

NRP Post

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Winter 2008

International Space Station National Lab Workshop “Going Where Our Intuition No Longer Applies”

By Kathleen Burton



Marc Uhran, NASA Associate Administrator for the Space Operations Mission Directorate (SOMD), takes questions after his kickoff keynote address at the ISS National Laboratory Workshop.

The Alliance for Commercial Enterprises in Space (ACES), a managing partner of NRP tenant California Space Grant Foundation, together with the NASA Ames Space Portal, hosted a glittering, successful International Space Station (ISS) National Laboratory Workshop Oct. 2-4 in Bldg. 3.

The workshop's goal was to identify and begin to craft a suite of pioneering research to be conducted on board the ISS National Laboratory when it “opens for business” after 2010. In 2005, the NASA Authorization Bill established the ISS as the first U.S. national laboratory beyond Earth, which means the US segment of the Space Station will be opened to new research by other government organizations and commercial companies.

“The field with the greatest promise of new discovery is the topic of our (ISS) workshop. The exploration of space is an iconic example of new discovery,” said Nobel Laureate and workshop Chairman Dr. Baruch Blumberg of the Fox Chase Cancer Center, during the workshop’s opening remarks.

The workshop tackled five key benefits of a national lab in space: enabling discovery, sustaining life through medical advances, benefitting humanity, advancing education and generating new businesses and wealth.

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Apprion Provides “Cheapsat” Communication

By Dr. Peter Fuhr, CTO, Apprion

Apprion, a NASA Research Park Partner involved in the development of integrated wireless infrastructure elements for the secure management of critical systems, has worked with NASA Ames for several years on a variety of projects. In late 2006 Apprion began assisting Ames Small Spacecraft Office development of inexpensive satellite systems. One project, euphemistically called “Cheapsat”, is an Earth imaging satellite using various Consumer-Off-The-Shelf (COTS) components and systems.

Apprion is providing inexpensive high bandwidth communications systems that transfer the satellite images to the ground quickly. In addition, satellite components’ and systems’ health may be monitored using the same bi-directional communications channel and Apprion’s IONosphere network management suite of applications.

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Nobel Laureate on NRP Lecture Panel

NRP presented a panel discussion as part of its ongoing Exploration Lecture Series on Oct. 2 entitled: “International Space Station: Your Lab of the Future.” Panelists included Nobel Laureate Dr. Baruch S. Blumberg, Fox Chase Cancer Center, Dr. Cheryl Nickerson, Associate Professor of Life Sciences, Center for Infectious Diseases and Vaccinology, Arizona State University and Thomas B. Pickens III, CEO SpaceHab, a Texas-based firm that supports manned and unmanned missions to space.

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Google Engineering Director for Google Print, Dan Clancy, introduces panelists at NASA Research Park's Exploration Lecture “International Space Station: Your Lab of the Future.” Panelists included Dr. Baruch Blumberg, Nobel Laureate and Workshop Chairman, Dr. Cheryl Nickerson, Associate Professor of Life Sciences, Center for Infectious Diseases and Vaccinology, Arizona State University and Thomas Pickens III, CEO of SPACEHAB.

NASA Ames Spacecraft to Search for Lunar Water Ice

NASA Ames Research Center will conduct a vanguard robotic mission for NASA's return to the Moon. The Lunar Reconnaissance Orbiter (LRO), to be launched in October 2008, will map the surface of the Moon in unprecedented detail.

The Lunar Crater Observation and Sensing Satellite (LCROSS), developed by NASA Ames Research Center, will fly as a secondary payload searching for water ice in early 2009.

The identification of water is very important to the future of human activities on the Moon. LCROSS' mission objectives are to confirm the presence or absence of water ice in a permanently shadowed crater at the Moon's South Pole.



The secondary payload spacecraft will travel with the Lunar Reconnaissance Orbiter (LRO) satellite to the Moon on the same Atlas-Centaur rocket launched from Cape Canaveral Air Force Station, Florida.

After launch, the LCROSS spacecraft will arrive in the lunar vicinity independent of the LRO satellite. On the way to the Moon, the LunarCROSS spacecraft's two

main parts, the Shepherding Spacecraft (S-S/C) and the Centaur Upper Stage will remain coupled. Rather than enter into a lunar orbit, LCROSS will swing by the Moon and enter a large orbit around the earth where it will circle the earth in preparation for a lunar impact.

As the spacecraft approaches the Moon's South Pole, the Centaur will separate and impact a crater in the south polar region, ejecting a plume from the Centaur crash as the S-S/C heads in towards the Moon. The S-S/C will fly through the plume with instruments to analyze the cloud for signs of water and other compounds. Additional space and earth-based instruments will study the huge plume, which scientists expect to be larger than 200 metric tons.

If there are substantial amounts of water ice hidden in the permanently dark crater at the Moon's South Pole, it could be used by astronauts to make rocket fuel when they later visit the Moon.



LCROSS will search for water and based on data from Clementine & Lunar Prospector Missions.

NRP Welcomes New Tenants

California State University Monterey Bay

Building 19, July 2007

Working on environmental monitoring networks

SGT Inc.

Building 19, December 2007

SGT Inc. is supporting the NASA Ames LCROSS office with its mission to the Lunar South Pole.

21st Century Information Management at UCSC

by Vanessa Binder

Research that benefits society is a central mission of the University of California. At the Jack Baskin School of Engineering, faculty members are working to make an impact in fields where technology is driving rapid change. Today's high-tech industries are not like businesses of decades past. Managers must deal with modern challenges: designing products and marketing in a competitive economy. A new proposed degree program in Technology and Information Management (TIM) will prepare managers for success in this climate. The program emphasizes a "systems approach to optimizing all aspects of high-tech businesses. The goal is producing leaders who keep their companies agile, resilient, and responsive."

Students can pursue a certificate in Knowledge Services and Enterprise Management and/or up to three 5-unit course credits towards a Master's or PhD degree. The TIM program is expected to have an official start date of Fall 2009. Classes are held at UCSC's Silicon Valley Center here at NASA-Ames. All required courses are held on weeknights and are targeted to working professionals.

The School of Engineering is holding a Career Event on Thursday, January 3, 2008, 6:00 pm at the Silicon Valley Center, Building 19, Room 2073 to introduce the Winter Quarter classes that will begin January 7. Come meet the UCSC Professors who will be teaching the following classes, and see an overview of what the Winter quarter classes have to offer. All classes being offered are Masters or PhD level.

ISM-245 Data Mining covers the principles, algorithms and applications of data mining, including mining sequential data, structured data, stream data, text data, spatiotemporal data, biomedical, and other forms of complex data.

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UAV Collaborative at NRP

by Diane Farrar



Assembly of Vector-P in preparation for flight at San Bernabe Vineyard near King City, CA

The UAV Collaborative, under the Directorship of Dr. Stan Herwitz, has been based in the NASA Research Park since 2004. Herwitz's vision for the UAV Collaborative is to showcase data acquisition capabilities of low-altitude UAVs (Unmanned Aerial Vehicles) for saving lives, protecting property and increasing our understanding of the earth and its atmosphere.

He envisions data streaming from 50-100 small eyes in the sky 24 hours a day, aiding the success of challenging missions such as atmospheric sampling, fire fighting and urgent search-and-rescue operations.

According to Herwitz, fuel efficient, reasonably priced UAVs have the potential to stay aloft for significantly longer time periods than piloted craft. Low altitude UAVs flying under 5000 ft. have tremendous potential for effective emergency response and disaster assistance, he said.

Herwitz, formerly Professor of Earth Science at Clark University, MA, is a committed research scientist and educator. As part of the UAV Collaborative's outreach activity, he has provided invited guest lectures at CMU West and San Jose State University, hosted interactive educational events, and offered hands-on internships to university students. Several of these interns have obtained positions with Silicon Valley firms such as Loral and Lockheed Martin.

In 2004 Herwitz established the non-profit UAV Collaborative and signed a Cooperative Agreement with NASA for managing UAV demonstrations and creating collaborative partnerships involving the public, private and academic sectors. The UAV Collaborative's charter includes: (1) supporting research, development and commercialization of UAV technology operating in the National Airspace System; (2) developing UAV programs for education and educational outreach; (3) building general public confidence in UAV technology; and (4) accelerating realization of economic and societal benefits from UAVs and their applications.



Vector-P operational team members and range safety personnel at San Bernabe Vineyard in front of FEMA vehicle, which was used as the UAV Ground Control Station

Examples of UAV demonstrations managed by Herwitz include imaging coffee field ripening during the harvest season in Kauai, HI using a solar-powered UAV, and imaging grape fields at San Bernabe Vineyard using Lockheed Martin's APV-3 UAV (12-ft wingspan). In 2004 the APV-3 was used again in a proof-of-concept mission for the detection of pipeline leakages using a NASA Ames-developed hyperspectral sensor at the Rocky Mountain Oilfield Testing Center (RMOTC) in Wyoming. In 2005 the APV-3 was used as part of an emergency response demonstration in collaboration with the Ames Disaster Assessment Response Team (DART). The UAV flight demonstration over the DART collapsed structure at Moffett Field featured a Lockheed Martin chemical sensor.

In 2005 Herwitz and the UAV Collaborative initiated and managed the transfer of ownership of two Sierra UAVs (20-ft wingspan) from the Naval Research Lab in Maryland to the NASA Ames Research Center. More recently, in 2007, Herwitz initiated and managed the transferral of ownership of Lockheed Martin's APV-3 to the UAV Collaborative. The APV-3 and the two Sierra UAVs are currently housed in Hangar 248 at NASA Ames.



Vector-P UAV taking off in April 2007

The UAV Collaborative works closely with the Range Safety Office at NASA Ames in preparing and submitting applications to the FAA for Certificates of Authorization (COAs), enabling FAA-approved UAV flight activity. The UAV Collaborative also is working closely with the Human Factors Group at NASA Ames on a long-term study of UAV maintenance.

More recent UAV flight demonstrations involving the UAV Collaborative include a communications relay payload over a controlled burn for the U.S. Forest Service at Fort Hunter Liggett using the APV-3, and a return to San Bernabe Vineyard for a test of a video payload on the Vector-P.

Herwitz envisions significant opportunities for UAV pilot training as UAV technology continues to advance. Completion of private pilot ground school training is required to become a certified UAV pilot, said Herwitz. He maintains that students having an understanding of flight safety and the hand-eye coordination skill of video gaming may emerge as the next generation of UAV pilots. The UAV Collaborative continues to further develop its UAV pilot training program.

Yuri's Night at NASA Ames Research Center

by Jessica Culler



On April 12, 2007, over 4,000 people from the communities near Moffett Field, CA, and some from further away, converged at NASA Ames Hangar 211 for a ten-hour celebration of space exploration, music, science, art, and technology.

For Yuri's Night 2008 we hope to double the number to 8,000 people, with a 2 pm to 2 am event on April 12, with the theme Radical Sustainability. During daylight, Bay Area organizations are invited to hold salons and demonstrations throughout the NASA campus to build cross-community awareness and support for both technical and artistic groups, and the many that overlap. At dusk, the true Yuri's Night World Space Party will begin, expanding on last year's unique integration of music and art installations, hosting distinguished space speakers and technical demonstrations, and linking up with parties across the nation and the Earth in a celebration of exploration.

We hope Yuri's Night Bay Area 2008 will be the world's largest and most successful Yuri's Night event to date. Our event will be far more than a party. We are planning a holistic educational and inspirational experience -- unifying our participants and evoking a new sense of wonder, excitement and optimism. We believe this unique event is a distinctive opportunity for sponsors to support positive images of scientists and engineers, for placement and demonstration of products and research at a technology leadership event, and to show support for the local community and culture.



NASA Ames Hangar 211, Credit: Scott Beale



NASA Ames Airfield, Credit: Scott Beale

You could assist the mission of Yuri's Night Bay Area in several ways. If organizations are interested in exhibiting, sponsoring, hosting day meetings or salons, or otherwise partnering -- please let us know and we'll start working with you right away. There are many diverse benefits to sponsorship and partnership, and we'd love to showcase our NRP partners during both day and evening events.

If individuals are interested in volunteering outside of work on teams organizing art, deco, music, performers, vending, general logistics, etc., or as general event staff, please contact us and we'll sign you up and get you in on the planning.

For more information contact Jessica Culler (Jessica.S.Culler@nasa.gov), Matt Hancher (Matthew.D.Hancher@nasa.gov), James Busby (James.Busby-1@nasa.gov) or info@worldspaceparty.com. Also, visit www.worldspaceparty.com.

Kentucky Space Express Mission Update

On December 5th, 2007 at approximately 9:06am MST, KySat Space Express achieved a successful liftoff from White Sands Missile Range in New Mexico. While all of the Kentucky Space Express systems operated successfully, shortly after launch the vehicle suffered a catastrophic failure and the KySat payload was not able to reach the target altitude in space.

Despite that, the KySat Space Express student team and mission advisors are extremely pleased with the performance of the student designed systems and payloads.

The team has conducted an initial debrief with White Sands officials and the launch vehicle providers to assess the mission.

KySat thanks the Space Express student team and mission advisors for their incredibly hard work and the performance of their systems and

payload. The design and successful integration of the Space Express payload was, despite the failure to reach the targeted altitude of 127km, an essential step in the continued development of the initiative including first orbital mission, projected to launch in mid to late 2008.

The Space Express payload was carried aboard a Shadow ID rocket provided by Lunar Rocket and Rover Company based in Los Alamitos, California. The primary objective of Space Express was to test subsystems and processes being developed for future orbital KySat missions now in development.

The Space Express payload configuration included:

- Electrical Power System
- Command and Data Handling System
- Communication System
- Telemetry System

The mission was monitored and tracked by three (3) KySat designed ground stations and the radar array at White Sands Missile Range. Approximately twelve students plus various faculty/mission advisors from member KySat organizations traveled to White Sands as part of the launch team.

KySat Enterprise Members include: University of Kentucky; University of Louisville; Morehead State University; Murray State University; Western Kentucky University; Kentucky Space Grant Consortium, Kentucky Council on Postsecondary Education; Kentucky Science and Engineering Foundation; Kentucky Science and Technology Corporation (Managing Partner, co-located at NRP) and Kentucky Community and Technical College System.



Photo from payload integration captured Tuesday, December 4th. The launch vehicle did not reach its targeted 127km altitude, but the student designed payload successfully sent in-flight data.

Complete mission details along with visuals of the Shadow 1D launch vehicle, a view from space at the approximate altitude Space Express is expected to achieve and names and photos of the KySat student design teams are available at <http://www.kysat.com>.

Photozig Albums Express Receives “Killer Download” Award

Market Watch

As digital cameras become better and less expensive (e.g. some 7.1 megapixel cameras cost less than \$200), more and more people are adopting this technology and taking thousands of pictures, but how to manage, display, and share your best shots?

According to The Daily Download of CNET, there are a number of online sites that do a nice job of presenting your pictures, “but if you want to keep your work local before pushing it out to the Web, want to post pics to your personal site, or want a few more customization options, a downloadable program might be your best bet.” (Source: The Daily Download article entitled “Killer Download: Get your photos on the Web for free” dated Sep 25 2007)



“Some of the best programs for displaying digital photos offer several options for presenting your pics, with simple methods for creating slide shows, customizable Web pages, and the ability to send your albums via e-mail or on a CD. Each of these apps has options for some or all of these features, but you’ll need to surrender an e-mail address to sign up for an included Web service. Maybe the best thing about these killer downloads (and their respective Web sites), is that they’re all free.”

The program on the top of the list of “Killer Download: Get your photos on the Web for free” was Photozig Albums Express. According to independent review of CNET Killer Download: “Photozig Albums Express offers a step-by-step process so you can design your project from start to finish. Large button icons with descriptions make it easy to start your project and select your preferred output for your images, including sending in e-mail, burning to CD, or uploading to a Web site. There are several skins to choose from that match the colors of specific holidays or you can choose skins to fit a certain color scheme. Large icons and a structured project path make easy to start your project and follow the process.”

Photozig Albums: create, organize, enhance, and share photo albums and slideshows via the Web and CDs. A free download of Photozig Albums is available at www.photozig.com.

Moffett Field Museum

by Bill Stubkjaer, Museum Curator



Left to right: Bob Lopez, NRP Account Manager, John Ellis, Bill Stubkjaer, Museum Curator, Gloria Perlett, Eugene "Frenchie" Choiniere, Bernie McDonough, MFHS President Photo courtesy of Sagar N. Pathak

For a fascinating and informative step into the earliest days of Moffett Field, visit the Moffett Field Museum in Bldg. 126 on Severyns Avenue, NASA Research Park, Wednesday thru Saturday, 10 a.m. - 2 p.m. Admission is free and the staff is friendly.

<http://www.moffettfieldmuseum.org/>

The Moffett Field Historical Society, formed in May 1993, created the Moffett Field Museum in 1994. The museum, managed and staffed entirely by volunteers, was originally located in the west



Macon at Hangar 1

side of historic Hangar One. This location was closed by NASA in January 2002 due to contamination in the Hangar One structure, and in May 2003 Hangar One was closed permanently due to contamination.

The Society obtained the use of Building 126 in NASA Research Park and reopened in its new spaces on April 12, 2005. The museum continues to look for photographs and other artifacts relating to the history of Moffett Field and all of the tenants based at Moffett Field and NASA Ames Research Center.

The following is from the pamphlet Moffett Field 60th Anniversary, 1933-1993:

"The creation of Moffett Field is a story linked to the birth of a new period in American aviation - the lighter-than-air craft era - which began with an idea about 70 years ago. Germany had found success in using giant airships for scouting purposes during World War 1, and the U.S. did not want to be left behind.

These were the days before radar, and dirigibles had the capacity to scout large areas of land or sea for long periods, longer than any other aircraft at the time. At first, the Navy had just two rigid dirigibles, the most famous being the USS Shenandoah. But the career of the Shenandoah, as with many of its predecessors, was short-lived. The cigar-shaped airship was torn apart in a severe thunderstorm over Ohio on Sept. 3, 1925, claiming the lives of 14 officers and crewmen. The demise of the ship added fuel to a growing controversy about the military effectiveness of dirigibles.

"When I first came in contact with rigid airships, I couldn't see anything to them," said Rear Admiral William A. Moffett, chief of the Navy's Bureau of Aeronautics in 1926. "It is noteworthy that every officer who has anything to do with these ships ... is in favor of them and thinks they will be of great value to the Navy." The advocates of this new-found technology won out. In 1926, the Navy announced that it was going to build two new airships, both larger and stronger than the Shenandoah. They would become the Akron and the Macon.

The Navy launched a search for a West Coast place to base one of the two ships. In an attempt to better their chances of receiving the base, Santa Clara, San Mateo, San Francisco and Alameda counties set up a financing program to buy the land and donate it to the Navy for the purposes of building an air base. San Francisco raised \$330,000, while Santa Clara County communities contributed most of the remaining \$100,000 to buy the land.

The communities eventually purchased 1,000 acres of the bay side property for \$476,066. Still the Navy had not made up its mind. After discarding dozens of possible West Coast sites, the choice was between Camp Kearny and the Bay Area. The competition ended in December. Two months later, President Herbert Hoover, himself a product of Stanford University, signed the bill that authorized the Navy to accept the Mountain View property for one dollar and appropriated \$5 million for construction on the base to begin as soon as possible.

Noted a San Francisco Chronicle editorial at the time: "What has been done with Sunnyvale is an example of what Northern and Central California can do when they play the game." For the Peninsula, the construction of the Naval base was

a boon in bad times. It meant an average of 500 construction jobs a month in a time when jobs were hard to come by. Merchants in local communities also looked forward to the purchasing power that would come with the 500 people expected to be stationed at the base upon its completion.

As excited as the Bay Area was to see the massive airships, the local interest in the construction of its storage hangar Hangar One - was almost as great. The hangar, 211 feet high, would be taller than all the buildings in the South Bay except one, the Bank of America tower in San Jose. The base also would be equipped with a massive nine-story mooring mast responsible for grabbing the giant airship by the nose and leading it in and out of the hangar on tracks.

The hangar was still under construction when the Bay Area got its first glimpse of the kind of monster for which it was intended. Despite a veil of fog that had settled on the San Francisco Peninsula, it was a carnival-like scene at the Mountain View-Sunnyvale border on the morning of May 13, 1932. More than 100,000 people - enough to fill Stanford Stadium - packed the bay side fields where they huddled in cars and sat in bleachers set up by concessionaires. Sixty-five state troopers were called in to handle the traffic on the still-uncompleted Bayshore Freeway where cars inched ahead four abreast en route to the site.

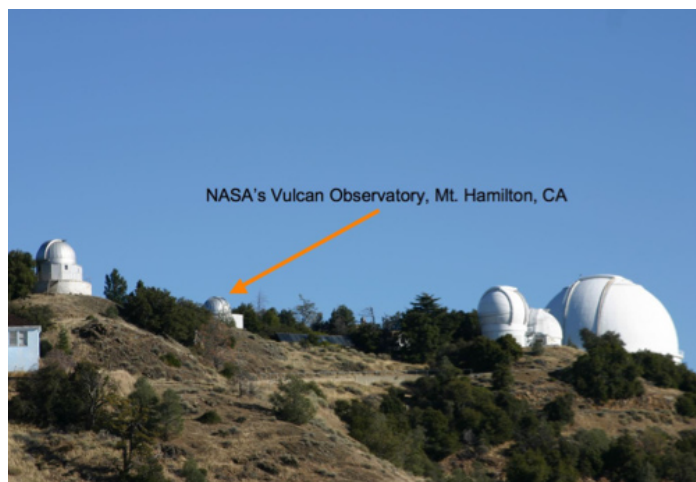
The crowd had assembled by the bay to greet a Navy aircraft carrier that was due to dock any time that morning. But this new ship would not be arriving by water. Suddenly, about 7 a.m., the recently completed USS Akron, which would be based in Lakehurst, N.J., dropped ghostlike out of the clouds. The silver dirigible stretched across the sky, two and a half times the length of a football field. The crowd cheered. "It was a never-to-be-forgotten sight" noted a Palo Alto Times story.

This would be the first and last time the Akron would visit the base. Less than a year later on April 4, 1933, the "sky-queen" got caught in heavy storm winds and crashed off the Atlantic Coast, killing 73 of the 76 officers and crew on board. Among those lost was Admiral William Moffett. Eight days later, a somber crowd gathered at the base, and Sunnyvale Naval Air Station was commissioned. Acting Commanding Officer M.J. Walker concluded the ceremonies by giving the non-famous orders to a deputy officer named D.M. Mackey, "Enter in the log that the Sunnyvale station is placed in commission at 11:30 a.m. Set the watches and pipe down."



On Feb. 12, 1935, the 785-foot-long Macon -- the largest and last built rigid dirigible in the United States -- was traveling at 80 knots, 100 feet above the water when winds around Point Sur, California knocked off the tail fin. The Macon drifted toward the choppy seas and sank.

Cheapsat continued from front page



As a "proof-of-concept," Apprion and Ames installed communications components at the NASA Vulcan Observatory on Mt. Hamilton, and at Ames. This 50+ Mbps communications channel carries live video from a camera at the observatory, and provides a Voice-over-IP telephony connection through a secure wireless 802.11 "cloud" layered over the observatory. Sensors have also been deployed at the site, allowing the "triple-play" of voice, video, and data to be simultaneously transmitted through the network. Network management and monitoring is performed 40+ km away, in Apprion's Bldg. 19 site and in Ames Bldg. 240.

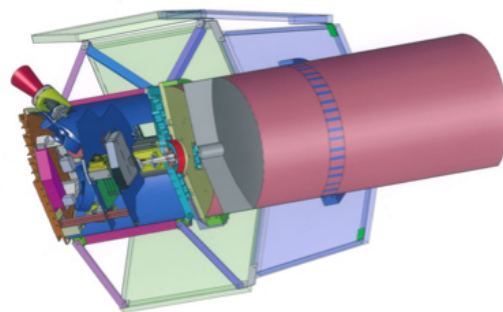


Illustration of Cheapsat Configuration

The IP-addressable nature of the network management application is well suited for Cheapsat, or similar satellite systems, and will allow ground-systems to easily monitor the satellite's system status and health while simultaneously being able to examine the imaging feeds. This integrated network management and visualization tool makes it much easier for individuals to perform functions previously done by multiple individuals, systems and displays.

For more information on this effort, please contact Dr. Peter Fuhr, Apprion, Building 19, Suite 1000, v: 650-934-5700, e: peter.fuhr@apprion.com.

UCSC continued from page 2



UCSC Professor Subhas Desa with Management of Technology students

ISM250: Stochastic Optimization of Information Systems & Technology Management: This is the first in a sequence of courses in Technology and Information Management. The objective of the course is to provide students with a systematic methodology and the corresponding set of methods and analytical tools to address the field of Technology and Information Management in an integrated manner. Topics covered will include a subset of quantitative marketing, including information search and retrieval using linear algebraic methods, data mining in product development and in supply chain management and e-business, constrained optimization and risk management in product development, planning and financial engineering, basic queuing and time responsiveness in enterprise level problems

ISM-270 Service Engineering and Management: This course is a thorough introduction to service engineering and management, from the role of services in the global economy to analytical models in service operations management. This is a rapidly developing field, and the material will cover fundamental principles of services as well as recent research developments in the field. Topics include designing efficient service networks, forecasting, resource allocation, and globalization.

ISM280S Seminar on Special Topics 1 Seminar participants will discuss a current research topic. The topics will follow a theme throughout the quarter, focusing on a specific aspect of TIM research. The theme of research presented throughout the course will be selected by the instructor. Topics may include, but are not limited to, knowledge management, service engineering and management, text and se-

mantic mining, financial engineering, enterprise resource planning, new product development and management of technology. The seminar material will be prepared and presented by faculty, visiting scholars and students.

Two additional classes that the Baskin School of Engineering will be offering are in Computer Engineering which offers a Master's degree with emphasis on Network Engineering:

CMPE-250 Multimedia Systems, A study of state-of-the-art technology in data processing and communication requirements for networked multimedia systems

CMPE-256 Project in Computer Networks, This project based course is a capstone for the program. It helps students tie together what they have learned in the other program courses by applying these concepts to a practical problem or project.

In today's "Information Age" companies must design effective information systems that give managers the right information, in the right form, at the right time to help them make better strategic decisions. Come join us for this event and meet our professors who will share their technological expertise in helping you better understand these concepts.



UCSC Professor Ram Akella teaching Knowledge Services & Data Analytics at Silicon Valley Ctr.

If you are interested in attending or have questions regarding the forum, contact Lucia MacLean at 831 459-1384 (lmaclean@soe.ucsc.edu) or Vanessa Binder at 650 528-4030 x-146 (vbinder@soe.ucsc.edu)

ISS continued from front page

Keynoter William Gerstenmaier, NASA Associate Administrator for the Space Operations Mission Directorate (SOMD) and the senior executive responsible, emphasized the discovery possibilities ahead for both the Space Shuttle and Space Station during his keynote address. "...We are opening up the U.S. segment of the Space Station to be used by both governmental and commercial organizations. We want to take maximum advantage of this unique laboratory in the sky, but we need you to be creative in how we use it," he said to attendees. "Forget scientific disciplines and organizational barriers. With unprecedented access to this facility, let's begin to discover what amazing research and development (we can) accomplish 220 miles in low Earth orbit."

Attended by 175 people from both inside and outside NASA, the workshop had "quite a few 'wow' moments," according to the event's creative force, Lynn Harper, Lead, Integrative Studies at the Space Portal. "The ISS Workshop was chaired by one of the greatest medical life savers in history, Dr. Baruch S. Blumberg, who won the Nobel as co-inventor of the Hepatitis B vaccine, which is the most widely used vaccine in the world and the first vaccine to prevent a cancer (liver cancer)," she said. Harper also noted other highlights during the three day event: a keynote by Dr. Craig Venter, a visionary technical and programmatic leader of the Human Genome Project; a panel featuring Venture Capitalists representing over \$50 billion in assets; a keynote by NASA's Associate Administrator for the SOMD, Mark Uhlan; a panel moderated by senior staff from California Senator Barbara Boxer's office and a taped presentation by Texas Senator Kay Bailey Hutchison. "It was an amazing, exceeds-our-expectations event," Harper said.

Harper noted that the Workshop was co-sponsored by NASA Ames Research Center, Adobe Systems, BayBio, BINRIDI, Google, Planners Collaborative, Joint Venture Silicon Valley Network, Silicon Valley Space Club, Universities Space Research Associates and the University of Santa Cruz University Affiliated Research Center.



Michael Marlaire, Director, Partnerships Office, NASA Ames Research Center



Dr. Venter, a leader in human genome research, addresses the ISS Workshop.

Among other Workshop highlights were presentations made by three NASA Astronauts – Dr. Larry DeLucas, Dr. Don Pettit and Mario Runco. The three provided compelling arguments for the value of the space environment for pharmaceutical development, monitoring global climate change and exploring new areas of fundamental physics and materials development.

Pettit, who spent over five months as an Astronaut on the ISS, completing two EVA spacwalks to continue external outfitting of the orbital outpost, gave the lunch-time keynote on the second day of the Workshop with a demonstration of unscripted 'discovery' science he performed on the ISS. "This is why we go to frontiers ... and space is certainly a frontier ... to go someplace where our intuition no longer applies," he noted.

Another high point of the workshop was a Biotechnology panel moderated by Adrienne Bousian, Deputy State Director, Office of the Honorable Barbara Boxer, U.S. Senator from California. During the panel's presentation, Dr. Cheryl Nickerson of the University of Arizona presented recent research that showed the value of the ISS

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Carnegie Mellon West Grads Toss Hats at NRP

Carnegie Mellon West celebrates the fifth anniversary of its successful Master's of Software Engineering program with 116 students receiving degrees on August 11, 2007 at a ceremony at the NASA Research Park, Mountain View, CA campus.



August 11 graduation ceremony at Building 23, NASA Research Park

Drew Perkins, a 1986 graduate of Carnegie Mellon and chief technology officer at Infinera Corporation, gave the keynote address.

Formerly a principal architect at FORE Systems, Inc., Perkins invented point-to-point protocol (PPP) and several other early Internet technologies while working at Carnegie Mellon in the 1980s. The recipient of an alumni achievement award from Carnegie Mellon in 2005, he has been an active developer of networking standards throughout his career.

Ren Bitonio, winner of an Outstanding Service Award from the university, said the master's program enhanced with the unique learn-by-doing-in-sandbox methodology is a great complement to the technical work he does at Yahoo.

"My taking this educational opportunity to become a software leader at Carnegie Mellon West is definitely one of my best life decisions," said Bitonio. "As I reflect on the past two years, I am very grateful for receiving the very fine education from Carnegie Mellon West and forging the valuable and meaningful relationships that will continue past my years at the campus."

Located in the heart of Silicon Valley, Carnegie Mellon West continues the tradition of offering world-class professional graduate programs in software engineering and software

management, meeting the needs of working professionals. A team-oriented, project-based curriculum provides the opportunity to learn invaluable skills and then immediately apply what is learned to actual work situations.

Within the Master's of Software Engineering program, 56 students are graduating from the program management track; 22 students from the development management track; and 28 students from its technical track.

Ten students are graduating from Master's in Information Technology program.

Carnegie Mellon Tartan Racing Wins DARPA Urban Challenge and goes for Lunar X Prize

A self-driving 2007 Chevy Tahoe called Boss earned Carnegie Mellon's Tartan Racing first place \$2 million prize in the Nov. 3, 2007, DARPA (Defense Advanced Research Projects Agency) Urban Challenge.

Boss was the fastest competitor by a large margin, averaging about 14 miles an hour over approximately 55 miles, and finishing about 20 minutes before the second-place finisher, Stanford University. Boss followed California driving laws, navigating the course of suburban/urban roadways at the former George Air Force Base in Victorville, CA. Racing against 10 robot competitors, Boss drove swiftly and safely, sharing the road with human drivers.

"Robots sometimes stun the world, inspire a lot of people and change beliefs about what is possible," said William "Red" Whittaker, a Carnegie Mellon robotics professor and team leader of Tartan Racing.

"Once the perception of what's possible changes, it never goes back. This is a phenomenal thing for robotics," said Whittaker, who spoke at NASA Research Park in 2005.



Boss wins \$2 million for Tartan Racing

Tartan Racing gained experience in two previous DARPA Grand Challenge robot races and built on the expertise of Carnegie Mellon's Robotics Institute, one of the largest robotic research and education organizations in the world. In addition to GM, Caterpillar and Continental AG, Tartan Racing's

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Carnegie Mellon Appoints Dr. Khalid Al-Ali Director of Research at West Coast Campus

by Diane Farrar

Founder of the Carnegie Mellon Innovation Lab (CMIL) in 2003, Dr. Khalid Al-Ali has been selected as Carnegie Mellon West's new Director of Research. CMIL creates compact, highly capable mobile autonomous vehicles covering ground, air and space operations. As principal investigator and project lead, Al-Ali collaborates with NASA Ames and NASA Jet Propulsion Laboratory on advanced aircraft and spacecraft control systems, intelligent avionics, novel power systems, planetary rovers and robots, spacecraft and autonomous vehicles for lunar, martian and Antarctic missions. Ames and JPL use some of these platforms as test beds for technology research, and as educational tools to engage students in robotics, science and engineering. Al-Ali is the principal UAV test pilot for the Adaptive Control and Evolvable Systems Group at Ames.



Khalid Al-Ali

The recipient of numerous awards and patents, Al-Ali's work has produced breakthroughs and methodologies that became "best practices." While a scientist at the Universities of Colorado and California, he led efforts in robotics, controls, acoustics for multi-media systems, space shuttle payload and medical systems. Dr. Al-Ali is the principal inventor of a US and worldwide patented technology involving advanced control systems for nonlinear acoustic devices.

Carnegie Mellon West & NASA Collaborate on Sub Vocal Control

Al-Ali and NASA Ames researchers Dr. Chuck Jorgensen and Corey Ippolito, Intelligent Systems Division, Exploration Technology Directorate, collaborated on a new application of Jorgensen's technology.

Jorgensen developed skin-attached electrodes that record electrical impulses en route to muscles, prior to muscle movement. Attached to the larynx, the system translates and relays these impulse signals as sub vocal commands. These signals can then either be processed as voice commands through a text-to-speech processor, or directly command devices such as rovers.

CMIL's star low-cost rover MAX was the world's first rover to be controlled using sub vocal speech, and was recently featured on the History Channel's Modern Marvels program ("The Telephone").

"We are proud of our innovation in sub vocal rover control," said Al-Ali. Sub vocal control of robotic rovers opens the door to making human-robot interaction more seamless," he said.

NASA needs the advantage of sub vocal commands for effective communication in noisy environments, especially where speech recognition technologies are planned as in Astronaut EVA suits. Fire fighters and SWAT teams also could benefit from sub vocal control technology.

On September 13, 2007, Ames' Kalmanje Krishnakumar and Corey Ippolito, with Carnegie Mellon West researchers led by Al-Ali, successfully completed flight tests for a distributed reconfigurable autonomous landing controller in a collaborative multi-vehicle system. Comprised of a small-scale autonomous unmanned aerial vehicle coordinated with an autonomous unmanned ground vehicle, the system is part of the Polymorphic Control Systems (PCS) project investigating the use of wireless technology for adaptability and robustness through multi-system reconfiguration and coordinated control in a multi-agent environment.

Building on the award-winning 2006 NASA-Carnegie Mellon West Atacama Rover Mission, two autonomous vehicle systems from NASA Ames Adaptive Control and Evolvable Systems (ACES) group took part in the exercise: the Exploration Aerial Vehicle (EAV) and the Mobile Autonomous eXplorer (MAX) unmanned ground rover, built by Carnegie Mellon West.

The EAV is a low cost experimental aerial test platform built from commercial off-the-shelf technologies (COTS), including commercial-grade GPS, MEMS-based sensors, and Intel-based processors, which are insufficient to conduct autonomous landings because of altitude measurement inaccuracies. MAX, a four-wheel small-scale rugged all-terrain ground vehicle test platform, also built with COTS technologies, provides a suite of sensing capabilities, including stereoscopic vision sensors.

During the autonomous landings, the EAV reconfigures its onboard controllers to use MAX' vision sensors and processing capabilities, hosting vision-based tracking algorithms, closing real-time control loops around the ground-based sensors to overcome the inaccuracies of the onboard sensors, and guide the aircraft to a safe landing.

The Polymorphic Control Systems project provides a model and methods for autonomous agents to coordinate control strategies and reconfigure controller topologies across networks that span multiple agents and systems. These flight experiments demonstrated an instrument-style approach and landing on uninstrumented vehicles, at uninstrumented landing sites, by utilizing and coordinating robotic resources in the local vicinity, communicating over secure wireless communication networks.

CMIL's Award Winning Research Faculty

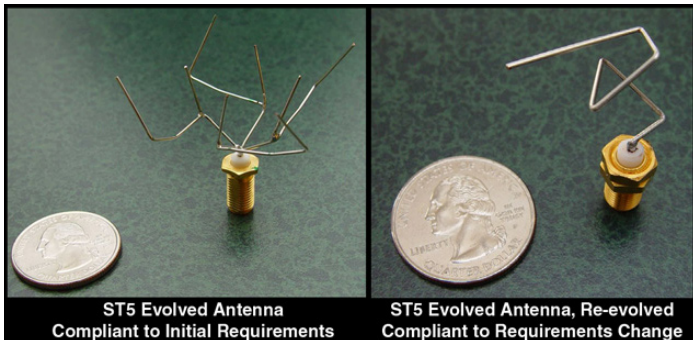
Dr. Jason Lohn is a Senior Research Scientist at Carnegie Mellon University. He has worked at Google, NASA Ames Research Center, Stanford University, and IBM Corporation. He received his M.S. and Ph.D. in Electrical Engineering from the University of Maryland at College Park and his B.S. in Electrical Engineering



Jason Lohn

from Lehigh University. He led research in Evolvable Systems while at NASA and was closely affiliated with the field of evolvable hardware -- the study of how simulated Darwinian evolution can be used to design and configure electronic and mechanical hardware. He co-founded

and chaired a series of successful NASA/DoD evolvable hardware workshops and conferences. He led a team of scientists and engineers to successfully evolve, develop and fly three evolved X-band antennas in space aboard a NASA mission in 2006.



His main interests are to research and develop search algorithms that can automatically design and optimize hardware systems to achieve increased performance and reliability in application areas such as electromagnetics, microelectromechanical systems, robotics, and spacecraft design. Dr. Lohn is a member of the IEEE, ACM, Sigma Xi, and Phi Kappa Phi. He has over 40 technical publications and has made contributions in automated hardware design, self-replicating systems, parallel processing, and neural networks. His other research interests include self-assembling systems, robotics, and biological computation. Dr. Lohn serves as an Associate Editor of IEEE Transactions on Evolutionary Computation.

Dr. Vadim Kotov Dr. Vadim Kotov joined Carnegie Mellon West in 2002 as Director of Engineering at the High Dependability Computing Program, a \$23.3M NASA-funded multi-disciplinary, multi-institutional program to improve NASA's capability to create dependable software. With expertise in high-performance and high-dependability systems -- concurrency theory, parallel programming languages and computers, mission-critical embedded systems and large-scale enterprise IT systems -- he conducts research to improve software dependability.



Mars rover Rocky 7 with Java software

His main projects with NASA include:

- Dependability of real-time Java for future Mars rover software.
- Dependable next generation air-traffic management software
- Dependability and performance of Java messaging for the NASA Deep Space observation network.
- Evaluation and calibration of tools for verification and validation of ground and flight software.

Dr. Kotov has authored more than 160 publications, including three books, and is an invited and keynote speaker at top-tier conferences, an awardee of the IFIP Silver Core award, a member of editorial boards of Information Processing Letters (1986-1994), Journal of Parallel Programming (1987-1995), Theoretical Computer Science (1988-



Vadim Kotov

1992), Parallel and Distributed Computing Practices (1994-2005). Dr. Kotov is a member of the Russian Academy of Sciences and the Russian Academy of Natural Sciences.

CMIL's Award Winning Research Faculty

Dr. Scott Howe, with CMIL, has PhDs in architecture and mechanical engineering, and specializes in construction robotics for planetary surface and orbital space environments. Involved with automated construction research for a decade, he first proposed robotic assembly and maintenance strategies for buildings in his master's thesis. In 1998 he began research with Kajima Corporation, Tokyo, Japan, on a variety of automated construction concepts, including the working prototype AMURAD that constructed several buildings.



Reconfigurable rover using the Trigon modular robotic system
(Credit: Chris Howe Design)

Dr. Howe, as an assistant professor at University of Oregon (3 years) and Hong Kong University (6 years), developed curriculum in architectural & engineering design, digital media tools & process, construction process & engineering, scientific method in design, and extreme structures. He is involved in the growth of the new aerospace field “space architecture” that studies engineering intensive approaches to construction in extreme environments like orbital space or planetary surface environments. Dr. Howe continues research with next generation Japanese robotic construction systems “IF7 Field Factory”, “Digiosk” robotically deployed kiosk, conceptual “Birdhouse” robotic assembly, “Cubolding”, and “Trigon” modular robotic self-assembly systems. Visit his design projects, research, publications, and teaching at: <http://bureau.west.cmu.edu/~ash>

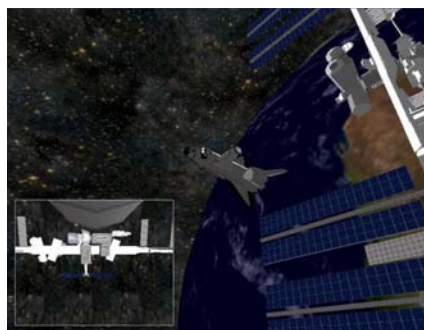


Truss design using Transformable Robotic Infrastructure-Generating Object Network (TRIGON)

Corey Ippolito is a member of the Adaptive Controls and Evolvable Systems (ACES) Group in the Intelligent Systems Division at NASA Ames Research Center, and an honorary Deputy Director of Engineering at CMIL. He has worked with NASA Ames' Haughton-Mars Project and the Biologically-Inspired Engineering for Exploration Systems (BEES) for Mars. As Lead Engineer on the Ames' Exploration Aerial Vehicles (EAV) and the Polymorphic Control Systems (PCS) projects, he developed traditional control systems for unmanned aerial vehicles and ground-based autonomous unmanned vehicle system, and non-traditional controllers for Mars exploration aerial vehicle concepts. An active researcher in Control Systems and Artificial Intelligence, he formulated a mathematical framework for developing emotion-based controllers in machines.



Corey Ippolito



Shuttle Docking Simulation

Corey has over ten years of experience in control systems design, computer architecture design, physics-based modeling and simulation of rigid-body and flexible structures, software engineering methodologies, graph theory, and computer graphics and animation. His major accomplishments include large-scale software designs and implementations such as the Reflection Architecture for distributed embedded systems development and simulation, the Cognitive Emotion Layer Architecture for machine intelligence, the Perception Physics Engine for constrained rigid bodies and soft-body physics simulations, the Reconfigurable Flight Simulator at Georgia Tech for the management of shared distributed development of flight simulation technologies, and the Self-Assembling Brokering Object Architecture for automating and verifying the assembly of component-based simulation modules.



MAX Rover Simulation



PCS Final Flight Group Shot

Corey worked with the video entertainment industry, providing physics simulation software and optimized 3D graphics and animation engines, and has published and given presentations on topics including software engineering techniques and smart hardware sensor design using emotional constructs.

DARPA continued from page 11

sponsors include Intel, Google, Applanix, TeleAtlas, NetApp, Vector CANTech, Ibeo, Mobileye, HP, CarSim, CleanPower Resources, M/A-Com and McCabe Software.

According to Whittaker, his team will use the \$2 million award to “win the Google Lunar X Prize Challenge.” He is now establishing a team to land and operate a robot on the moon by 2012 to capture the \$20 million challenge announced Sept. 13 by the X Prize Foundation and Google Inc.

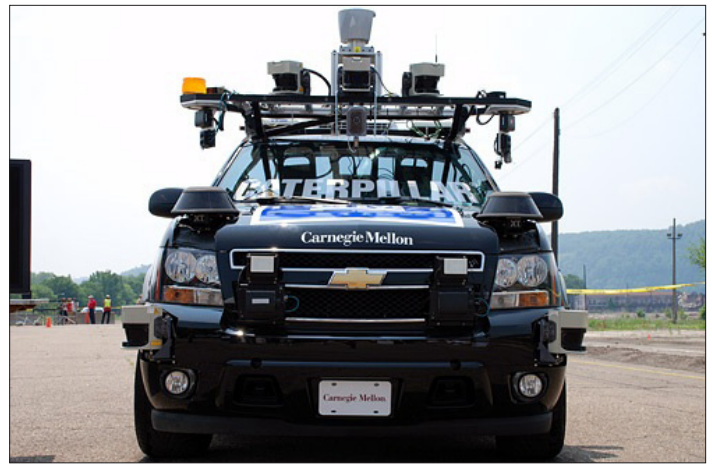
The Google Lunar X Prize, www.googlelunarxprize.org/lunar, is the richest international competition in history, with a total purse of \$30 million. To win the \$20 million grand prize, a team must drive a robot for at least 500 meters on the lunar surface and transmit images to Earth. This will be the first private off-planet exploration.

“Planetary exploration is a dream,” said Whittaker. “We have spent decades building and testing robotic technologies for just this purpose, so combining lunar rovers with a competitive race to the moon is a great opportunity.”

The moon will severely test robotic technology, more so than Mars. “At noon, it’s hotter than boiling water and the lunar night stays colder than liquid nitrogen for two solid weeks,” he noted. “Moon robots also risk harsh radiation and lunar dust, which has microscopic jagged edges that can rapidly clog joints and seals.” Because the moon is so close to Earth — only three seconds away for radio communication — it will be possible to deliver streaming video and two-way interaction. “Public access, made

available through innovative corporate sponsorships, could be a breakthrough for the first-ever private robot on another body in space,” he said. Commercial sponsors will be able to take ownership of innovative features, such as the first video feeds from the moon or have an opportunity to take the wheel and explore the moon independently.

Whittaker is looking for partners with experience in launching spacecraft and landing payloads, and veterans of engineering challenges posed by lunar exploration. A web site at www.LunarRover.org explains the team’s plans for winning the Google Lunar X Prize. The team contact is Michele Gittleman at 412-268-6556 or michgitt@cmu.edu.



Boss, a self-driving Chevy Tahoe

The Lunar X Prize includes an additional \$5 million for bonus achievements: imaging Apollo or other manmade artifacts, driving for more than 5 kilometers, surviving a lunar night and/or discovering water ice. If the rover mission is not accomplished by the end of 2012, the first prize drops to \$15 million. The competition may be terminated if no one achieves the challenge by the end of 2014. A \$5 million second prize is allotted for a second team if successful prior to 2014.

“This is a tremendous opportunity to pioneer the endless frontier, and I am excited that Carnegie Mellon will be there,” said Jay Apt, a former NASA astronaut who is now an associate research professor at Carnegie Mellon’s Tepper School of Business and a Distinguished Service Professor in Engineering & Public Policy.

“This challenge is a thrilling thing for space exploration and a thrilling thing for robotics,” Whittaker said. “It’s inevitable that someone will find a way to win it. Regardless of who takes home the cash, this achievement will enrich us all.”

ISS continued from page 9

for combating infectious disease. Recent experiments flown by Nickerson on the space shuttle showed that salmonella bacteria grow deadlier when freed from Earth's gravity. Her team's results appeared recently in the Proceedings of the National Academy of Sciences. Other biotechnology panelists discussed the use of ISS for tissue engineering, for a better understanding of organ disease and aging and for launching a new generation of nano-scale medical tools.

The Workshop also featured as a keynote speaker genome pioneer Dr. Craig Venter, one of the most important technical and programmatic leaders of the Human Genome Project. The visionary Venter -- whose round-the-world yacht voyage discovered an array of new genes and new gene families in the world's oceans, including 6 million new proteins -- proffered the idea of sampling human astronauts to see how biota, including bacteria, are affected by space flight.

"We have a hundred trillion human cells and probably an equal number of bacterial cells in our bodies. You can't describe the human body assuming we are a sterile organism," he said. "We depend on these bacteria and they depend on us. We have been using new techniques (recently) for sampling the biota of (human) body cavities, and one of the things we have talked about with private space groups is to conduct this sampling on private astronauts before, after and perhaps even during their trips (to space) to understand how this entire range of biota may be affected by a space flight," he said.

A commercial and private investor perspective on using the ISS as the first in-space national laboratory was offered by a group of venture capitalists representing over \$50 billion in assets including Thomas Pickens III, CEO of SPACEHAB, Tom Stedding, author and senior corporate executive of several high tech companies, Petter Kleppan, Managing Partner and founder of NORROC, Alan Marty, investment consultant to NASA and Russ Hancock, President and CEO of Joint Venture Silicon Valley Network.

"You need three things to make a commercial model (for Space Station users): Demand, Supply and Capital," said Marty. "If you don't have all three of these, you don't have a commercial model. Unless you have all three points engaged voluntarily, you have nothing."

Space solar power is another possibility for space station research, as fossil fuel prices on Earth soar and greenhouse gases rise, noted Harper. Other suggestions from the Workshop were to use the Space Station as an Earth observing platform for climate change, weather, polar ice observation and the evolution and understanding of killer hurricanes.

"The ISS National Laboratory provides the first opportunity to bring together biotech, info-tech and micro-miniaturization in the ISS environment to explore the biology of the only life in the universe we know in its first generations beyond the planet of origin," Harper noted.



Nobel continued from front page

The moderator was Dr. Dan Clancy, Engineering Director for Google Print, a project focused on indexing off-line printed content to make it text-searchable on the web.

The panelists presented their perspectives on the value of using the ISS as a national lab. In 2005, the NASA Authorization Bill established the ISS as the first US national laboratory beyond Earth, opening it to commercial and non-NASA payloads. The panelists discussed the ISS' potential to enable discovery, advance education, sustain life through medical advances and generate new business and wealth. Nickerson presented recent research showing that salmonella bacteria flown in space grow deadlier when freed from Earth's gravity.

Seasons Greetings & Best Wishes for the New Year from NRP Staff



Brandy Dettmer, Web Designer with guest. Brandy leaves NRP for Fairchild Semiconductor December 21st. Good luck Brandy!



Bob Lopez, NRP Account Manager



Donna Barrese, former NRP Project Liaison, with Dave Guerrieri of InformArt/GaryAir at 2007 NRP Ice Cream Social. We miss you Donna.



Diane Farrar, NRP Account Manager, with NRP Partner, Bruno Kajiyama, Photozig CEO



Meighan Haider, Chief, NRP Office



Cyndi Carbon-Norman, NRP Account Manager



L to R: NRP Account Managers Kathleen Burton & Dani Thompson with Donna

NRP Post

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Phone: (650) 604-2NRP

Email: researchpark@mail.arc.nasa.gov

Website: www.researchpark.arc.nasa.gov

In remembrance of our dear friends Sam Addala & Johnny Green