHT INTO DEADLY DISEASE
NASA press release

Scientists at NASA's Marshall Space Flight Center in Huntsville, AL, have taken an important step in understanding the molecular structure of a disease that afflicts 200 to 300 million people and is second only to malaria in cause of death worldwide. The disease, known as Schistosomiasis, is caused by parasites found in contaminated water.

"We were able to determine a three-dimensional atomic structure of an important enzyme from one of four species of parasites known to cause schistosomiasis," explained Dr. Daniel Carter, research director and chief of Marshall's Biophysics and Advanced Materials Branch of the Space Sciences Laboratory. "That allowed us to identify critical parts of the enzyme's surface structure which elicit the immune responses to the disease. This important step seems to offer the most potential for developing vaccines that protect people against the entire species of schistosomiasis parasites, not just one species," said Carter.

Using highly specialized X-ray equipment and protein crystallization techniques developed for space-based microgravity research, biophysics researchers were able to locate key positions of individual atoms in the enzyme, also a major target for drugs used in the treatment of schistosomiasis, and build a computer picture or blueprint of the schistosoma enzyme structure.

The determination of the enzyme structure offers the possibility of combining such techniques as the use of disease fighting drugs with the development of preventative vaccines to form an effective barrier against the transmission of schistosomiasis.

"Building a person's immunity is one way to fight schistosomiasis," explained Carter. "Many people are repeatedly infected with the disease. If we can break the life cycle of the parasite by vaccinating people against transmission of the disease, we can make a major step toward eliminating the threat of schistosomiasis in those parts of the world where it poses a major health hazard."

The research has paid dividends in other areas as well, said Carter. "Information gained in the search for a particular atomic structure often helps us learn more quickly about other research targets," he said. "For instance, a three-dimensional crystal structure of a schistosomiasis enzyme joined with atomic structural components of Human Immunodeficiency Virus type 1 (HIV-1) has also been resolved. This structural, building-block approach to HIV research has helped us learn more about the structure of HIV proteins, which have proven very difficult to crystallize and thus study more thoroughly," said Carter

Schistosomiasis research at Marshall was performed in collaboration with the Institute of Applied Microbiology in Vienna, Austria, and the Center For Advanced Research in Biotechnology of the National Institute of Standards in Washington, DC.

Also known as bilharzia, schistosomiasis is a disease caused by any of four parasitic flatworms or flukes. Persons can become infected with schistosomiasis when they wade or swim in contaminated fresh water by exposure to skin-penetrating, free- swimming larvae. Schistosomiasis is known to occur in parts of Brazil, Egypt, sub-Saharan Africa, southern China, the Philippines and Southeast Asia. There is no vaccine against the disease.

NASA AWARDS LIFE AND BIOMEDICAL SCIENCES RESEARCH GRANTS
NASA press release

NASA has selected 46 proposals to receive two and three-year grants for conducting ground-based or space-borne life sciences research, totaling approximately $15 million. The purpose of these grants is to encourage science and technology research in the space life sciences. The grants funded through this annual NASA research announcement support a program of research that conducts experiments on Earth and in space to provide the basic understanding of the role of gravity in biological processes.

Sponsored by NASA's Office of Life and Microgravity Sciences and Applications, Washington, DC, this research offers investigators the opportunity to take advantage of NASA's life and biomedical sciences research facilities to improve the understanding of fundamental biological processes.

NASA received 380 proposals in response to this research announcement. The proposals were subjected to a fully external peer-review through assembled panels made up of scientific and technical experts. The selected proposals represent the following areas: space biology (16); space physiology and countermeasures (11); environmental health (2); space radiation health (3); space human factors (3); advanced life support (5); advanced extravehicular activity systems (1); advanced technology development (2); data analysis (2) and interdisciplinary proposals (1).

NASA's life and biomedical sciences grants provide investigators with the opportunity to study and characterize basic biological mechanisms in ways not possible on Earth. By using access to space as a research tool, NASA-sponsored research will advance fundamental knowledge of the way in which weightlessness, radiation, and other aspects of the spaceflight environment interact with biological processes. These grants also seek to enhance the application of this knowledge to procedures and technologies that enable humans to live, work and explore in space and to benefit the health and well-being of people on Earth.

FAIRLY RECENT PUBLICATIONS IN EXOBIOLOGY AND RELATED FIELDS
By Julian Hiscox

Allen, 1995. An interplanetary transportation system for delivering large groups of people to mars.
JBIS 48, 373-386.

Bruckner et al. 1995. Mars in situ propellent technology demonstrater mission.
JBIS v48, 337-346.

Chappell. 1995. Mars subsurface radar mapper. JBIS 48, 395-404.

Cockell, 1995. The polar exploration of Mars. JBIS 48, 355-364.

Daly and Minton, 1995. Resistance to radiation. Science 270, 1318. (About Deinococcus radiodurans).

Fogg, 1995. Terraforming Mars: Conceptual solutions to the problem of plant growth in low concentrations of oxygen.
JBIS 48, 427-434.

Hansson, 1995. Exobiology, SETI, von Newman and geometric phase control. JBIS 48, 479-483.Heidmann, 1995. SETI programmes from all over the world (and further out).
JBIS 48, 447-452.

Hiscox and Thomas, 1995. Genetic modification and selection of micro- organisms for growth on Mars.
JBIS 48, 419-426.

Horgan, 1995. The world according to RNA. Experiments lend support to the leading theory pf life's origin.
Scientific American 274, 27-30.

Horneck, G. 1995. Exobiology, the study of the origin, evolution and distribution of life within the context of cosmic evolution: a review. Planetary Space Science. 43, n1/2, 189-217.

Keefe et al. 1995. Investigation of the prebiotic synthesis of amino acids and RNA bases from CO2 using FeS/H2S as a reducing agent. PNAS 92, 11904-11906.

Landis, 1995. Footsteps to Mars: An incremental approach to Mars exploration.
JBIS 48, 367-372.

Maccone, 1995. Interstellar travel through magnetic wormholes. JBIS 48, 453-458.

MacNiven, 1995. Environmental ethics and planetary engineering. JBIS 48, 441-444.

Mautner, 1995. Directed panspermia. 2. Technological advances toward seeding other solar systems and the foundation of panbiotic ethics. JBIS 48, 435-440.

Mautner et al. 1995. Meteorite organics in planetary environments: hydrothermal release, surface activity, and microbial utilization. Planetary Space Science 43, 139-147.

Mellon, 1995. Living on Martian ice.
Ad Astra 7, 30-34.

Mitchell and Stauffer, 1995. A multi-attribute utility analysis on the location of an Earth-based analog for habitation on planetary bodies. JBIS 48, 459-464.

Nussinov and Santoli, 1995. Epistemology of a paradox-Discussing ETI through the evolutionary impulse paradigm: We are not alone but few and far between.
JBIS 48, 475-477.

Owen, 1995. How the Earth got its atmosphere. Ad Astra 7, 26-29.

Parisi, 1995. Controlling laser chaos.
JBIS 48, 465-466.
(About fast communication between spaceships)

Powell, 1995. Strange places: An astronomical breakthrough reveals an odd new world.
Scientific American 274, 22-23.
(About 51 Pegasi).

Sims and Mills. 1995. Measurement of the pH of the Martian surface. JBIS 48, 391-394.

Thomas, 1995. Biological aspects of the ecopoeisis and terraformation of Mars: Current perspectives and research:
JBIS 48, 415-418.

Williams et al. 1995. Design of vapor adsorption reactor for Martian in situ resource utilization.
JBIS 48, 347-354.

Winters, 1995. The planet at 51 Peg.
Discovery 17, 86-87.

Zubrin et al. 1995. Report on the construction and operation of a Mars in situ propellent production plant.
JBIS 48, 327-336.

Zubrin, 1995. Diborane/CO2 rockets for use in Mars ascent vehicles. JBIS 48, 387-390.

Zubrin, 1995. The economic viability of Mars colonization.
JBIS 48, 407-414.

Zubrin, 1995. The use of currently unknown near-solar objects in facilitating interstellar missions.
JBIS 48, 467-474.

CORRECTION
From Larry Klaes, editor of *SETIQuest*
(About Volume 2, number 14).

"Thank you for including the info I sent on the planet orbiting 51 Pegasi. I would appreciate it, though, if you also gave credit to Dan Werthimer of the SERENDIP SETI Project at UC Berkeley. Dan is the one who originally sent me the info. Also, I'm afraid you forgot the "I" in *SETIQuest* twice."

MARSBUGS BACK ISSUES ON THE WEB
By Dr. Mark Pallen

"Just a brief note to let you know that I have put up links to all the back issues of *Marsbugs* on my WWW hotlist page:

http://www.qmw.ac.uk/~rhbm001/hotlist.html

using Dejanews to call up WWW-like versions of the articles, complete with clickable URLs."

[Thanks to Mark. Eds.]

End *Marsbugs* Vol. 2, No. 16