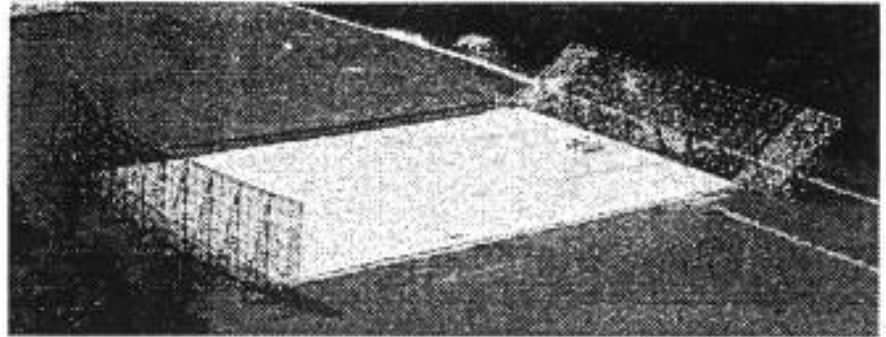




NAAPO (North American AstroPhysical Observatory)

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SIGNALS



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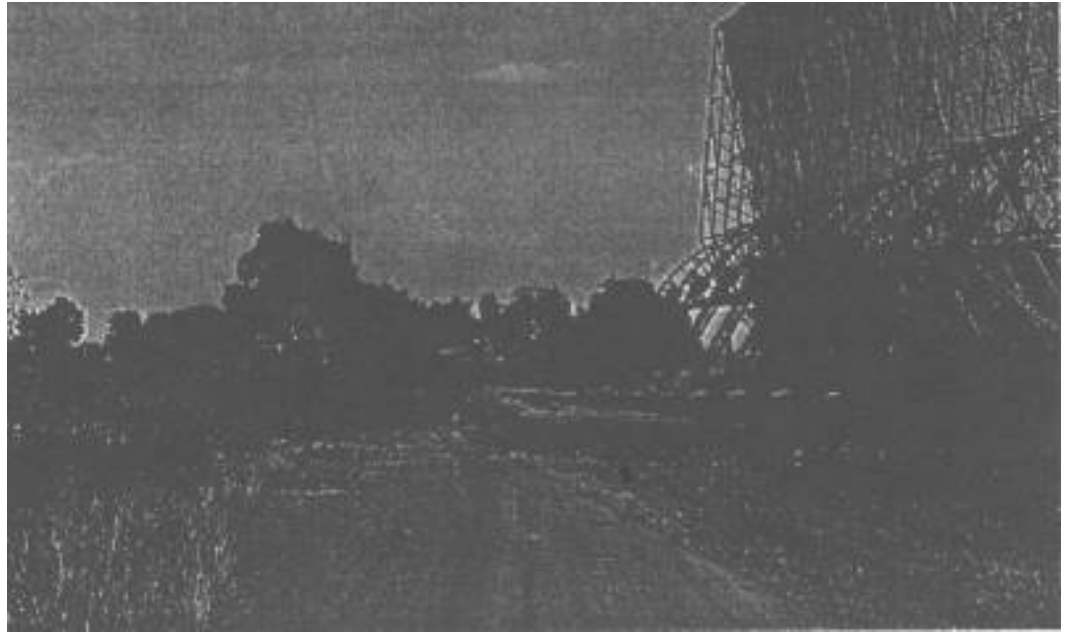
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GOLF COURSE BUILDERS IN VIOLATION OF LEASE AGREEMENT

The developers of the land upon which the Big Ear radio telescope sits are apparently in violation of the lease agreement with OSU.

They have started construction of fairways around the telescope but have failed to abide by the stipulation that they



are not to interfere with the continued operation of the telescope nor impede the user's normal activities.

Beginning just prior to the June 21 working session, their bulldozers piled felled trees on the entrance driveway barring access to the site. Dr. Dixon informed the supervisor that he was in violation of the lease agreement and asked that he immediately remove the trees blocking the roadway. It was then discovered that the WWV antenna was torn down and ground into the dirt piled in front of the focus room entrance.

The phone line to the observatory has been cut and downed power poles are left blocking the driveway to the garage. Covers are removed from the underground electrical service pits and the ground-plane vehicle access road has been eliminated. It is no longer possible to gain access to the ground plane with motor vehicles.

There has been little accomplished through the offices of the University Legal Department. Communication through them has been very slow and ineffective at best.

Two local newspapers on July 4th and 5th carry full page advertisements inviting interested people to visit the "new" golf course construction during four 'open house' events during the next two months. Volunteers are going to monitor the situation and be on hand at the times of all four open houses.

THIS WEEK ON GALILEO

June 30 - July 6, 1997

Playback begins immediately after the completion of the Callisto - Orbit 9 encounter period. With a 77 day duration, this cruise period is the longest of Galileo's orbital tour. The next encounter, Callisto-10, will not occur until mid-September. Unlike previous cruise periods, playback must share the stage with a series of fields and particles observations of Jupiter's magnetotail and quite a few Earth occultations.

The first magnetotail observation occurs this Friday. During the observation, playback is paused and fields and particles data is transmitted in its place at the highest available data rates. These data, taken periodically as the spacecraft gets deeper into the magnetotail, are expected to provide a record of how Jupiter's magnetotail evolves and interacts with Jupiter's middle and inner magnetosphere and the solar wind.

Playback during this first week contains a little bit of almost everything — with the notable exception of Callisto observations. Observations of Ganymede are returned from SSI (*Solid State Imaging camera*), NIMS (*Near Infrared Mapping Spectrometer*) and PPR (*Photopolarimeter Radiometer*). SSI returns an observation of an unnamed sulcus that bridges the gap between the regions of Perrine and Galileo Regio. The sulcus is roughly the scale of Uruk Sulcus and is expected to be just as geologically interesting and diverse. The image also serves as regional context for some Ganymede-1 observations. A second SSI observation is designed to look at a region of Ganymede that was not observed during previous missions and has not been observed to date by Galileo. The NIMS observation returned this week is a global map of Ganymede's surface and is expected to provide data on composition and mineralogy in a global context. PPR's observation was performed in polarimetry mode and is part of a mission long series of observations designed to construct a polarimetry map of Ganymede's surface.

Observations of features in Jupiter's atmosphere are also returned this week. Two of these are performed by NIMS and look at the Great Red Spot. They are two of fourteen total NIMS observations of the Great Red Spot. PPR also returns two observations of the Great Red Spot. These data will be compared with Great Red Spot data taken during the G1 encounter and will enable scientists to examine long-term variations in the Great Red Spot. PPR also returns two observations of regions known as plume heads. Recall that these features are believed to be formed by

relatively narrow columns of rising air that tend to flatten out when they can go no higher in Jupiter's atmosphere.

Completing the playback schedule for this week are observations of Europa performed by NIMS and SSI, observations of Io performed by NIMS and several observations of the minor satellites performed by SSI. Of the 20 minor satellite observations taken during the encounter period, 10 are returned this week (*Amalthea-2, Thebe-2, Metis-2,Adrastea-4*). This campaign of observations is designed to provide global views of the satellites and determine shape and composition.

COORDINATOR'S CORNER

By: Phil Barnhart

May 1997

The coordinator has returned from south of the equator! It is a thrill to see the southern Milky Way, even though it is the winter segment. I still look forward to seeing the galactic center high overhead with the southern cross and Magellanic clouds nearby. I have a picture of a crew member standing on his shadow. We were only two degrees from the equator at the time. Seeing Mars in the Zenith was also a new experience.

While not quite a shambles, the radio observatory activities have ground to a near halt. The search and survey continues, but other activity seems to be loose and inactive. We still need to press forward on the **Argus** antenna project. The card reconciliation project is back on track. Ron Leeseberg is going at it at the rate of about 20 boxes a month. We need more warm bodies to get boxes to him for disposal.

I would like to see everyone subscribed to the RADOBS Listserver check in. You don't have to say anything (*that would be nice too*) but just let us know you are still keeping up with what is going on there. Traffic has fallen off dramatically of late.

We also should get to work on testing the antenna patterns for the prototype helical cones. We should discuss this at the July 19 meeting.

Earl Phillips decided to get married. I say this is a pretty flimsy ploy to get out of parking cars at the open house! He and Amy spent the Open House week in Jamaica. Congratulations! [*Just remember, Amy, a husband is someone who will stick by you through all kinds of trouble you would never have had if you hadn't gotten*

married!!!]

First Day Of Summer 1997 Meeting Notes

Attending were Dixon, Phillips, Brooman, Ehman, the Barnharts, Campanella, Brown, and Hanson.

Upon arrival, we found the grounds heavily ripped up, and the entrance road, sidewalks, and east entrance to the telescope blocked by felled trees and mounds of dirt. Dr. Dixon immediately spoke to the foreman of the demolition crew and demanded that they open the entrance road, which they did. He then discovered that the wrecking crew had also torn down and ran over the WWV antenna, which will have to be replaced. He is considering billing the demolition crew for its replacement. Dr. Dixon had earlier been asked by the developers if they could do some preliminary work before the end of the year deadline. As Dr. Dixon wanted to be agreeable, he decided to allow some preliminary work, so long as it did not interfere with the operation of the telescope. Since they have blatantly disregarded this request, Dr. Dixon plans to rescind his permission for any preliminary work.

Dr. Dixon also reports that he received a letter from the Port Columbus Radar people, in response to a letter he sent them about a year ago, requesting information. They not only provided the info he requested, but also offered a tour of their facilities.

Ang Campanella reports that he is still processing punch cards, and is communicating with Ron Leeseberg regarding the project.

Cindy Brooman received a catalogue of nautical products, and noticed a waterproof, weatherproof notebook PC offered for sale. She wondered if it may have application for the **ARGUS** project, but Steve Brown thinks that may be overkill.

Jerry Ehman reports that he's seen ads for the movie "*Contact*", and wonders if we'll receive a free screening. The consensus was doubtful.

Tom Hanson has also corresponded with Ron Leeseberg on the card project, and Ron reports that he is ready to begin reconciling.

Steve Brown reports that he and Russ Childers detected, tracked down, and repaired a power supply that was introducing noise into the **LOBES** system.

The meeting was preceded by a *Signals* folding, stuffing, and labelling work party, and ended with Dr. Barnhart giving a "cook's tour" of the facility to a retired Otterbein secretary and her sister.

CORRECTIONS TO VOL. 13, #2 VOLUNTEER OF THE MONTH

ed. note: The last issue of "Signals "carried a story on our volunteer of the month, Jerry Ehman, that contained some errors. These corrections were submitted by Jerry. I apologize profusely, Jerry, and thanks for the corrections!

I noted with some embarrassment that, according to the article, I have "a Masters degree and a PhD in SAstronomy from Michigan State University". First of all, let's apply the notation [sic] to the word "SAstronomy" to account for the typo. Then let's note that my M.A. and Ph.D. degrees are in astronomy from the UNIVERSITY OF MICHIGAN!. I'm sorry for the flaming but there is a rivalry between Michigan State University (MSU) and the University of Michigan (UM) that won't die down in the foreseeable future. MSU is known as more of a party school and UM as a more serious school. The situation is somewhat analagous to the rivalry and differences between Ohio University and The Ohio State University here in our state.

Sorry but I just couldn't resist noting these MINOR errors!

COMMUNIQUE FROM CHRIS SLACK

From: slackcc@craft.camp.clarkson.edu (Chris Slack)

Mon, 23 Jun 1997

Greetings to all, it has been a while since I posted anything here, but I have been busy. I recently graduated from Clarkson with a degree in Computer Engineering, and started work 2 weeks ago for GE Medical Systems in Milwaukee, WI. Currently I am working in the CT (computed tomography) software engineering department, but as part of GE's TLP program will have the opportunity to work in 4 different sections of medical systems before choosing a permanent position. I would like to thank this group for helping to make my success possible, my internship 4 years ago gave me valuble experience, and helped to get me my first co-op job while in college, which led to a second, and allowed me to receive many offers for permenant hire. So my thanks in particular to Dr. Kraus for first exposing me (through Steve Willard originally) to the group, and bringing news of me to the group, to Drs. Barnhart and Dixon for offering me the internship, and to Steve Brown and Russ

Childers for helping me out during my first "real world" experience, and to everyone else who helped out. The observatory in its current configuration may be nearing an end, but its influence will affect my life some time to come, as I imagine it will affect others as well.

Thanks again, and I hope to be of help to the observatory in the future in what ever way I can from up here in Wisconsin.

ASTEROID MATHILDE REVEALS HER DARK PAST



More than 100 years after her discovery, asteroid 253 Mathilde has been sharing her secrets with scientists in the Science Data Center at the Johns Hopkins University Applied Physics Laboratory in Laurel, Md. A 25-minute flyby of the asteroid by the Near Earth Asteroid Rendezvous (*NEAR*) spacecraft on June 27 has resulted in spectacular images of a dark, crater-battered little world assumed to date from the beginning of the solar system.

The Mathilde flyby is the closest encounter with an asteroid to date and the first with a C-type asteroid. The asteroid's mean diameter was found to be 33 miles (52 *kilometers*), which is somewhat smaller than researchers originally estimated. A study of the asteroid's albedo (*brightness or reflective power*) shows that it reflects three percent of the sun's light, making it twice as dark as a chunk of charcoal. Such a dark surface is believed to consist of carbon-rich material that has not been altered by planet-building processes, which melt and mix up the solar system's original building block materials.

"The Mathilde encounter was one of the most successful flybys of all time," says Dr. Robert W. Farquhar, of the Applied Physics Laboratory, who serves as the NEAR Mission Director. "We got images that were far better than we thought possible, especially since the spacecraft was not designed for a fast flyby." Only the multispectral imager, one of six instruments on the spacecraft, was used during the flyby in order to conserve power provided by solar-powered panels. The spacecraft was 2.0 AU from the sun (*AU = the mean distance between the Earth and sun: 93 million miles, or 149 million kilometers*), too far to provide power for NEAR's other

instruments.

"Even though this was a very difficult undertaking," says Dr. Stamatios M. Krimigis, head of the APL Space Department that managed the program for NASA, "the NEAR Operations Team was so well prepared there was little doubt that it would succeed; not only that but this was the smallest operations team of any planetary encounter, proving that the Discovery Program paradigm of 'smaller, faster, cheaper' is alive and well."

Although Mathilde proved to be rounder than asteroids such as Gaspra and Ida, Dr. Joseph Veverka of Cornell University, Ithaca, N.Y., who leads the mission's imaging science team, says, "Mathilde turned out to be more irregularly shaped than most of us expected. The degree to which the asteroid has been battered by collisions is astounding. At first glance there are more huge craters than there is asteroid."

The imager found at least five craters larger than 12 miles (*20 kilometers*) in diameter just on the lighted side of the asteroid. Scientists wonder how the asteroid can remain intact after having been hit by this many projectiles, each probably a few kilometers wide.

The craters reveal evidence of the asteroid's makeup. "We knew that C-asteroids are black, but we did not expect their surfaces to be as uniformly black and colorless as Mathilde's surface turned out to be," Veverka says. "This global blandness is an important clue telling us that asteroids such as Mathilde are made of the same dark, black rock throughout because none of the craters, which are punched deep into the asteroid, show evidence of any other kind of rock." Such uniformity seems to confirm that C-type asteroids are in fact pristine samples of the primitive building blocks of the larger planets.

Dr. Donald K. Yeomans of the Jet Propulsion Laboratory, Pasadena, Calif., who heads up the radio science team formed to determine Mathilde's mass says, "Mathilde is an asteroid with a very tortured past." By determining the bulk density of the asteroid researchers will have a clue to how it was formed. A composite of objects would have a lower density than a solid chunk from a larger asteroid. Data analysis to determine density will not be complete until later this year, but Dr. Yeomans says, "Preliminary results suggest that Mathilde is much less dense than we had thought."

The Mathilde flyby met all its initial goals: getting a clear image of the sunlit side of

the asteroid, getting color images that will give clues to the types of rock that make up the asteroid, and getting images that will help researchers determine if Mathilde has any moons. In the next month scientists expect to complete initial analysis of their data and have improved measurements of Mathilde's volume, mass, and density.

One mystery that remains is Mathilde's extraordinarily slow (*17.4 days*) rotation rate. Its collision history could be a factor, but more research needs to be done to determine what role such collisions have played. The search for Mathilde moons continues; none has yet been discovered.

The next major event of the NEAR mission will occur on July 3, when the spacecraft's bi-propellant engine is fired to head NEAR back toward Earth. This deep-space maneuver will be the first time the engine has been fired and will keep both engineers and scientists in suspense for 11 minutes before they know if the maneuver was successful. An Earth gravity-assist maneuver on Jan. 23, 1998, will send the spacecraft toward its primary target, asteroid 433 Eros. NEAR will reach Eros nearly a year later and will remain locked in orbit around the asteroid until Feb. 6, 2000, when the mission ends.

Commenting on the success of the Mathilde flyby soon after the first images were received, Dr. Wesley T. Huntress Jr., NASA Associate Administrator, Office of Space Science, said, "It's today the Discovery Program really begins. NEAR was the first of our Discovery missions to be launched and it's the first to return scientific results." He said the APL-led team that managed the NEAR program proved the concept behind the Discovery Program: that exciting planetary missions can be done at low cost, in a short time.

The NEAR spacecraft was launched Feb. 17, 1996, from Cape Canaveral Air Station in Florida. NEAR Science Team Group Leaders are: Joseph Veverka, Cornell University; Jacob I. Trombka, NASA/Goddard Space Flight Center; Mario H. Acuna, NASA/GSFC; Maria T. Zuber, MIT and NASA/GSFC; and Donald K. Yeomans, NASA/Jet Propulsion Laboratory. Andrew Cheng, JHU/APL, is the Project Scientist. Mission operations have been the responsibility of the Johns Hopkins University Applied Physics Laboratory.

For more information contact Helen Worth, JHU/APL Office of Public Affairs. Phone: (301) 953-5113; e-mail: Helen.Worth@jhuapl.edu; or fax: (301) 953-6123 or Donald Savage, NASA Headquarters Office of Space Science. Phone (202) 358-

1547; e-mail: dsavage@hq.nasa.gov; or fax: (202) 358-3093. Mathilde flyby updates can be obtained on the Mathilde homepage at: <http://sd-www.jhuapl.edu/NEAR/Mathilde>. Photographs of the first Mathilde images, the NEAR spacecraft, and the NEAR launch are available upon request.

7/5/97 MEETING NOTES

By: Earl Phillips

Attending were: Barnhart, Phillips, Brooman, Ehman, Campanella, Brown, Hanson, and Leesberg.

Upon arrival, it was obvious that the developers ignored Dr. Dixon's request to cease their activity, since the grounds are even more ripped up than before. It is now impossible to get to the ground plane, garage, and focus room. The telephone service has also been cut, and there is evidence that at least one of the electrical junctions has been tampered with.

Barnhart suggested that we contact a reporter and ask them to write a piece on the flagrant disregard the developers have for the agreement they signed with OSU. He reports that he will be on a camping vacation from roughly mid-July to mid-September. He has received a monetary donation and request for the October open house date. Greg Charvat, a past intern, has informed him that he has received an offer from Western Kentucky University to work on a gamma ray project.

Ehman brings in a full page ad from the *Olentangy/Powell ThisWeek* newspaper placed by the developers, listing 4 possible open house dates they intend to hold on the property. Discussion of the fact that this is in direct violation of the agreement ensued, and a general plan to be on site during their planned open houses was agreed upon. It is intended that we will inform them that they are not allowed to trespass on leased property, and ask the sherrif to remove them if necessary. He has also recently performed two television interviews, one for channel 6 locally and one for CNN, on **SETI** and the **WOW!** signal.

Brooman brings in a copy of the same ad Jerry Ehman brought in, but this one from the *Delaware Gazette*. She also brings in the "hit" report for the Big Ear web site, citing 4680 "hits" for the month of June '97. She also has a printout of NASA's "Astronomy Picture Of The Day" for 6/26/97 that contains a link to the Cosmic Search section of the Big Ear web site.

Phillips announced that he will be performing another Perseid Meteor Watch this year, and need one more pair of observers.

Campanella continues to work on the card reconciliation project.

Leeseberg also continues to work on the card reconciliation project, bringing in 20 completed boxes and picking up 20 more. He also cites evidence that the Russian space station Mir may still be tumbling after the recent collision with one of its supply ships, despite reports to the contrary.

Hanson reports that he has set up a work station at home to do card reconciliation as well.

Brown reports that he has been in email contact with the OSU attorney. After being brought up to speed on the developer's activities and recent advertising, Steve has agreed to contact the attorney and ask him to inform the developers that they are violating their agreement, and to cease all illegal activity.

After the meeting, several volunteers gathered photographic evidence of the violations.

PATHFINDER LANDS, SENDS DATA TO EARTH

July 4, 1997

The Mars Pathfinder space probe has landed successfully on Martian soil and has transmitted its first batch of data to Earth, according to the Jet Propulsion Laboratory in Pasadena.



JPL scientists confirmed the landing based on a change in the radio signal strength received from Pathfinder's transmitter, then received the first data shortly after 5:00 p.m. EDT.

"We know that it hit the surface, that it all worked, that it is alive on the surface," Shirley said. "It all worked."

The U.S. probe is the first spacecraft launched from Earth to arrive on Mars in more

than 20 years. The landing, in a rough, rocky flood plain called Ares Vallis, was confirmed at 1:07 p.m. EDT. The news was greeted with loud cheering and hugging, with a few tears, among the scientists at JPL.

Unlike previous Mars probes, which established an orbit in the Martian atmosphere and slowly descended to the planet's surface, Pathfinder used a new technique where it literally bounced to a stop, buffeted by large air bags that inflated just before impact. If all goes as scheduled, here is what should unfold on Mars over the next few hours:

Between about 6:30 p.m. and 8 p.m. EDT (*2230 and 2400 GMT*), the camera and telecommunications antenna will be deployed and pointed toward Earth. The first detailed images will be received on Earth. NASA is scheduled to publicly release the first Mars images from Pathfinder at 9 p.m. EDT (*0100 GMT*). Just before midnight EDT (*0400 GMT*), Pathfinder's small, nimble rover, named Sojourner, will move out of the lander and on to the Martian surface to begin a month of exploration.

The primary focus of the Pathfinder mission is to gather data about what kinds of technology will be needed in designing future Mars probes, which scientists hope may lead to a manned mission by 2012.

Sojourner will also perform an analysis on the Martian surface to determine the chemical composition of its features. Other experiments will also explore the feasibility of using solar energy to turn Mars' atmosphere into rocket fuel, a process which may prove necessary if spacecraft are ever to fly from Mars back to Earth. Both the main landing craft and Sojourner also have cameras on board and will beam back detailed images of the planet's features.

The mission is designed to last a month before the solar-powered Pathfinder reaches the end of its life. But scientists hope that the landing craft and rover will outperform their scheduled life span.

Pathfinder is not designed to answer the provocative question of whether life once existed on Mars, because it will not be returning to Earth with soil or rock samples which would be needed for a definitive answer.

RUSSIAN SUPPLY SHIP COLLIDES WITH SPACE STATION MIR

June 25, 1997

A Russian supply ship crashed into the space station Mir Wednesday during a test, causing one module to lose pressure, NASA said. The three men on board, including a U.S. astronaut, were reported to be safe.

The crew watched as the Progress ship, filled with garbage, moved toward the Mir and collided into a module during a test of the automated docking system, said NASA spokesman Rob Navias.

A solar panel on the module was damaged, and pressure began to drop inside. "It's heading toward zero," Navias said this morning.

The crew hurriedly sealed off the module to prevent a further drop in pressure in the rest of the sprawling station.

SUPPLY SHIP BLASTS OFF TOWARD MIR

July 5, 1997

Russia's Progress M-35 cargo ship blasted off from Baikonur Space Complex in Kazakhstan Saturday, on its way to the it space station with supplies for a complex repair mission.

Ten minutes after its launch, Progress was in orbit, scheduled to dock with Mir on Monday. Mission Control director Vladimir Solovyov said the station was ready for the docking.

"The climatic conditions, the humidity conditions, the electricity, that's all up to norm," he said.

Solovyov said a solar panel on the cargo ship did not unfold properly, but that was not a concern.

Progress is loaded with over two tons of supplies, including a new, custom-made hatch that Mir's crew will install on the Spektr module, damaged June 25 when a cargo ship rammed the aging space station. The station has been running on reduced power since the accident.

The supply ship is also carrying half a ton of fuel, more food and water for the crew, and personal supplies, as well as more scientific equipment for a French astronaut scheduled to join Mir in August.

Progress is also carrying 154 pounds of gear and equipment for U.S. astronaut Michael Foale, because nearly all of his belongings are in the sealed-off module.

Repair work is not expected to begin until mid-July to allow the station's crew more time to practice.

Once repairs are under way, Russian commander Vasili Tsibliyev, wearing a space suit, will have to enter the depressurized Spektr module and re-connect several cables from the solar panels. The cables must be run back through the new hatch to the Mir's power system.

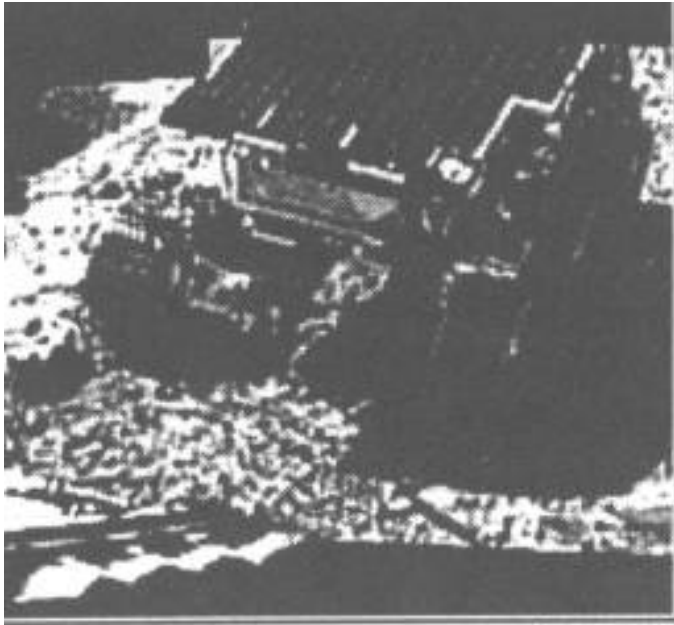
The process is complex, but Russian scientists say it can be done.

"It's not an easy task," said Vladimir Syromiatnikov, an Energia representative.

"Always there is some part of a danger in connection with every spacewalk. But (*the cosmonauts*) performed it many times."

Monday's docking is a similar procedure to the one that resulted in the June collision, but the two ships will dock automatically instead of manually this time. Scientists say they are keeping their fingers crossed that there is no repeat performance.

ROVER ROLLS OVER MARTIAN SURFACE



(NASA)

NASA's six-wheeled Martian rover rolled down a ramp Saturday night and into history, becoming humanity's first autonomous vehicle to travel on the surface of another planet.

Mission Control erupted into cheers and applause early Sunday morning when pictures from the Mars Pathfinder lander showed the microwave oven-sized Sojourner rover on the surface of the red planet.

"The images that you see today show a perfectly deployed rover that has driven down a perfectly deployed ramp, making its first track in the soil of this planet, opening a new era of exploration," said rover project manager Jacob Matijevic at a late night news conference.

The solar-powered rover took four minutes to roll down the ramp and onto the surface. The 22-pound vehicle spent about an hour on the surface before it was shut down for the Martian night, and will begin analyzing rocks and soil in an on-board laboratory after Earthrise on Sunday.

The successful roll-out topped a roller-coaster day of anxiety and excitement. After a wildly successful landing, mission engineers spent much of Saturday trying to solve a communications glitch between the rover and the lander that threatened Sojourner's Martian mission.

Mission managers still aren't certain what fixed the problem, which they believe was a software glitch. But when the crafts' systems were awakened Saturday night, communications between the two flowed smoothly, and the lander's ramps deployed to give Sojourner a path to the rocky surface.

"The spacecraft is fine. The lander is fine," mission manager Richard Cook said. "But we're a little perplexed as to what happened."

"It's just like having your screen lock up on you when you're using Microsoft Word or something," said rover operator Matt Wallace. "You've got to hit the reset button."

The computer on board the lander — renamed Saturday in memory of astronomer Carl Sagan — reset itself Friday night. Mission operators said the reset caused no problems, but they were looking for the cause of the hiccup.

NASA mission managers pieced together an eight-frame "video" of Sojourner rolling down the ramp and onto the planet, where it left clear tracks in the dusty red soil.

"We can report visually six wheels on soil," flight director Chris Salvo announced shortly after 2 a.m. EDT Sunday.

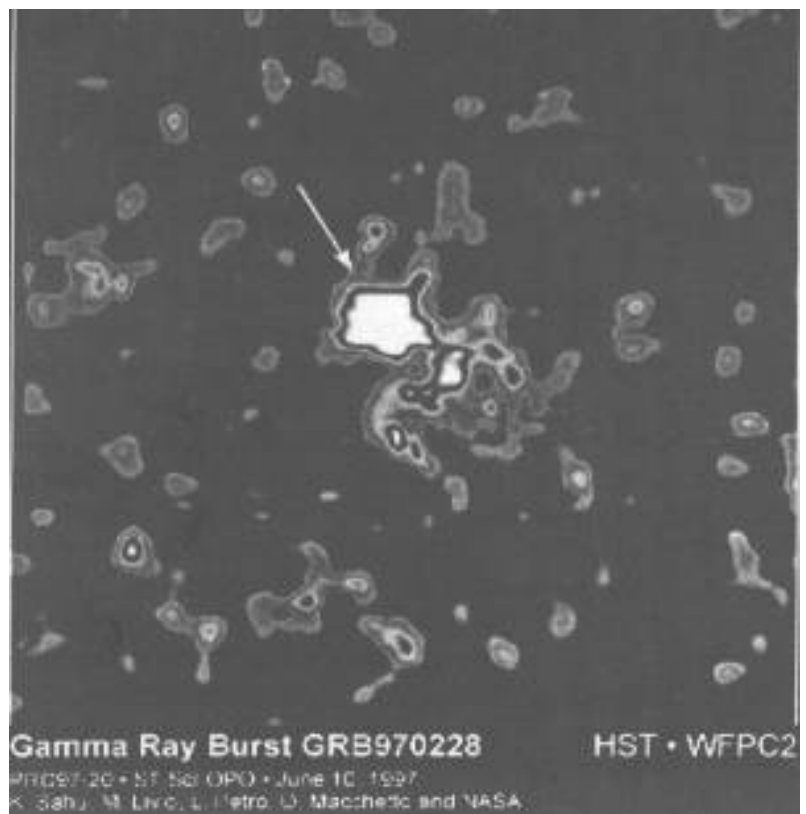
The little vehicle begins its mission in earnest Sunday, but the scientists back on Earth are already thrilled with what they've seen.

"We've already seen differences in colors and textures," said project scientist Matthew Golombek. "There looks like there's layering in some rocks." Golombek and his fellow scientists must now decide what to look at first, as Sojourner's Earth-side operators learn to drive it.

HUBBLE PINPOINTS OPTICAL COUNTERPART OF GAMMA RAY BURST IN A DISTANT GALAXY

This is a false-color Hubble Space Telescope image of the visible fireball which accompanied the gamma ray burst called GRB 970228. This is the first optical image ever taken which associates a gamma-ray burst source with a potential host galaxy. This observation provides strong supporting evidence that gamma-ray bursts are cosmological — they originate in distant galaxies across the universe. The burst was detected on February 28, 1997.

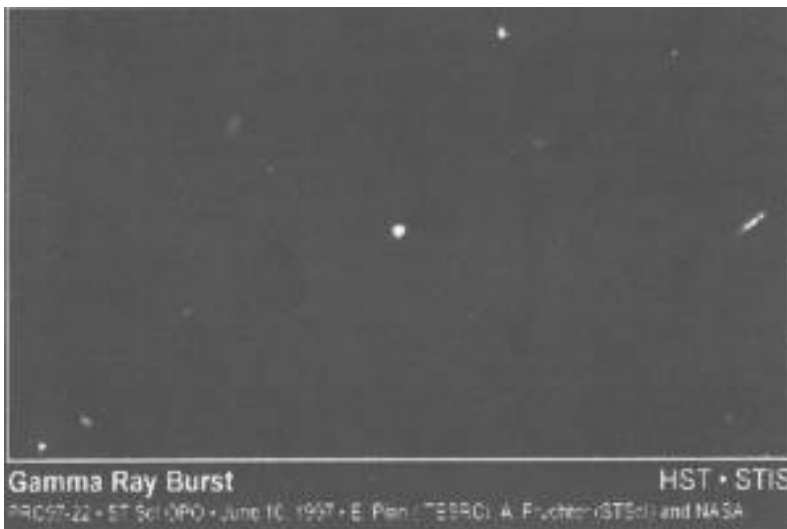
The Hubble picture is a combination of two images taken on March 26 and April 7, with the Wide Field Planetary Camera



2 (*in planetary camera mode*). The arrow points to the fireball, which is a white blob immediately to the upper left of image center. Immediately to the lower right of center is an extended object (*roughly resembling an "E"*) interpreted to be the host galaxy where the gamma-ray burst is embedded. A follow-up image taken on April 7 showed the fireball had faded, but not the extended source, supporting the interpretation it is a host galaxy at great distance. It maybe a significant finding that the fireball is offset from the center of the galaxy. This rules out a supermassive black hole that could be at the galaxy's core, as the source of the gamma-ray burst. A more likely explanation is that the burst came from the titanic collision of two neutron stars, or a neutron star with a stellar-mass black hole, in the disk of the galaxy.

Credit: K. Sahu, M. Livio, L. Petro, D. Macchetto, STScI and NASA.

MYSTERIOUS FIREBALL FROM A CATAclySMIC EXPLOSION



The visible fireball from a titanic explosion in deep space, called a gamma-ray burst, blazes in the center of this image, taken with the CCD camera (Charge Coupled Device) on the Space Telescope Imaging Spectrograph, a new instrument on Hubble Space Telescope.

The burst occurred on May 8, and Hubble observations to acquire the fading fireball were made on June 2. No accompanying object, such as a host galaxy, can be found near the burst. This result adds to the puzzlement over of the source of these enigmatic explosions, because a previous Hubble image of another gamma-ray burst counterpart identified a potential host galaxy. If a galaxy is present, and at the distance suggested by Keck spectroscopy, it is uch fainter than our Milky Way. A few faint galaxies are, however, seen several arcseconds from the source. If one of these is the host, then the gamma-ray burst is very far out in the galaxy's halo, well outside the galaxy's stellar disk.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (*AURA*), for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a

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Designed by Jerry Ehman

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