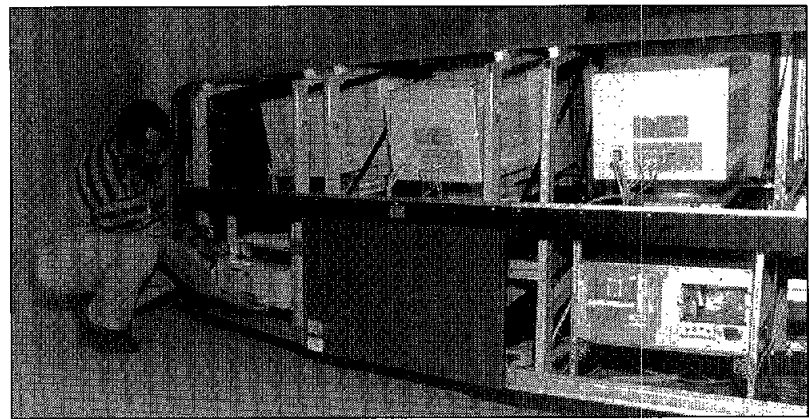


# Space News Roundup

Vol. 33

December 30, 1994

No. 48



**Above: Use of commercial hardware and workstation operating systems will offer unprecedented flexibility in flight control operations. The new system will allow the new MCC to control both space shuttle or space station missions with equal ease. Left: Independent work stations have replaced the circuit board-by-circuit board systems of the current Mission Control Center. The new MCC will control its first shuttle flight in the summer of 1995.**

## Old, new meet in Mission Control

By James Hartsfield

Mission Control, Houston, is moving—albeit only a few hundred yards—but the change will move the famous manned space flight control facility from the 1960s into the 21st century and beyond.

Mission simulations began Dec. 20 in the new version of Mission Control Center. The simulations usher in a drastic change in the tools and costs associated with manned space flight control. The new control center eliminates the NASA-unique equipment and massive hardware orientation of the current MCC, replacing it with a modular, software-oriented design that uses standard, commercially available equipment.

The new MCC, developed at a cost of about \$250 million, is planned to begin actual operations for control of shuttle flights this summer, and the current mission control then will be slowly phased out, eventually relinquished to history.

"A shuttle mission is the end result of a journey, and the first step in that journey is the first simulation," said John Muratore, chief of JSC's Control

Center Systems Division. "The first simulation in the new MCC means that we now have enough capability and reliability in the facility to start using it for real work. It's no longer under development. It's now moving into operation."

The new MCC's design offers an unprecedented flexibility in flight control operations, allowing the facility to be changed from controlling a shuttle to controlling any other spacecraft at almost the speed of simply choosing a different function from a computer menu. The commercially available equipment and up-to-date technology used in the new MCC will greatly reduce maintenance costs for the facility as well.

Unseen by most who are familiar with television views of the current mission control is the support equipment for the control room, a first floor completely filled with, by today's standards, obsolescent mainframe computer equipment. A staff of about 80 is required around the clock during shuttle missions to operate the equipment, and maintenance on the cur-

Please see **NEW**, Page 4

## Honeycutt takes Kennedy Space Center helm

Former JSC employee named to replace Crippen as center director

Jay Honeycutt takes the helm at Kennedy Space Center, becoming its sixth director following his appointment by NASA Administrator Dan Goldin.

"Jay has been an accomplished member of NASA's human space flight team for many years," Goldin said. "He understands spacecraft processing, launch operations and flight operations, and I believe he will make an exceptional director of this vital field center."

Honeycutt succeeds Robert Crippen, who is leaving the agency

Jan 21.

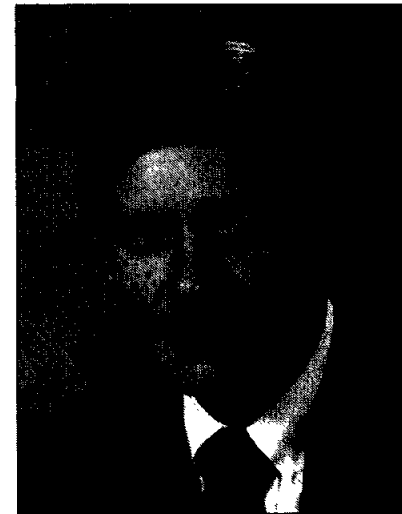
"I am very pleased that Jay will be succeeding me as center director," Crippen said. "He has made major contributions to KSC and the agency as director of shuttle management and operations while at KSC. In particular, he has greatly improved the efficiency of the shuttle team. I know he will carry on the KSC tradition of safety and excellence."

Honeycutt began his career at Redstone Arsenal in Huntsville, Ala. in 1960 and joined NASA in

1966. In 1967, he became chief, Vehicle Simulation Section in the Flight Operations Directorate at JSC. He later became the assistant chief of the Flight Training Branch in 1969 and chief in 1974. In 1976 he was promoted to assistant to the director of Flight Operations. He became the technical assistant to the associate administrator for the space transportation system at Headquarters in 1981 and moved back to JSC as assistant to the director, Space Shuttle Program, in 1982.

Before moving to his present job at KSC in 1989, he served in a number of management capacities including manager, STS integration and operations and special assistant to the associate administrator for space flight at NASA Headquarters. From 1987 to 1989 he was deputy manager of the shuttle program.

During his career, he has earned a number of significant awards including two NASA Exceptional Service Medals and NASA's Outstanding Leadership Medal.



Jay Honeycutt

## Hubble observations challenge theories on evolution of galaxy

Observations made with the Hubble Space Telescope are challenging long-held beliefs about the age of the galaxy.

Astronomers using the telescope as a "time machine" have obtained the clearest views yet of distant galaxies that existed when the universe was a fraction of its current age.

The results suggest that while elliptical galaxies developed quickly into their present shapes, spiral galaxies that existed in large clusters evolved over a much longer period—

the majority being built and then torn apart by dynamic processes in a restless universe.

Those estimates for the age of the universe do not allow enough time for the galaxies to form and evolve to the maturity seen at an early epoch by the telescope.

"This is compelling, direct visual evidence that the universe is truly changing as it ages, as the Big Bang model insists," said Alan Dressler of the Carnegie Institution

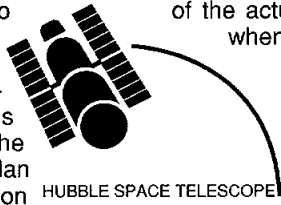
in Washington, DC. "Though much of the quantitative work can be done best with large Earth-bound telescopes, the Hubble Space Telescope is providing our first view of the actual forms and shapes of galaxies when they were young."

A series of long exposures, taken by three separate teams, traced galactic evolution in rich clusters that existed when the universe was approximately one-tenth, one-third, and two-thirds its

present age.

Key findings identified by the scientists include the long-sought population of primeval galaxies that began to form less than one billion years after the Big Bang, and a "cosmic zoo" of bizarre fragmentary objects in a remote cluster that are the likely ancestors of the Milky Way Galaxy. A series of pictures, showing galaxies at different epochs, offers the most direct evidence to date for dynamic galaxy evolution driven by

Please see **IMAGES**, Page 4

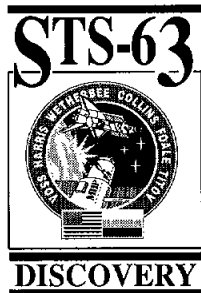


## Discovery on schedule for STS-63

By James Hartsfield

*Discovery* will begin 1995 on the move and on schedule toward a Feb. 2 launch on shuttle mission STS-63, a mission that will include a rendezvous and fly-around of the Russian Space Agency's Mir space station.

Currently in Kennedy Space Center's shuttle processing hangar bay 2, *Discovery* will be rolled to the Vehicle Assembly Bldg. on Wednesday to be hoisted vertical and attached to the STS-63 fuel tank and solid rockets. It is scheduled to be moved to Launch Pad 39B around Jan. 11.



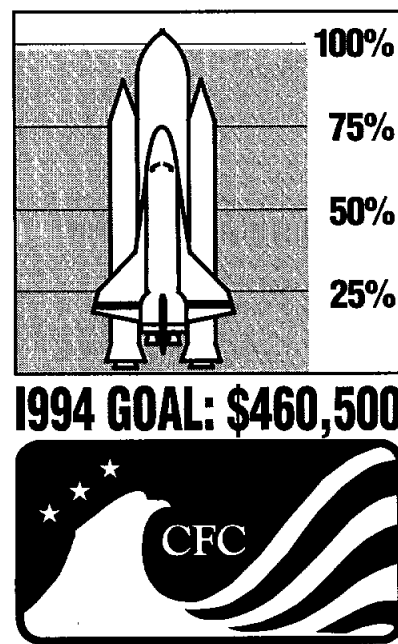
Last week, technicians closed out the engine compartment, checked out the recently replaced auxiliary power unit two, and began close-outs of the crew cabin. Also, the payload bay doors were closed with the Spacehab-3 module and Spartan 204 satellite ready for flight. Other work included final tests of the orbital maneuvering system and reaction control system.

Elsewhere, the main engines were installed in *Endeavour* in preparation for a March launch on STS-67 carrying the Astro-2 telescope package aloft. Other activities included

checks of a signal conditioner on the right orbital maneuvering system pod and servicing of the water spray boilers.

Also at KSC, *Atlantis* is being readied for the first docking between a space shuttle and Mir on shuttle mission STS-71 in June. Last week's work on *Atlantis* included troubleshooting of the flash evaporator system, draining residual propellants from the reaction control system and checks of payload bay floodlights. Leak tests of the main propulsion system plumbing also were completed.

Shuttle processing work took a break during the holidays with no activity since Dec. 23. Work on the orbiters will resume on Tuesday.



## CFC concludes

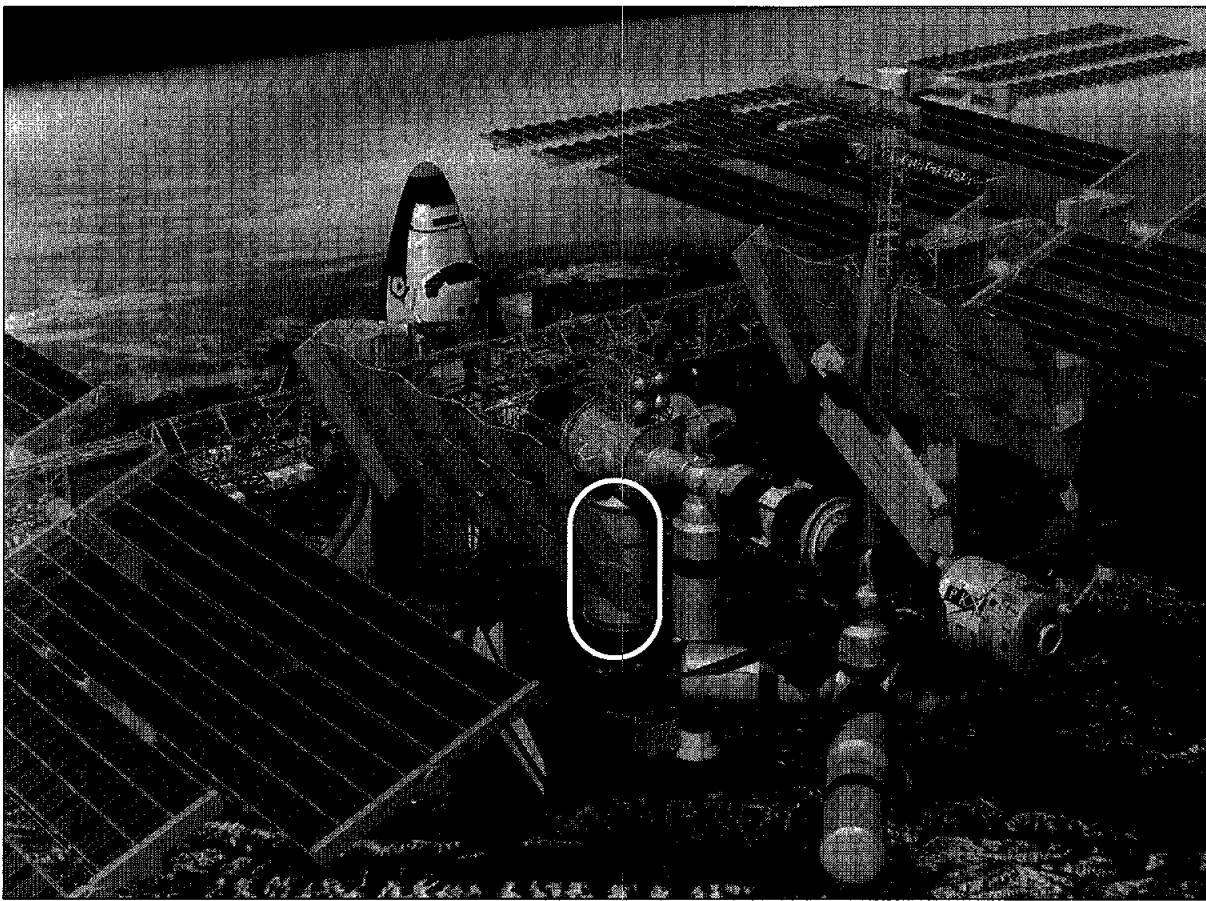
JSC employees responded to the call, donating \$458,832.16 to this year's Combined Federal Campaign, boosting the grand total a full percent over last year's contributions.

Ten organizations gave more than 100% of their 1994 goals. Three organizations gave over 200%.

The Engineering Directorate contributed the largest dollar amount, with \$124,439.76 or 104 percent of its goal. The Mission Operations Directorate contributed the next largest amount, \$87,417.72 or 121 percent of its goal.

Winners of the five Continental airline tickets whose names were drawn from employees contributing one-hour's pay per month or more were: Tim Adams, NS4; Carrie Ash, BI; Lee Graham, OA; Greg Oliver, DM; and Kathy Thornton, CB.





# The Night before Trivia

1. What is the purpose of the International Space Station module circled?

**'T**was the night before deadline and all through Bldg. 2, Not a brain cell was stirring, there was nothing new. The nooses were hung outside the Roundup office with care, In the hopes that the editor soon would be there. He made new writers take over this task, Without benefit of food, or even a flask. We pulled all the files; we opened the drawer. There had to be more trivia from NASA lore. On the information highway we crashed and we burned, How much more trivia can one person learn? On Windows, On Word, On Quark and MS Mail, This is our only chance, we'd better not fail. The deadline passed, the writing was done; So read through and answer, we hope you have fun.

See pictures for questions 1, 79, 80 and 81.

2. Which planet has the widest range of surface temperature?
3. How many American candidates will be in the astronaut class of 1995?
4. What does CEOSH stand for?
5. When is the next full moon?
6. Who was the oldest astronaut at flight time to go into space?
7. What was the name of the first bug in space?

8. What city was the birthplace to the most current astronauts?

9. Which mission featured the first live TV coverage of a spacecraft returning to Earth (including parachute descent)?

10. How big is the Vehicle Assembly Bldg. at KSC?

11. How many women have flown on the shuttle? (Bonus: How many flights have they flown on?)

12. What is the origin of the word "rocket"?

13. Who wrote *Suddenly Tomorrow Came*?

14. JSC accountants can be found in Bldg. T-585 in FMD. What does FMD stand for?

15. Who became the 200th person in space?

16. Who are the flown astronauts whose last names have only three letters?

17. Which unapproved spacecraft name was used by Capcom over the air to ground communication loop?

18. What astronaut has his own echo?

19. What was the first high-school student experiment sent into space on board a shuttle?

20. Who is JSC's Executive Assistant?

21. Who was the first flown "hog" in space?

22. Who was the real pilot for the crash sequence in the opening of the Six Million Dollar Man television series?

23. What is the largest known

volcano in the solar system?

24. Besides the Eagle what other aircraft went to the Moon with Neil Armstrong and Buzz Aldrin?

25. In which state was Dr. Carolyn Huntoon born?

26. What are the three branches of JSC's Public Affairs Office?

27. Which astronaut spent two weeks on a game show?

28. When was the last snowfall at JSC?

29. Which mission transmitted the first color photographs of the Earth?

30. Who is the only flown astronaut who was born in Cameroon, Africa?

31. Which mission marked the first use of Mission Control Center?

32. Who was Marilyn J. Bockting?

33. Who is ultimately responsible for your safety?

34. What Hollywood stars were invited to the roll out of the orbiter used for approach and landing test?

35. What was the name of the orbiter?

36. What does LDR stand for?

37. How long has there been a SNR? Where was the first one published?

38. How many American spacecraft have visited Saturn? What are their names?

39. Name two members of Congress who have buildings named after them at JSC?

40. What is the nickname for the vibration lab in Bldg. 49?

41. In the cult classic "Santa Claus Conquers the Martians" what is the name of the NASA rocket

development engineer that helps save the day?

42. What is Standard Form number 63?

43. Flags for three Baltic nations which the U. S. did not recognize as part of the Soviet Union were flown during the Apollo era. Name the nations.

44. What is Pluto's atmosphere made of?

45. Astronaut word play. Who would you find on the beach?

46. What was the name of the recovery ship for Apollo 10?

47. Where is the manned maneuvering unit (MMU)?

48. Where was the WETF located prior to Bldg. 29?

49. What does the Safety Office consider a "close call"?

50. Who is the head of Technology Transfer at JSC?

51. What is an EMU?

52. How many EMUs are stored on the orbiter for flight?

53. How many moons does Uranus have?

54. How much was Alan Shepard paid for being the first American in space?

55. What is the name of the NASA television satellite?

56. Who's name and number is listed on the first level SNR's telephone call processing tree?

57. What building houses the Space Lab Trainers?

58. What does the acronym ETA stand for?

59. What is its purpose?

60. Where is the ETA located?

61. Which astronaut went on to manage the New Orleans Saints?

62. What probe visited Pluto?

63. How many contractor abbreviations are listed on page ten in the 1994 JSC phone book?

64. What building was built for only a single purpose?

65. What were the first women astronaut candidates called?

66. What year did NASA first start testing women to become astronauts?

67. What was the name of the first satellite the U.S. attempted to launch?

68. What sort of airplane was modified to become The "Super Guppy"?

69. How many U.S. flags were planted on the moon?

70. What organization can be found at mail code ZS8?

71. What date is STS-63 scheduled to be launched from Florida?

72. What four moons of Jupiter are known as the Galilean satellites?

73. What country will Norm Thagard be launched from next?

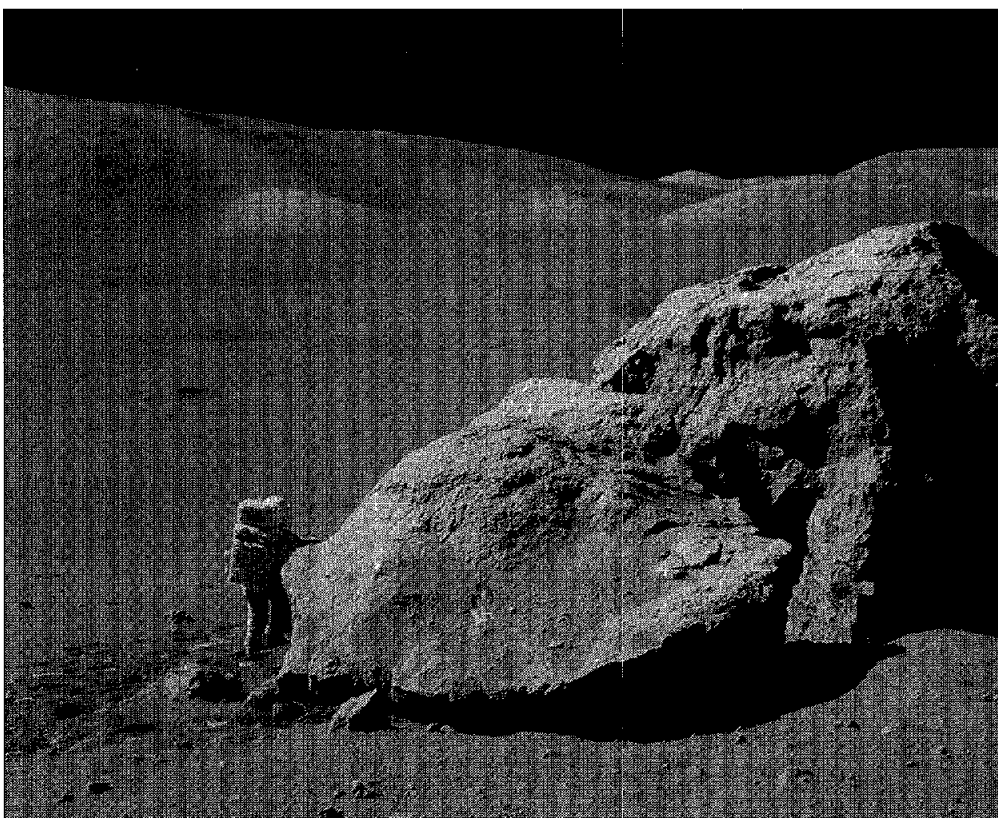
74. What is the real name of the technical library in Bldg. 45?

75. How much propellant was consumed per second by the Saturn V rocket engines?

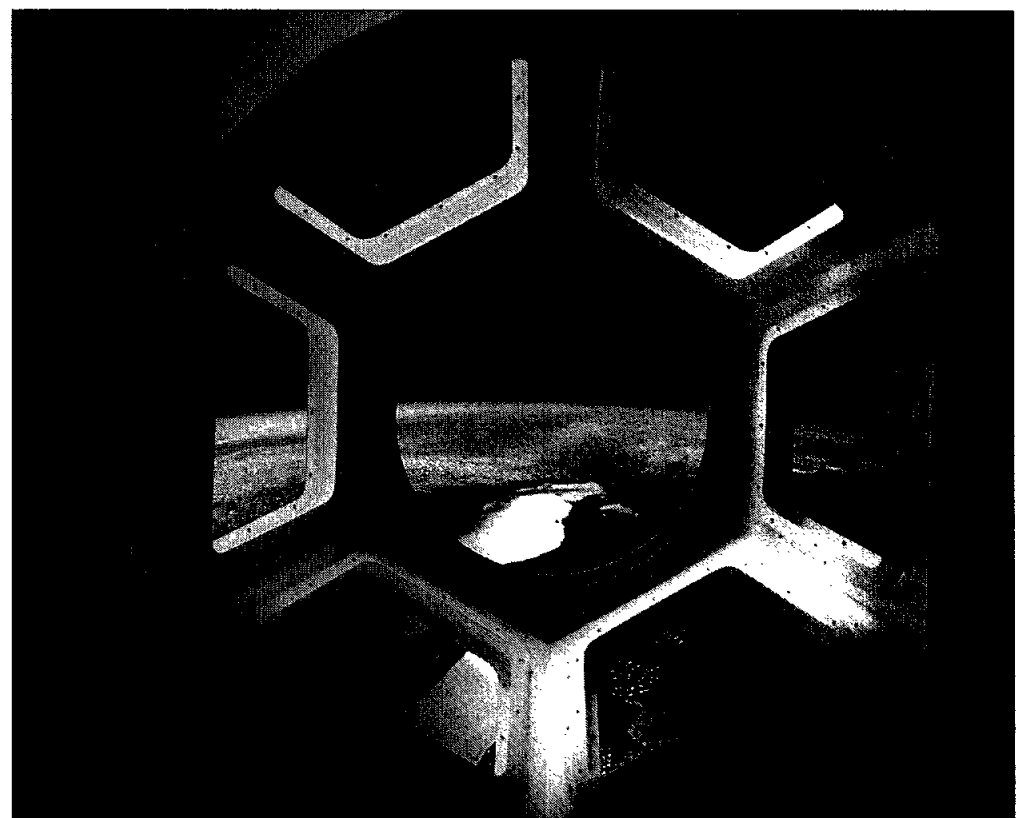
76. Why is it likely that you would talk like Mickey Mouse on Jupiter, Saturn, Neptune, and Uranus?

77. What is the ARRPCS?

78. What is it used for?



79. What changes did Alan Bean make when he painted this lunar rock?



80. From what vantage point was this picture taken?  
81. What terrain is visible?



# Program to study plants' perception of environment

A joint government research program may result in the development of plants that can withstand drought, unseasonable temperatures, salinity in the soil, and other adverse growth conditions.

Supported by NASA and the National Science Foundation, this collaborative program, called the Research Network on Plant Sensory Systems, will foster interactions among scientists that will increase human understanding of how plants sense and respond to various environmental signals, such as light, temperature and gravity.

The program includes the award-

ing of nine science grants totaling more than \$5 million over five years. The program also was selected as NASA's ninth Specialized Center of Research and Training, continuing a program dedicated to space life sciences begun in 1990.

Plants are vital to the existence of humans. From providing oxygen to breathe, to foods for meals, plants are a renewable resource upon which human existence depends.

The results of the research supported by this joint program will contribute to the long-term health of the environment and humans.

Plants, unlike animals, have not

developed specific organs that see, hear, and feel various environmental stimuli. They can not move to avoid adverse environmental conditions. Yet, plants respond to various environmental stimuli and survive significant fluctuations in environmental conditions. Many plant species have evolved to take advantage of the specific environments in which they live.

In extremely harsh seasonal conditions, some plants are able to shut down certain functions and preserve only the bare minimum set of functions required to survive until more suitable growing conditions exist. There also are some indications

that common mechanisms might be operating in plants' perception of and response to different environmental signals.

How plants perceive and respond to the environmental signals is one of the major unanswered questions in biological sciences. Recent advances in biotechnology provide scientists an unprecedented opportunity to find answers to this long-standing question.

The nine research projects awarded grants were selected based on their scientific excellence from 35 applicants. All nine projects will focus on the question of how

plants perceive environmental signals and how those signals bring about growth and development of plants. An additional objective of the grants is to enhance opportunities for university students to receive research training in multidisciplinary and collaborative activities.

Awards under this program are exclusively for ground-based research. If research requires a microgravity environment for concept verification it will be considered for flight opportunities by the Office of Life and Microgravity Sciences and Applications at a later date on a competitive basis.

## Images of an evolving universe

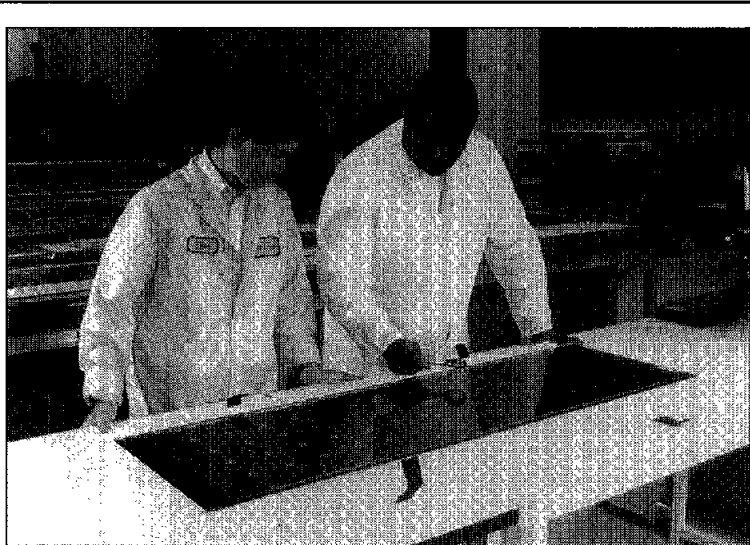
(Continued from Page 1)

explosive bursts of star formation, galaxy collisions, and other interactions that ultimately created and then destroyed many spiral galaxies that inhabited rich clusters.

The astronomical equivalent of digging through geologic strata on Earth, Hubble can peer across a large volume of the observable universe and resolve thousands of galaxies from five to twelve billion light-years away. Because their light has taken billions of years to cross the expanding universe, these distant galaxies are "fossil evidence," encoded in starlight, of events that happened long ago.

Ground-based observations have not been able to establish which of several competing theories best describe how galaxies formed and evolved in the early universe. Though the largest ground-based telescopes can detect objects at great distances, only Hubble can reveal the shapes of these remote objects by resolving structures a fraction of the size of our Milky Way Galaxy. This capability allows astronomers for the first time to discriminate among various types of distant galaxies and trace their evolution.

"Our goal now is to look back further than twelve billion years to see what we are sure will be even more dramatic evidence of galaxies in formation," Dressler said.



Lockheed employees check out the prototypes of the solar arrays sent to Russia in November and December.

## Panels support joint efforts

Solar panel modules destined to augment existing power supplies on Russia's Mir space station are in Russia, marking the first delivery of U.S. space station flight hardware in support of joint U.S./Russia space efforts.

The hardware shipments each consisted of 45 solar panel modules developed for the Mir cooperative solar array project, an effort that brings together NASA's advanced photovoltaic technology with Russia's proven structures and mechanisms.

The program objective is to augment Mir's power by replacing an existing degraded array with the new, jointly-developed array. The power from the new array, and a second all-Russian array, is

needed to extend the lifetime of the Mir and support experiments conducted at the station by U.S. astronauts.

Each panel module consists of 80 solar cells. One panel measures approximately 51 inches long by 17 inches wide, and is capable of generating about 80 watts.

Eighty-four of the modules will be integrated with Russian-made frames in 42 hinged pairs. After the modules are installed in the frames, the completed array will be shipped back to the U.S. to be readied for launch. The complete six kilowatt joint array will be taken to the Mir Space Station during STS-74, scheduled for flight in October.

## New MCC is world's largest fiber network

(Continued from Page 1)

rent mission control must be done on a circuit board by circuit board basis. For that maintenance, specialists who know the old equipment in such circuit by circuit detail are always on hand because similar equipment was long ago purged from the commercial world.

The new MCC uses workstations interconnected via a local area network, doing away with the older mainframe approach and bringing it in line with the systems most commonly in use today. Manufacturers can maintain the equipment on a modular basis, pulling out and replacing entire workstations rather than intricate parts, a change that will reduce the maintenance personnel required for mission control by about 180 positions as the current control center is phased out.

In part, the greater capability and lower costs of the new MCC are benefits gained by NASA from an industry the space program helped create.

"In the 1960s, as late as 1963, 90 percent of all of the electronic chips, computer chips, in the U.S. were bought by NASA and the Air Force," Muratore explained. "The industries supporting NASA at that time went on to use that technology to revolutionize consumer electronic products. By using more easily maintained and more capable commercially available equipment in the new MCC, we are reaping a harvest from seeds planted by NASA in the Apollo era."

In the new MCC, a total of 197

workstations can be used to control both the space shuttle in flight and the International Space Station to be launched in 1997. Currently, 204 workstations are required for shuttle flight operations alone. The number of equipment racks needed in the new MCC is half the amount in the current mission control. The networks in the new MCC are linked by 125,000 feet of fiber optic cable, making it the world's largest fiber data distributed interface network.

The majority of software packages used in the new MCC are standard, commercially available products as well. Only a "thin layer" of software that is inherently required to accomplish tasks unique to shuttle flight control has been developed by NASA. The software also makes use of intelligent systems to assist flight controllers in monitoring the health of the shuttle, although the flight controllers themselves are, as always, the primary mechanism for detection of malfunctions and attempts to resolve them.

Although the setting and tools are changing, the philosophy, discipline and the flight control positions themselves remain the same.

"The original mission control was a technological wonder of the world when it was built. Nothing like it had ever existed before. It was the first of its kind," Muratore said. "The new mission control is a wonder in the way we are applying technologies to a difficult and complex job. It is the best of its kind."

## Answers to the annual NASA Trivia Challenge

(Continued from Page 3)

1. It is the only habitation module for the station. Russians will be able to reside in the old Mir module, but current plans are for all astronauts to be housed together in the U.S.-built habitation module.
2. Mercury ranges from 467° Celsius to -183° Celsius.
3. Nineteen.
4. Center of Excellence for Occupational Safety and Health.
5. Never. Apollo astronauts brought back 842 pounds of rock during their missions. The last full moon was July 21, 1969.
6. Vance Brand on STS-38 in 1990. He was 59 at flight time.
7. Arabella, the spider on Skylab 3.
8. Seven astronauts were born in Cleveland, Ohio: Ken Cameron, Gregory Harbaugh, David Low, Ronald Sega, Donald Thomas, Carl Walz and Mary Ellen Weber.
9. Apollo 9 on March 13, 1969.
10. The Vehicle Assembly Bldg. is the second largest building (by volume) in the world. The United Nations Secretariat Bldg. could fit through its door. There is room on the roof for the Astro-dome and most of its parking lot, and room inside for three Empire State Buildings.
11. There are 22 women who flew on 43 flights.
12. The 14th century Italian historian Muratori (no relation to

- John Muratore) used the word rochetta, referring to an implement used in spinning thread, to describe the shape of the weapons introduced by the Arabs.
13. Henry C. Dethloff.
14. Financial Management Division.
15. Steve Smith on STS-68.
16. Mark Lee, G. David Low, and Jay Apt.
17. As Gemini 3 launched, Gordon Cooper said, "You're on your way, Molly Brown," confirming a name that was not supposed to be used.
18. Richard Richards.
19. Eighteen-year-old Todd Nelson of Rose Creek, Minn., devised an experiment to check the effects of weightlessness on insect flight. Dozens of moths, houseflies, and honeybees were orbited on STS-3.
20. Susan Garman.
21. Mark Carneau on STS-41G.
22. Bruce Peterson, NASA test pilot. He was injured in May 1967 in a crash which became the opening sequence of the television show. He did not acquire superhuman capabilities from bionics.
23. Olympus Mons on Mars, is three times higher than Mt. Everest and covers an area the size of Arizona.
24. The Lunar module for Apollo 11 carried a piece of the fabric and propeller of the Wright Brothers first plane which flew at Kitty Hawk.

25. Louisiana.
26. News and Media Services, Education and Information Services, External Affairs.
27. John Glenn was on Name That Tune in 1957.
28. February 1, 1994.
29. Apollo 10, May 1969.
30. Patrick Baudry on STS-51G.
31. Gemini 4.
32. Marilyn Bockling started as a secretary in 1963. She was promoted to Administrative Officer before she retired in 1979. The award was named after her due to her advocacy in professional secretarial development.
33. You, according to CEOSH (see question 3).
34. The cast from the original Star Trek series.
35. Enterprise.
36. Labor Distribution Record.
37. The first issue was published in 1961 at Langley Research Center.
38. Three: Pioneer 11 (1979), Voyager 1 (1980), Voyager 2 (1981).
39. Jake Garn and Olin Teague.
40. Shake and Break.
41. Wehrner von Green.
42. Memorandum of Call (standard phone message notes).
43. Latvia, Lithuania, and Estonia.
44. Methane.
45. Robert Cabana.
46. USS Princeton.
47. In storage.
48. Bldg. 260, it consisted of a large tank.
49. It is when an accident hap-

- pens or could happen but no one gets hurt.
50. Hank Davis.
51. Extra-vehicular mobility unit.
52. Two, unless there is a scheduled EVA, then it's three.
53. Fifteen, 10 of which were discovered by Voyager 2.
54. Flight pay for the 15 minute trip came to \$14.38.
55. GTE spacenet 2.
56. Associate editor Karen Schmidt at x38784.
57. Bldg. 36.
58. Environmental Test Article.
59. The ETA is an altitude chamber used to test many of the environmental systems on the orbiter prior to flight. It is now used to train the astronauts in EVA activities.
60. Bldg. 7.
61. Dick Gordon.
62. No probe has visited Pluto.
63. Eighty.
64. Bldg. 46 houses the Cray computer.
65. First Lady Astronaut Trainees (FLATS).
66. 1959, the project was kept secret for three years, then dropped.
67. Vanguard, Dec. 6 1957, it blew up on the launch pad.
68. It was a Boeing Stratocruiser.
69. Six, one from each Apollo mission.
70. Space Flight Meteorology Group.
71. February 2, unless you're in Houston. Launch is scheduled for 11:51 p.m. JSC time Feb. 1.

72. Europa, Io, Ganymede, Callisto.
73. Kazakhstan.
74. The JSC Scientific and Technical Information Center.
75. Three tons per second.
76. The atmosphere is largely composed of helium.
77. Atmospheric Repressurization Revitalization Pressure Control System.
78. The ARRPCS provides breathing air to the astronauts in flight and it maintains cabin pressure and monitors carbon monoxide.
79. Bean painted the name of Gene Cernan's daughter, Tracy, in the dust next to the area from which Cernan took samples during the Apollo 17 mission. Bean made the addition to his 1984 painting entitled "Tracy's Boulder" after Cernan expressed regret for not having written her name in the dust when he was there.
80. The view looks toward Earth from inside the International Space Station cupola.
81. The Great Lakes region of North America.

*Editor's note: The assistance of the Public Affairs Office staff and the External Affairs Librarian, Information Services in compiling this year's Trivia Challenge is gratefully acknowledged.*