

# MARSBUGS:

The Electronic Exobiology Newsletter

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The purpose of this newsletter is to provide a channel of information for scientists, educators and other persons interested in exobiology and related fields. This newsletter is not intended to replace peer-reviewed journals, but to supplement them. We, the editors, envision MARSBUGS as a medium in which people can informally present ideas for investigation, questions about exobiology, and announcements of upcoming events. Exobiology is still a relatively young field, and new ideas may come out of the most unexpected places. Subjects may include, but are not limited to: exobiology proper (life on other planets), the search for extraterrestrial intelligence (SETI), ecopoiesis/ terraformation, Earth from space, planetary biology, primordial evolution, space physiology, biological life support systems, and human habitation of space and other planets.

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SPACE STATION NODE 1 AND LABORATORY MODULES SUCCESSFULLY COMPLETE PROOF PRESSURE TESTS  
NASA release 96-027

The first U.S. component of the International Space Station, Node 1, and the U.S. laboratory module have successfully completed proof pressure tests. Today, Boeing engineers conducted a proof pressure test on Node 1 at NASA's Marshall Space Flight Center (MSFC) in Huntsville, Alabama. During the four-hour test, the node was successfully pressurized to 22.8 pounds per square inch gauge (PSIG), or 1.5 times the normal maximum operating pressure of the International Space Station pressurized elements. A structural design modification that

has been incorporated into the node substantially reduced the stress levels previously encountered in the radial port low wall gussets.

Node 1, the first U.S. space station component is scheduled to be launched in December 1997. The nodes serve as connecting passageways to other modules on the International Space Station. With the proof pressure test now completed on Node 1, it will be moved out of the test facility and returned to the Space Station manufacturing building at MSFC where it will be prepared for assembly and check-out activities that begin in mid-October.

This past Sunday, Aug. 25, the U.S. laboratory module also successfully completed its proof pressure test. Like the Node 1, the lab module also was pressurized to 22.8 PSIG, or one and a half times its normal maximum operating pressure requirement on-orbit. Data analysis indicated the module had excellent performance during the pressure test.

Having completed its proof pressure test, the lab welds now are being inspected. The lab will undergo leak tests in mid-September. It will then be moved back to the Space Station manufacturing building in late September.

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**INVADING MARS: THE MARS EXPLORATION PROGRAM**  
Lecture announcement

Organization for the Advancement of Space Industrialization and Settlement and the Orange County Space Society (OASIS/OCSS) invite you to:

Invading Mars: The Mars Exploration Program with Donna Shirley, Deputy Manager--Mars Exploration Program Office

Saturday, October 5, 1996 at 7:00 PM  
McDonnell-Douglas Aerospace Corporation  
Building 28 Conference Center  
5301 Bolsa Avenue  
Huntington Beach, CA  
(Take turnoff at first light east of the intersection of Bolsa and Bolsa Chica. Conference Center is on north side of the street.)

**FREE ADMISSION**

The planet Mars, a favored subject of science and science fiction, remains mysterious. Was it always cold and barren or did it once nurture life? To know, we must explore there.

This year, NASA launches the first two spacecraft of a decade-long expedition to Mars. While Mars Patherfinder dispatches small rover to probe its landing site, Mars Global Surveyor will orbit above to chart the planet's geological history. Along with the Russian Mars'96 mission, an international robotic fleet will follow, culminating in the return of Martian rocks and soil to Earth.

Donna Shirley manages the Mars Exploration Program at NASA's Jet Propulsion Laboratory. Previously she led the Mars Pathfinder project and was Project Engineer for the Cassini mission to Saturn.

Doors open at 6:00 PM

For more information, contact the oasis hotline at (310) 364-2290.

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**INDEPENDENCE DAY 1997: ALIENS FROM EARTH ARE INVADING MARS**  
Lecture announcement

Ms. Donna Shirley  
Manager, Mars Exploration Program Office  
NASA Jet Propulsion Laboratory

Wednesday, September 25  
TRW Forum (Building S)  
TRW Space and Electronics Group  
One Space Park  
Redondo Beach, Calif.

Mixer (Pizza and Soft Drinks): 6 p.m.  
Program: 6:30 p.m.  
R.S.V.P.: Noel, (310) 643-7510; email: noels@aiaa.org

Cost -- \$4.00 AIAA members; \$5.00 others

**Background**

With the recent discovery of possible fossil evidence of life on Mars in a meteorite found in Antarctica, there is heightened interest in the National Aeronautics and Space Administration's plans for exploration of the Red Planet.

After the mysterious disappearance of the Mars Observer spacecraft in August 1993, NASA's Jet Propulsion Laboratory developed a plan for Martian exploration based around a series of smaller, less costly probes. The first of these spacecraft, Mars Global Surveyor, is scheduled for launch in November. Imagery from this orbiter will help scientists determine promising locations for future Mars landings.

In December, JPL plans to launch its Mars Pathfinder lander. This spacecraft is scheduled to make a parachute landing on the Martian surface on July 4, 1997. In addition to taking pictures of the Martian surface, Pathfinder will release Sojourner, a 10-kilogram robot, to conduct the first roving geological exploration of the Martian surface.

This talk will discuss the status of these two missions, as well as JPL's plans for follow-on Mars Surveyor orbiters and landers. The talk will conclude with an overview of the technical and programmatic issues associated with a future search for in situ evidence of Martian life.

Directions to TRW from I-405 (San Diego Freeway): Take Rosecrans Avenue West (Manhattan Beach) exit. Drive west on Rosecrans to Aviation Blvd.. Turn left (south) on Aviation to Marine Blvd. Turn left (east) head on Marine to the entrance for Building S parking. The TRW Forum is on the lower level of Building S.

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**THE ROAD TO UBAR**  
Lecture (film) announcement

Jet Propulsion Laboratory's Public Information Office von Karman Lecture Series

Introduced by Dr. Ron Blom & Nicholas Clapp

Thursday, September 19, 7pm  
JPL's von Karman Auditorium  
4800 Oak Grove Blvd.  
Pasadena, California  
Free admission  
(818) 354-5011 for information

Emmy-award winning director Nick Clapp presents an exciting film describing the discovery of the lost city of Ubar in ancient Arabia. Ubar, a major center in Arabia for the frankincense trade thousands of years ago, existed only in myth until its discovery in the early 1990's, when its location was revealed by various remote sensing technologies, historical research, and traditional archaeology. Dr. Ron Blom is a remote sensing specialist and a geologist at JPL, whose participation in expeditions to Ubar in 1991-92 helped to locate, excavate and further understand the lost city.

**MARS SPACECRAFT STATUS REPORTS**

The following status reports are from the Mars Pathfinder  
Home Page: <http://mpfwww.jpl.nasa.gov/>

*Mars Pathfinder Status*

Week of September 2, 1996

EDL testing done, the lander was disassembled so that the interior electronics could be accessed. We had two fuses, some relays, and a waveguide transfer switch that needed to be replaced. Also we installed a fresh, fully charged, flight battery. This battery is the best one that we have used to date and will now have to survive to do its job over the next year. Once the electronics were updated, we performed a full functional test to confirm that the fixes worked and that we didn't disturb anything in the process.

*Mars Pathfinder Status*

Week of September 9, 1996

Early this week, for the final time, we reinstalled the ISA (Integrated Structure Assembly) - that's the white thermal and structural box that surrounds the lander electronics and has the red "JPL" letters on it. We then calibrated the stop positions on the HGA (High Gain Antenna) - that's the lollipop-shaped articulated antenna that sits next to the camera on the ISA. We used special theodolites (similar to those used by construction surveyors) to verify that the HGA mechanically points in the direction we want it to point with respect to the lander's base petal. We then reinstalled and checked out the pyro switching electronics and installed the lander thermal batteries. We use "thermal" batteries to provide power (current) to ignite explosive initiators in the EDL pyrotechnic devices (things like the parachute mortar, separation nuts, cable cutters and rocket ignitors). The batteries are called "thermal" because they get their electrical energy from self-generated chemical heat. Similar to the pyrotechnic initiators to which they provide, these batteries themselves need to be "lit" seconds before they are used on the spacecraft during EDL. Once "lit", these batteries will operate for only a few minutes - plenty of time to do their jobs.

Once the ISA was installed, we performed some radio communication tests between the rover and the lander. We had been uncertain whether or not we needed to launch with an RF (radio frequency) attenuator in series between the lander's rover antenna and the lander's RFD modem used to talk with the rover. This attenuator was thought some time ago to be needed to allow communication with the lander at close distances. These tests and some others coming up have nearly convinced us that we can live without it. We think that it would be good if we did not use it because the attenuator might reduce the communication range if we ever decided to drive the rover a long way away from the lander in its "extended" mission. Either way, the primary mission is unaffected.

We successfully performed other radio tests as well. Until this week, we had not yet tried to uplink the large software patch files using the real X-band radio and a ground station. The patch files are used in the unlikely event we have to reload large portions of the flight software into the EEPROM memory during the mission. Using the MIL-71 ground station at the Kennedy Space Center, we found that the process works fine.

We also took a few last verification images from each eye of the IMP camera on the lander. This is the last time the IMP

camera will be taking interesting pictures until we land on Mars.

There has also been much work on the cruise stage. The HRS (Heat Rejection System) freon pumps have been installed and checked out. The HRS is the system used to flow freon inside the lander and around the perimeter of the cruise stage to keep the lander electronics cool. We need to keep the battery, the digital electronics, the rover, and the big X-band radio transmitter we call the SSPA (Solid State Power Amplifier) cool during the especially warm early part of the "cruise" phase of the mission as we leave Earth. We had to replace the pumps that had been installed during this summer's thermal tests because we think that it may have been damaged during one of our electrical tests. Because it is so hard to take apart, we can't tell for sure that it is broken. So just in case it was, we decided to replace it with the flight spare unit.

Later this week we will reattach the petals (the Sojourner Rover is already mounted on its "Y" petal). Next week we begin the long process of installing the flight airbag as well as the many pyrotechnic devices on the lander.

*Sojourner Rover Status*

Week of September 9, 1996

The "Sojourner" rover successfully completed its first series of tests after arrival at the Cape. These tests consisted of extensive health checks (i.e., all actuators and sensors tested), a functional test with the rover's science instrument (the APXS - alpha, proton, and x-ray spectrometer) and a communication test with an initial configuration of the Mars Pathfinder lander. Once these tests were completed, the rover was stowed on the lander's rover petal along with the exit ramps. All components were tied down in preparation for petal attachment to the lander and petal closing later this month. Additional communication checks are planned with the lander prior to petal closing as the lander completes its reassembly.

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LIVE FROM MARS--A PASSPORT TO KNOWLEDGE PROJECT

UPDATE # 2 - September 12, 1996

PART 1: Weekly WebChat  
PART 2: Teacher's Guide status  
PART 3: Preview of the collaborative activity  
PART 4: Discussion group for teacher  
PART 5: Spacecraft updates

*Weekly webchats*

A new opportunity is now available to connect live with other teachers and the LFM development team. Every Thursday, we will meet virtually online to discuss issues and learn from one another. Hopefully your questions about the LFM project will get answered. I know the LFM team will come with our listening-ears on, ready to adapt the project to meet real teacher requirements.

We will hold the discussion on the Web using a technology called WebChat. To use it, you only need a Web browser like Netscape or Microsoft's Internet Explorer. These teacher chats will be similar to the student/NASA-expert forums that will be held beginning in October. So these chats will allow you to get comfortable with the technology ahead of time.

On Thursdays, we will alternate the starting time of the one hour discussion. We hope this will allow for participation from teachers on the east coast, west coast, and everywhere in between and beyond. The schedule for the next few weeks is:

	Pacific	Eastern
September 12	3:00pm	6:00pm
September 19	noon	3:00pm
September 26	3:00pm	6:00pm
October 3	noon	3:00pm

To join the fun, point your web browser to <http://quest.arc.nasa.gov/webchat/mars2.html>

*Teacher's guide status*

We know that everybody is quite anxious for the Teacher's Guide. The entire Passport To Knowledge team is hard at work, madly jamming to finish the document. We expect that we'll be done in about two weeks, and expect to start shipping hardcopy versions by the end of September. The free, online version should be available shortly thereafter, around October 10.

Within a week, the table of contents should be finalized and we'll distribute that online (via this list and the Web) so you can learn what lessons will be included.

If you plan to order the hardcopy, please consider sending in your order as soon as possible. There are TWO ordering options for the Live From Mars teacher materials. Please

read over the options carefully and fill out the form below. Be sure your check, money order, or purchase order is made out to Passport to Knowledge and sent to:

Passport to Knowledge  
P.O. Box 1502  
Summit, NJ 07902-1502

OPTION ONE: Live From Mars Teacher's Guide with suggested hands-on activities and lessons, opening and closing activities. and orientation and background information including how to use online resources. \$10.00 (US) \$15.00 (Canada)

OPTION TWO: Live From Mars Multi-media KIT: Includes Teacher's Guide (described above), Teacher Orientation Videotape, original color poster, slide set, sample online materials, and Mars CD-ROM (IBM/Mac) and other instructional materials fully-underwritten by NASA's Mars Exploration Directorate--and more! \$99.00 (US) \$112.00 (Canada)

Price includes shipping and handling. Canadian orders--please make your payment payable in US DOLLARS!

Pricing for locales other than US and Canada, please contact Jan Wee <jwee@mail.arc.nasa.gov> or call 608-786-2767 (8am-4pm Central time). Volume pricing information also available.

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**Live From Mars Teacher Materials Order Form**

Name:  
Position/Title:  
Grade Level:  
Number of students materials will impact:  
School/Museum/Science Center, etc:  
Mailing Address (Street, City, State, Zip, Country):

\_\_\_\_\_ Number of Teacher Guides only (option One) at \$10.00 each (US), \$15.00 (Canada)

\_\_\_\_\_ Number of Multi-media Kits (option Two) at \$99.00 each (US), \$112.00 (Canada)

\$\_\_\_\_\_ Total of check or money order enclosed

Make out check, money order, or purchase order to: Passport to Knowledge

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*Preview of the collaborative activity*

Here is a preview of upcoming Live From Mars activities involving students collaborating with one another. The full details will be available within the next few weeks.

The activity involves having students simulate the activities of the Pathfinder team. Roughly sketched out:

- in October, students brainstorm in their classrooms what common/inexpensive tools they would place in a shoebox to measure their local environment
- Nov 1 - Nov 15 they share their ideas online

- Nov 15 until Christmas break, the students will debate online the relative merits of various tools to include. At the conclusion, we reach consensus on a uniform instrument package.
- During the break, Santa Claus (or Hanukah Harry, etc) delivers the goods to classrooms; resourceful teachers may have to step in also.
- January is spent measuring local environments with the agreed upon tools
- February we share the collective data online; a few select locations are designated Mystery Spots. A

contest is held to determine the location of these Mystery Spots.

So that is the basic plan. More details will be forthcoming shortly.

#### *Discussion group for teachers*

A new mail list called discuss-lfm is now available. The list will provide a forum for teachers to discuss a wide variety of issues, concerns, teaching strategies, useful resources, project collaboration opportunities, and suggestions for the LFM project.

The goals are similar to the weekly WebChats (described above), but the Email format will allow for more thoughtful discussion. Whereas WebChat demands an immediate response limited to a few sentences, discuss-lfm is not so constrained.

The messages from discuss-lfm can be sent directly to your mail box. This is the most common way to participate in the discussion. For this option, every time a colleague shares a message, you'll receive it in your mailbox. To join the list this way, send an email message to: [listmanager@quest.arc.nasa.gov](mailto:listmanager@quest.arc.nasa.gov)  
In the message body, write only these words:  
subscribe discuss-lfm

For those feeling like they already receive too much email, a digest of the discuss-lfm list is available. For this option, all the messages from a day are compiled into one bigger message which is forwarded to your email account. In this way, you'll receive all of the information, but the traffic will come only once per day. To join the list this way, send an email message to: [listmanager@quest.arc.nasa.gov](mailto:listmanager@quest.arc.nasa.gov)  
In the message body, write only these words:  
subscribe discuss-digest-lfm

And for those that really don't want any more email, you may keep up with this list via the Web. Look under the Teacher's Lounge at: <http://quest.arc.nasa.gov/mars/discuss-lfm-lwgate.html>

#### *Spacecraft updates*

Mars Pathfinder arrived safely at the Spacecraft Assembly and Encapsulation Facility (SAEF-2) at 3 p.m. August 13, having traveled across the United States in a special van. Three of the four separate components have arrived at the Kennedy Space Center (KSC): the cruise stage, the aeroshell and the lander. The fourth element, the Rover Sojourner, was air shipped from Los Angeles to Orlando on Friday, August, 23. It arrived at the Cape later that day and was safely placed in the airlock at SAEF-2.

The "Sojourner" rover successfully completed its first series of tests after arrival at the Cape. These tests consisted of extensive health checks (i.e., all actuators and sensors tested), a functional test with the rover's science instrument (the APXS - alpha, proton, and x-ray spectrometer) and a communication test with an initial configuration of the Mars Pathfinder lander. Once these tests were completed, the rover was stowed on the lander's rover petal along with the exit ramps. All components were tied down in preparation for petal attachment to the lander and petal closing later in August. Additional communication checks are planned with the lander prior to petal closing as the lander completes its reassembly.

The integration of the four Mars Pathfinder elements began with the installation of the rover on one of the four petals of the lander. After the petals are closed, the aeroshell which surrounds and protects the lander will be installed and the parachutes will be attached.

The assembled entry vehicle will then be mated to the cruise stage that will carry the spacecraft on its interplanetary voyage. Finally, before going to Launch Pad 17b, the completed Mars Pathfinder will be mated to the upper stage booster. McDonnell Douglas Delta II. This entire process will go quickly in preparation for the early December launch, scheduled for a mere 81 days from today!

#### *Mars Global Surveyor Status: MGS Arrives at the Cape!*

On August 13th, the spacecraft arrived at the Cape in the C-17. The spacecraft manager George Pace reported:

"The C-17 landed at the skid strip at 3:25 AM EDT. The trucks were loaded and the convoy was underway by 5:45 AM to beat the morning travel curfew of 6:00 AM. The convoy arrived at PHSF (Payload Hazardous Servicing Facility) at 6:15 AM. The spacecraft shipping container and MGSE were moved into the airlock. After stabilization and cleaning the container was rolled into the high bay where the spacecraft was removed and mounted on the test dolly.

To subscribe to the updates-lfm mailing list (where this message came from), send a message to: [listmanager@quest.arc.nasa.gov](mailto:listmanager@quest.arc.nasa.gov)  
In the message body, write these words:  
subscribe updates-lfm

Conversely...

To remove your name from the updates-lfm mailing list, send a message to: [listmanager@quest.arc.nasa.gov](mailto:listmanager@quest.arc.nasa.gov)  
In the message body, write these words:  
unsubscribe updates-lfm

If you have Web access, please visit our "continuous construction" site at <http://quest.arc.nasa.gov/mars> This site will remain fairly sparse until early September.

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NASA SCATTEROMETER POWERED ON TO BEGIN COLLECTING DATA  
JPL press release

Engineers at NASA's Jet Propulsion Laboratory are receiving the first calibration data from the NASA Scatterometer (NSCAT) after the instrument was successfully powered on Monday night.

NSCAT, an instrument that measures the speed and direction of winds over the oceans, was launched August 16 by Japan's National Space Development Agency (NASDA) onboard its Advanced Earth Observing Satellite (ADEOS). Information from NSCAT will help scientists predict climate changes and improve weather forecasts, and will also help them understand ocean circulation and the role of air-sea interactions in the global ecosystem.

"We'll spend the next few days assessing the instrument's health by cycling through several operational modes and checking out the engineering data," said Jim Graf, the NSCAT project manager at JPL. "The instrument will enter

into a science observation mode on Monday, September 16. The first wind image should be available sometime in early October."

NSCAT will provide an important new tool for weather forecasters to more accurately predict weather, particularly in coastal regions such as Southern California. "Winds over the oceans affect us in Los Angeles directly, because that's where most of our weather comes from," Graf said.

NSCAT has been developed under NASA's strategic enterprise called Mission to Planet Earth, a comprehensive research effort to study Earth's land, oceans, atmosphere, ice and life as an interrelated system. JPL developed, built and manages the NSCAT instrument for NASA. The start of operations initiates a long-term cooperative investigation of Earth by the United States and Japan.

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End *Marsbugs* Vol. 3, No. 11