

Ames' Hubbard to champion NASA Mars program --Assessment team recommends changes

On March 14, the long-awaited report of Dr. Thomas Young's Mars independent assessment team was issued during a news conference at NASA Headquarters.

Despite serious criticism of a number of significant flaws in organization, process and training, the news was not altogether bad for NASA. The team concluded that Mars exploration is an important national goal and should be continued. Further, with proper application of the "faster, better, cheaper" approach, NASA has the required capabilities to implement a successful Mars exploration program, the team reported.

But the nature of that program is about to undergo significant changes. For one thing, Dr. Edward Weiler, NASA Associate Administrator for Space Science, canceled plans for the Mars 2001 lander until a new overall Mars "architecture" strategy has been developed. Further, in response to the team's recommendation that a single point of contact be established at NASA Headquarters with responsibility for all requirements and funds, Weiler appointed Ames' Scott Hubbard to the newly created position of NASA Mars program director, reporting directly to Weiler himself.

Hubbard is no stranger to planetary science and missions, or to the "faster, better, cheaper" Discovery-series approach to space exploration. He was the originator of the Mars Pathfinder mission during its formative development stages at Ames, and he served as NASA's mission manager for the highly successful Lunar Prospector mission to the moon. Currently Associate Director for Astrobiology and Space Program at Ames, Hubbard is expected to take up his new post full-time in June, but will be shuttling back and forth among Headquarters, Ames and the Jet Propulsion Laboratory (JPL) in Pasadena in the interim.

"Although it is difficult to leave Ames and the Bay Area, I am delighted to be taking on this new challenge," Hubbard said. "I am honored that Associate Administrator Weiler and NASA Administrator Goldin are placing their confidence in me to get the job done. I have already started working towards reformulating the Mars

program in order to make it a great success," he said.

What kinds of problems does the Mars team believe confront Hubbard and NASA as they act to redefine a successful new Mars exploration program? The primary areas of concern that they raised were communication, training and the need for increased funds and contingency margins.

In addition to Hubbard's appointment, it is anticipated that a single point of contact for Mars missions will be established at JPL as a second element in the process of clearly articulating lines of authority, clarifying roles, and improving inter-organization communication. Overall, NASA's Office of Space Science will address this by developing an integrated strategic response to the Young team's findings and recommendations.

Another key change anticipated is that NASA Headquarters will set aside a source of funds that can be used in case of unforeseen mission contingencies.

The Young team concluded that the Mars 98 mission (encompassing the dual failures of Mars Climate Orbiter and Mars Polar Lander) was underfunded by at least 30 percent. This set the JPL team up for failure, the team reported, and there was simply no wiggle room available to make the project work.

Despite the best efforts and beliefs on the part of Mars 98 mission scientists that they could pull it off, in retrospect, it is clear that the project was almost certainly doomed to fail from the outset, the assessment team now believes.

With science requirements, launch vehicle size, and mission schedule and costs fixed, the only variable left in the equation was risk, the Young team reported. As circumstances changed, the Mars 98 mission team unintentionally took on additional risks well above and beyond acceptable levels. In Weiler's assessment, it is one thing for NASA to continually push the boundary, but with a seriously underfunded project, finding that boundary is inevitable. That is what happened in the case of Mars 98, he concluded.

Dr. James Arnold, Chief of Ames' Space



G. Scott Hubbard

Technology Division, was a member of the Young team. Director of Information Systems at Ames, Dr. Steven Zornetzer, and Chief of Ames' Computational Sciences Division, Dr. Peter Norvig, served as consultants. Possible realignment at Ames in the wake of Hubbard's impending departure has not been announced.

BY DAVID MORSE 

Save the date!

"Strive to Sustain - Earth Day 2000"
 Date: April 20
 Place: Moffett Training and Conference Center, Bldg 3
 Price: Free
 Exhibits: 10 a.m. to 4 p.m.
 Symposium: 8 a.m. to 3 p.m.
 Food available to purchase from 10 a.m. to 3 p.m.
 For more information, see Web url: <http://q.arc.nasa.gov>
 --see story on back page

Ames Outreach Activities

Martwick to help build orphanage near Ordea, Romania

A home for Romanian orphans will be built this year with help from volunteers including Fred Martwick of Ames, Code YSE. Martwick, a member of the Caminul Felix Orphanage Organizing Team, is co-leading the humanitarian project.

The orphanage will be one of 18 homes located in a village outside of Ordea, Romania, about 6 hours from Budapest, Hungary.

"I am working through a group, Assist International, to build the orphanage home in Romania," said Martwick. "In May, I will be traveling, in a group of six. During our deployment from May 18 to June 3, 2000, our group will be laying the 4,500 sq. ft. foundation and slab plumbing. In August, a group of 40 volunteers will travel to Ordea,

for two weeks to complete the eight-bedroom, five-bath, two-kitchen home," he added.

"After it's completed, 20 orphans will be placed there with a Romanian foster family," he explained.

In addition to the children's homes, a dedicated dairy farm was built, not only as an educational aid, but to help the complex become self-sufficient, he said. A medical clinic and recreation building are also in the planning stages, Martwick noted.

"It has been roughly a decade since the wall dropped, and the tough conditions in Eastern Europe exposed. Despite the time lapse, many Romanian children are either homeless or are housed in rundown, densely housed government orphanages. Several

volunteer groups are laying their hands to the soil to help with these type of projects," said Martwick.

Assist International is a nonsectarian, non-political organization dedicated to relieve the human suffering in Eastern Europe, the former Soviet Union and various third world countries, according to Martwick. The group has organized the construction of homes in several countries and has provided western medical equipment to various clinics and hospitals.

More information about Assist International is available on the Internet at <http://www.assistintl.org/> or through Martwick.

BY JOHN BLUCK 

Ames hosts Small Disadvantaged Business forum

On March 14, Ames hosted its annual Small Disadvantaged Business (SDB) forum. The purpose of the forum was to allow highly qualified high-tech SDBs and women-owned small, businesses and minority educational institutions to present their capabilities to NASA senior management, technical staff, and visitors and to address questions from a technically oriented audience.

The presenters for this year's forum were: (1) Howard University; College of Engineering, Architecture and Computer Sciences; Washington, DC; with capabilities in artificial intelligence, networking, atmospheric studies, and simulation; (2) Digital Interface Systems, Inc.; Youngstown, OH; with expertise in data acquisition systems design, development and instrumentation; (3) Astro Technology, Inc.; Houston, TX; with capability in fiber-optic sensors, robotics, solid rocket motors; (4) Metacomp Technologies, Inc.; Westlake Village, CA; with R&D capability for computational fluid dynamics software; and (5) Metrolaser, Irvine, CA; R&D capability in holography, NDE testing, particle sizing.

Ames Center Director Dr. Henry McDonald introduced Dr. Robert L. Norwood, Director, Commercial Technology Division, Office of Aero-Space Technology, at NASA Headquarters. Guests included personnel from various federal agencies (including the Small Business Administration), large prime contractors, women-owned businesses, and SDBs. Headquarters representatives also in attendance were Vernell Jackson, Code K, and Suzanne M. Humphrey from Code RS. Special recogni-

tion went to Frank Islam, President of QSS Group, Inc., whose company was awarded one of the largest (8a) contracts in NASA history.

A pleasant note was added to the forum when James A. Gambardella, of the SBA's San Francisco Government Contracting Office, presented the Ames Research Center's Small Business Specialist, Thomas J. Kolis, with an award for his contributions

to socioeconomic contracting programs. The award read "in recognition of your outstanding efforts on behalf of the Small Business contractor Community. You exemplify the finest traditions of our nation and we deeply appreciate your support."



photo by Dominic Hart

From left to right: Vernell Jackson, NASA-Headquarters, Code K; Lee O. Kareem, President, Digital Interface Systems, Inc., and Thomas J. Kolis, Small Business Specialist, Ames.

Center Briefs

Tiny hearts monitored by NASA technology

A NASA technology developed at Langley Research Center originally used to measure airflow over airplane wings, has been successfully used to develop a portable, non-invasive, easy-to-use fetal heart monitor. The new clinically proven fetal heart monitor takes advantage of aerospace technology to make it more affordable, portable and easy to use by expectant mothers in their own homes. What's more, it "listens, documents and stores" fetal heart-rate data without injecting energy into the womb, making it totally non-invasive.

GLAST secondary investigation selected to monitor gamma ray bursts

NASA has selected the Gamma-Ray Burst Monitor (GBM) to be flown on the Gamma Ray Large Area Space Telescope (GLAST) mission, planned for launch in 2005. This instrument will complement the primary instrument, the GLAST Large Area Telescope Flight Investigation, selected Feb. 28, 2000. GLAST will explore the most energetic and violent events in a quest for the ultimate sources of energy in the Universe. Objects explored will include distant galaxies fueled by super massive black holes at their center, neutron stars and individual black holes that are the remnants of stars that have ended their life with an explosion (supernova), and many other stars at the extremes of mass and energy. Goddard Space Flight Center, Greenbelt, MD, will manage the GLAST mission for NASA's Office of Space Science in Washington, DC.

NASA renames NEAR spacecraft for planetary science pioneer Gene Shoemaker

The Near Earth Asteroid Rendezvous (NEAR) NASA satellite, managed by Johns Hopkins University Applied Physics Laboratory, Laurel, MD, conducting the first-ever close-up study of an asteroid has been renamed to honor Dr. Eugene M. Shoemaker, a legendary geologist who influenced decades of research on the role of asteroids and comets in shaping the planets. The NEAR spacecraft, currently orbiting asteroid 433 Eros more than 145 million miles from Earth, will now be known as NEAR Shoemaker. Shoemaker died in a 1997 car accident in the Australian outback while on an annual study of asteroid impact craters. With his wife and research partner, Carolyn, Shoemaker was part of the leading comet discovery team of the past century, perhaps most famous for finding the comet (Shoemaker-Levy 9) that broke up and collided with Jupiter in 1994.

Planet hunters on trail of worlds smaller than Saturn

Planet-hunting astronomers have crossed an important threshold in planet detection with the discovery of two planets that may be smaller in mass than Saturn.

Of the 30 extrasolar planets around Sun-like stars detected previously, all have been the size of Jupiter or larger. The existence of these Saturn-sized candidates suggests that many stars harbor smaller planets, in addition to the Jupiter-sized ones.

Finding Saturn-sized planets reinforces the theory that planets form by a snowball effect of growth from small ones to large, in a star-encircling dust disk. The 20-year-old theory predicts there should be more smaller planets than large planets, and this is a trend the researchers are beginning to see in their data.

"It's like looking at a beach from a distance," explained Geoff Marcy of the University of California at Berkeley. "Previously we only saw the large boulders, which were Jupiter-sized planets or larger. Now we are seeing the 'rocks,' Saturn-sized planets or smaller. We still don't have the capability of detecting Earth-like planets, which would be equivalent to seeing pebbles on the beach."

Jupiter alone is three times the mass of Saturn. This has left the nagging possibility open that some of the extrasolar planets might really be stillborn stars, called brown dwarfs, which would form like stars through the collapse of a gas cloud. But now researchers are better assured these "Jupiters" are only the tip of the iceberg, and there are many more planets to be found that are the mass of Saturn or smaller.

"Now we are confident we are seeing a distinctly different population of bodies that formed out of dust disks like the disks the Hubble Space Telescope has imaged around stars," said Marcy.

The discovery was made by planet-sleuths Marcy, Paul Butler of the Carnegie Institution of Washington, and Steve Vogt of the University of California, Santa Cruz, using the mighty Keck telescope in Mauna Kea, Hawaii. They discovered a planet at least 80 percent the mass of Saturn orbiting 3.8 million miles from the star HD46375, 109 light-years away in the constellation Monoceros, and a planet 70 percent of the mass of Saturn orbiting 32.5 million miles around the star 79 Ceti (also known as HD16141), located 117 light-years away in

the constellation Cetus.

These planets are very close to their stars and so have short orbits. They whirl around their parent stars with periods of 3.02 days and 75 days respectively. This allowed for their relatively rapid discovery.

The astronomers detected the small wobble of a star caused by the gravitational tug of the unseen planets. For the past five years, Marcy and Butler have used this technique successfully to catalog 21 extrasolar planets. Boosted by the light-gathering power of Keck, they have steadily increased the precision of their measurements so they can look for the gravitational effects of ever-smaller bodies. In this latest detection, the change in a star's velocity -- rhythmically moving toward and then away from Earth -- is only 36 feet per second, a little faster than a human can sprint.

The Saturn-mass planets are presumably gas giants, made mostly of primordial hydrogen and helium, rather than the rocky material of Earth. They are so close to their parent stars they are extremely hot, and are not abodes for life as we know it. The planet orbiting 79 Ceti has an average temperature of 1,530 degrees Fahrenheit (830 degrees Celsius).

The planet orbiting HD46375 has an average temperature of 2,070 degrees Fahrenheit (1,130 degrees Celsius).

They probably formed at a farther distance from the star, where they could accumulate cool gas, and then migrated into their present orbits.

Along the way, they would have disrupted the orbits of any smaller terrestrial planets like Earth. These "marauding" gas giants seem more the rule than the exception among the planets surveyed so far, because Marcy and Butler's detection technique favors finding massive planets in short-period orbits. This seems to be the case for approximately six percent of the stars surveyed so far. Their research is part of a multi-year project to look for wobbles among 1,100 stars within 300 light-years of Earth. The project is supported by NASA and the National Science Foundation.

BY JOHN BLUCK



Events & Training

Flying high

Two British airplanes recently found a permanent home at Ames in the former ER-2 hangar. Air Platforms Inc., a family-owned corporation based in Northern Cali-

sphere, hurricane and remote sensing research.

An important feature to atmospheric scientists is a highly advanced dropsonde

etry system.

With a unique capability to fly over any weather pattern, the Canberra allows scientists to conduct scientific studies in a safe environment directly above hurricanes and thunderstorms. "To date the Canberra is the only aircraft to demonstrate successful dropsonde deployment from an altitude of 50,000 feet, and it is capable of even higher altitudes, which opens up new horizons to Ames and other agency scientists," said Ross Falconer, Air Platform program manager. "We recognize the expanding requirement for medium-to-high altitude airborne science and the rapidly developing application and commercialization of air-



Randy Hobbs, Code JF, pulling aircraft out of hangar.

fornia, brought two English-Electric Canberra aircraft to NASA Ames to support airborne scientists and researchers. "This is part of an ongoing program to develop Ames Research Center as a national center for remote sensing and airborne science applications" declared Geary Tiffany, Moffett Airfield manager.

The British used these aircraft at the Defense Engineering Research Agency (DERA) to perform sensor development and atmospheric research. In keeping with these aircraft's history and the wide-ranging capabilities of the Canberra, they will now be used in support of aircraft safety, atmo-

system called the Airborne Vertical Atmosphere Profiling System (AVAPS) designed and built by Air Platforms. It is a small, parachute-stabilized, air-launched expendable system that uses a Global Positioning Satellite (GPS) receiver and other sensors to provide wind speed, temperature, pressure and humidity measurements that can be reported in real time through the telem-



Commercial aircraft at NASA Ames hangar.

photos by Tom Trower

borne technology. It is, therefore, our purpose to adapt our aircraft and programs to match client specific needs, today and tomorrow."

"Historically, Ames has been the place to go for high altitude airborne research activities in the United States," noted Todd Falconer, Air Platform business manager. "NASA Ames offers unequalled access to engineering, fabrication and integration resources for the research aircraft community, and provides an excellent 'jumping off' point for atmospheric investigations in the Pacific Rim, currently an area of intense interest for atmospheric scientists and weather modelers."

Air Platforms, Inc. is seeking Ames scientists interested in utilizing the unique capabilities of the Canberra aircraft. "Our goal is to take these safe, reliable aircraft and combine them with a wide variety of technologies which have been pioneered at Ames. This will provide a readily available high altitude research capability which private and public researchers can readily access", said Falconer.

BY VICTORIA KUSHNIR

Management training



Recent participants in the "Proactive Management" class pose with their instructor Bo Boynton during a break in their training at the Asilomar conference grounds. The tire, from Boynton's vehicle, featured prominently in the class' closing ritual. For more information about management and supervisor training at Ames, call Mike Asercion at ext. 4-4684.

Services & Visitors

Employee Express on-line provides convenience and easy access

Employee Express is a 24 hour-a-day, 7 days-a-week, automated service that allows Ames employees to make changes to their employee benefits and payroll information. Employee Express can be accessed either by computer or touch-tone phone. You can call on any touch-tone phone from work (912) 757-3169 or at home (800) 571-3453. In addition, you can also access the service via the Internet at <http://www.employeeexpress.gov>

You will need your social security number and your Employee Express personal identification number (PIN). Depending on the transaction, you may need to provide additional information.

Adjustments that can be made at any time using Employee Express include changing an employee's federal and state tax withholding; changing their home address and changing their health coverage from family to self only. They can also arrange for direct deposit of their pay as well as set up pay allotments. Additionally, they can cancel their TSP participation as well as cancel their health benefits coverage.

During open seasons only, employees

may also allocate their Thrift Savings Plan (TSP) contributions; enroll in TSP and/or change their biweekly contributions to TSP. Also, they can change their health coverage; change their health benefits plan or enroll in health benefits coverage.

Employee Express saves time by eliminating the need to complete and submit forms. In addition, it's convenient since one can make changes or review current information, from home or work at any time. Also, it's reliable and timely.

Personal identification numbers (PINs) are mailed to new employees by the Office of Personnel Management in Macon, Georgia (OPM-Macon). If you lose, forget, or didn't receive your PIN and need a replacement, you can request one from the Help Desk at (912) 757-3030. For security reasons, the Help Desk will not issue and mail a new PIN to any address other than the official one on file. Therefore, you must make sure that your address is up-to-date with the Payroll office. You should receive a replacement PIN by mail at your home address within 5-7 days of request.

Upon confirmation and completion of

an action, Employee Express provides the effective date for the action as well as the date when it will appear on Leave and Earnings Statement. Usually, actions are made effective at the earliest pay period available.

Hearing impaired employees may call the TDD number at (912) 757-3117 or use the internet site. Others may obtain assistance through the Benefits office, at ext. 4-1019 or ext. 4-1020, Bldg 241, Room 145.

Help information is always available on the system. In addition, you may call the OPM-Macon Help Desk, which is available Monday through Friday between the hours of 7 a.m. and 7 p.m. EST at (912) 757-3030. At other times, a message may be left and someone will return your call. Questions concerning specific personnel and payroll information should be directed to the Benefits Office at ext. 4-1019, Leticha Hill at ext. 4-3792, or the Payroll office at ext. 4-5293.



Gingrich visits Ames

Newt Gingrich was at Ames on March 15 to meet with scientists and engineers and discuss advanced research and information technology, biotechnology and nanotechnology.

Gingrich visited Ames at the suggestion of NASA Administrator Daniel S. Goldin and Associate Administrator for Aero-Space Sam Venneri.

photo by Dominic Hart

Ames Happenings

Fifth Annual Pollution Prevention award

The Environmental Services Office, Code QE, is accepting nominations for the 5th Annual Pollution Prevention (P2) award. The impetus for this award was the Pollution Prevention Act of 1990. Hitherto, environmental policy treated the "symptoms" of environmental degradation through waste management and pollution control. In contrast, the Pollution Prevention Act was designed to attack the root of the problem, thus revolutionizing environmental policy. The Act sets forth guidelines to ensure that pollution entering the environment is reduced or eliminated.

The purpose of the Ames P2 award program is to recognize employees who have made a substantial contribution to reducing or preventing pollution or environmental impacts. The scope of the award includes projects that prevent pollution or otherwise reduce environmental impacts. Activities that are candidates for nomination include reduced hazardous waste generation; reduced solid waste generation; implementation of controls that minimize hazardous materials purchases; use of "green-building" design techniques; reduction in energy use through operations or facilities changes; resource conservation through reuse/recycling; development of

standard operating procedures for source reduction; reduced air emissions through source reduction or materials substitution; and reduced industrial waste water discharges.

Any Ames employee may apply for this award. Civil servants are eligible for a cash honorarium. The award program description and nomination forms are available on the code QE Web site at <http://q.arc.nasa.gov>

Nomination forms may also be requested from Diane Shelander at ext. 4-0921 or you can reach her via her email at dshelander@mail.arc.nasa.gov.

Additional information about pollution prevention can be found at <http://www.westp2net.org/facts/ohepa1.htm> and <http://www.westp2net.org/facts/vadeq12.htm>.

Nominations must be received by May 1, 2000 for consideration. The awards will be presented later this year.

All Ames employees are encouraged to participate in the P2 award program.

This award is a great opportunity to show the Ames community how you and your colleagues have made a positive difference by reducing negative impacts on our environment.

BY LINDA VRABEL



In 1998, the Facilities Maintenance Branch began using goats to graze stubborn vegetation. This procedure substantially reduced total herbicide usage at the Center. The goats are provided and tended by JFP's Landscape crew. The goats reside here year-round and are moved from place to place as needed.

Latest results of astrobiology research to be unveiled at Ames

An internationally recognized cadre of researchers from diverse scientific disciplines will present their latest findings demonstrating the novel, multidisciplinary nature

themes will be discussed during oral presentations and in numerous scientific and technical posters.

"Astrobiology is a unique and exciting new field that probes into some of humanity's and science's most intriguing questions about the origin and evolution of life in the universe," explained Dr. Lynn Rothschild, an evolutionary biologist at Ames and chairperson of the meeting's local organizing committee. "This conference is our first opportunity to assess the science, discuss the mission opportunities available, and really ignite the field," she added.

More information about the Astrobiology program and conference is available on the astrobiology Web site at <http://astrobiology.arc.nasa.gov>. The website contains the conference agenda, list of speakers, and scientific and technical abstracts.

BY LAURA LEWIS



of astrobiology during the First Astrobiology Science Conference to be held at Ames on April 3-5.

Mission opportunities and technology requirements for astrobiology research-- the study of the origin, evolution, distribution and destiny of life in the universe--will also be discussed. The conference is organized into six provocative themes that relate to the fundamental questions and research areas within Astrobiology: Water--the Sine Qua Non of Life; The Environment; Astrobiology programs and Mars; Transfer; Detection; and Simplicity and Complexity. The

Ames Café to raise prices

Due to increased costs during the last year, the Ames Exchange will be raising prices by a modest amount in the Ames Café on selected items. The most significant increase will be the "daily specials" by .25 cents. The cost of the salad bar, sandwich deli and most grill items will remain unchanged.

This price increase will take effect on April 17. Thank you for your patronage. We look forward to another successful year.

All Ames retirees

-- Every Friday at 10 a.m., retirees from Ames meet at the LeBoulangier restaurant in the Prune Yard in Campbell for coffee and conversation. The Prune Yard is on Bascom Avenue about three blocks south of Hamilton. Come on out and meet with those you worked with for many years. POC: Don Moody, (408) 736-5393.

Events & Miscellaneous

Franklin wins prestigious American Helicopter Society award

The American Helicopter Society (AHS) recently announced that Dr. James A. ("Jack") Franklin of Ames code ARH has been selected to receive the 2000 Paul E. Haueter award. The award will be presented to Franklin at the 56th Annual AHS Forum to be held in Virginia Beach, VA, May 2-4.

The Haueter award is given for significant contributions to the development of Verticle Take-Off and Landing (VTOL) aircraft other than helicopters. It honors an aeronautical engineer, devoted public servant, and AHS officer who was instrumental in fostering the early development of VTOL aircraft in the United States.

Previous award winners include: Dr. Richard Carlson; MG Harold Blot, USMC; the Bell-Boeing/NAVAIR V-22 Team; John Magee; the NASA-Ames 40x80 foot wind tunnel staff; and several industry awardees, including LTV Aerospace Corp., Hawker-Siddeley Aviation, Grumman Aircraft, McDonnell-Douglas Corp., and Sikorsky Aircraft.

Strive to Sustain - Earth Day 2000

Earth Day 2000 promises to have significance around the world by being the largest environmental event in human history. It can transform how we live on Earth and with each other. Approximately half a billion people will participate in Earth Day activities this year. In celebration of Earth Day 2000, Ames' Environmental Services Office, the Ames Environmental Conservation Committee and the Silicon Valley Manufacturing Group, are hosting a one-day symposium and exposition. The lectures and the exhibits are free and focus on cutting edge environmental issues.

Date: Thursday, April 20

Place: Moffett Training and Conference Center, Bldg. 3

Time: 8 a.m. to 4 p.m.

Cost: Free

Events are as follows:

EXPO "Change your energy provider"

--Come to the "Car Show" featuring many of the newest models of alternative vehicles available in California. Try to win an electric bike. View personal electric vehicle conversions. Learn about transportation alternatives. Talk to the regulators. Enjoy the music. Purchase your lunch. Registration is not required. Exhibits are open from 10 .m. to 4 p.m.

Morning session: "New Energy for a New Era"--With the deregulation of the power industry in California, there is growing concern about unintended and undesirable environmental consequences. This has raised the question of how do we, as energy consumers, choose from the many

green energy providers. Addressing this and other questions, each panelist will examine how consumers can make informed choices about switching to renewable energy. Registration is required.

Afternoon session: "Technologies for a Better World"-- Learn what practical steps you can make towards purchasing "green products" at work. Find out how you can prevent pollution, reduce waste generation, and save the Center money. The panelists will discuss what they have done to minimize our footprint on the Earth. Registration is required.

Be sure to be a part of this planetary event. Mark your calendars with the date. Register electronically on the code QE web site at <http://q.arc.nasa.gov> or email: lvlabel@mail.arc.nasa.gov for the symposium or to be an exhibitor at ED 2000.



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