



Richard Hasegawa / JPL PhotoLab

*Navigators, clockwise, from bottom left: Jeremy Jones, Powtauche Williams, Paul F. Thompson, Kevin Criddle, Daniel Parcher and Yungsun Hahn.*

## Cassini at Enceladus: so far, yet so close

By Mark Whalen

In order to achieve the best possible science return from a far-off planet, closer is generally better. In the case of Cassini's Aug. 11 flyby of Saturn's moon Enceladus, at its closest point the encounter was a mere 50 kilometers (30 miles) from the surface of the tiny moon.

For the JPL Cassini Navigation Team, led by Jerry Jones, it comes down to the basics of knowing where you are today and where you're going tomorrow.

Not so simple a task, with Cassini exploring the Saturn system hundreds of millions of miles away from Earth.

"In the early phase of the Saturn tour the biggest issue for Enceladus encounters was location of the moon itself," Jones said. But with four relatively close flybys and numerous optical navigation images, the team has dramatically improved the accuracy of the Enceladus ephemeris, data that provide positions and velocities of planetary bodies. "Over the last two flybys we've proven we know where Enceladus is, so our safety issues have been taken care of."

With at least 70 minutes of one-way light time between the spacecraft and Earth, the team works in far from real time. The team must determine Cassini's position relative to Saturn and relative to the satellites it will encounter. Tracking data from the Deep Space Network is augmented by optimal navigation from pictures from the spacecraft's camera, which leads to predictions for Cassini's path the following days.

The team's biggest challenges lie not only in the level of accuracy it must achieve, but also in keeping to schedule. It's a tall order, considering Cassini ends up having encounters quite often, Jones noted.

"For a while there we were averaging one every two weeks," he said.

"We have to meet that schedule; we can't be late," Jones said. "It's like a new launch every time we have a new encounter. Then there are a series of dates ahead of that you have to meet, and between every encounter we typically have three maneuvers to accomplish." Each maneuver has a pre-established execu-

tion time and new orbit estimates, and maneuver solutions are required to meet this schedule, he noted, adding that delay in the meeting the schedule can have severe mission impacts.

For the early-August Enceladus encounter, the orbit estimate at the time of the planned maneuver predicted Cassini would come to within a kilometer and a half high of the 50-kilometer target, Jones said.

"We were predicted to be so close that the second planned maneuver was canceled," he said. "After the encounter, we determined that the flyby was actually closer to Enceladus by half a kilometer.

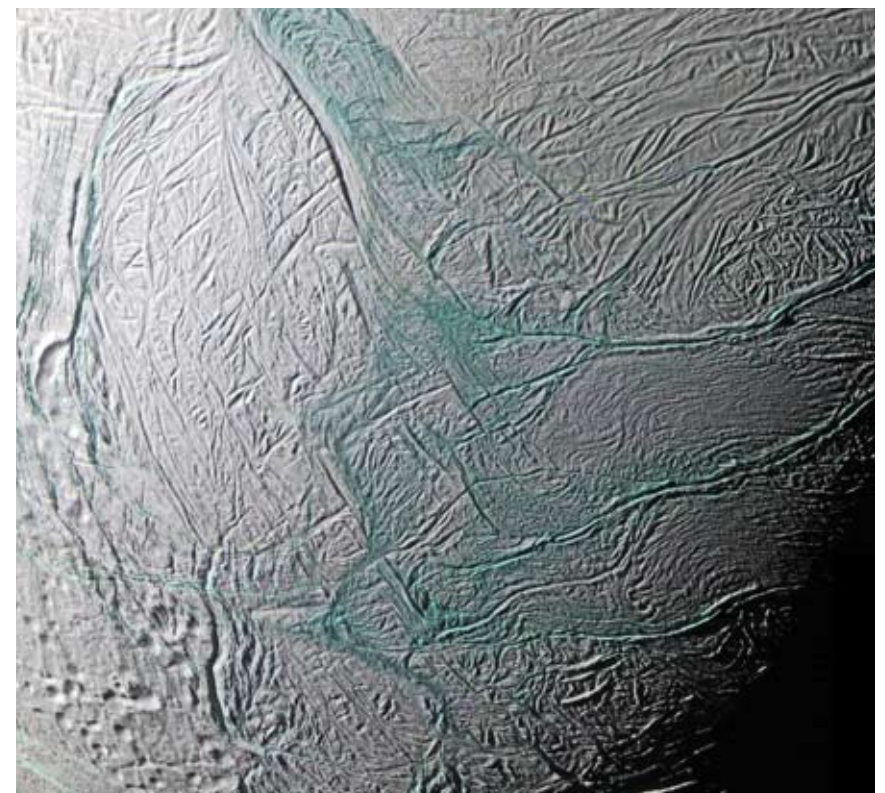
"The Aug. 11 encounter flew by Enceladus at the same distance as Cassini's flyby of that moon in March, both marking the closest approach by the spacecraft to any moon.

Two more Enceladus flybys are planned for October. The first of those will trim the Aug. 11 flyby distance by half and bring the spacecraft to a remarkable 25 kilometers (16 miles) from the surface. Enceladus measures about 500 kilometers (310 miles) in diameter—just one-seventh the diameter of Earth's moon.

For Cassini's tight closeup to come, Jones is confident about cutting the distance in half. "We've shown that we have the procedures in place to deal with off-nominal conditions so the Enceladus ephemeris accuracy is no longer an issue."

The team may indeed be working millions of miles away, but Jones said that's "not really important to us."

Indeed, guided by advanced planning and backup plans and spurred on by its proven propensity for accuracy, the team definitely knows where it's been and where it's going.



*This sweeping mosaic of Saturn's moon Enceladus provides broad regional context for the ultra-sharp, close-up views Cassini acquired during its Aug. 11 flyby. The Cassini navigation team moved the spacecraft to within 50 kilometers (about 30 miles) of the moon's surface.*



Photo by Brian Frank

From left: Andrew-Jan Garcia, Minchull Paul Kim, Adam Richie-Halford, Paul Jacobs, Rey-Jan Garma.

## Air Force officers contribute to Lab's mission

By Brian Frank

Most days Adam Richie-Halford rides to JPL on his Suzuki GS-500 motorcycle wearing sporty sneakers and a black leather jacket. But if you catch him on a Monday, you'll see him in full camouflage fatigues and squared-off cap. And no, that's not an Army uniform. Richie-Halford is an Air Force lieutenant (orders came down from on high to ditch the regular blues and wear fatigues as a reminder that our nation is still at war).

Lt. Richie-Halford joined the Lab a few weeks ago along with five other lieutenants and one captain as part of a six-month industry/Air Force employee exchange program with the Space and Missile Systems Center at the Los Angeles Air Force Base in El Segundo. It's the fourth such group to work at JPL since 2003, when the program officially started.

Twenty-five-year-old Richie-Halford, who earned a private pilot's license so he could be more competitive for pilot-training selection, says he realized he was a nerd while taking undergraduate science classes. He decided against pursuing a career as a pilot and says he remembers being very impressed during a tour of JPL. When this opportunity came up, he saw it as a chance to do real science.

"It's kind of exciting for me to know that I'm going to be able to contribute something new to science," he says.

Working with John Armstrong, a member of the Cassini radio science team, he will analyze a phenomenon called radiowave scintillation to study solar wind activity too close to the sun for a spacecraft to collect data. Solar wind turbulence can interfere heavily with radio communication. In past solar conjunction events that were studied, when Cassini passed behind the sun, its signal became distorted—but by analyzing what many scientists would consider noise, he and Armstrong should be able to infer certain characteristics of the solar winds.

"From a pure science point of view, it's interesting to extract that data from a radio signal," Richie-Halford says. The engineering application, he adds, would be to improve our understanding of the turbulence so that engineers can extend the ability of spacecraft to communicate just before they pass behind the sun and just after they reemerge.

By many accounts, visiting officers like Richie-Halford have been very helpful additions to the Lab.

"People have come to realize how valuable these lieutenants are to their own organizations, because they really work hard and they're very interested in whatever they're doing," says Lynn Baroff, the JPL coordinator for the program. Baroff notes that in the first year only 10 to 15 JPLers submitted descriptions of opportunity, but this year he received 30 to 40.

Regardless, both institutions have benefited from the program: the Lab has earned certain contracts in part because of its relationship with the Air Force base, which in turn has developed an electronic version of its regulations after studying JPL Rules!, and Air Force participants have advanced their careers. And participating JPL scientists and engineers get extra help at minimal cost, since the Air Force continues to pay the officers' salaries.

Air Force people are fascinated by the work JPL does, says General Gene Tattini, who has a unique vantage point from serving currently as the Lab's deputy director and formerly as the commanding officer of the El Segundo base. And "I've heard comments by JPLers about how bright these officers are," he says.

For their part, the officers seem pleased with the hands-on technical experience they are getting at JPL. Lt. Rey-Jan Garma, 25, who is currently helping with the requirements process for the Gravity Reduction and Interior Laboratory (Grail) project, says at the Air Force base he dealt more with logistics than with engineering. But later in his assignment at JPL, he may get to help with the development and testing of an algorithm for the Grail spacecraft. The ultimate goal of the mission, which is scheduled to launch in 2011, will be to characterize the gravitational field of the moon, including any subtle variations caused by objects deep below its surface. The algorithm will help to isolate the gravitational influence on the spacecraft by accounting for and ruling out the effects of thruster force and solar pressure.

Working directly alongside engineers and scientists at JPL on projects like Grail can give these officers a stronger technical base from which to build their management skills later. Many of them say it's a step toward future career goals.

Brian McLaughlin, who came to JPL with a group of eight other lieutenants in 2005, says he is grateful to have participated in the exchange. He used part of his time at JPL to learn about solar photovoltaic engineering. Now no longer in the Air Force, he is director of engineering at a private firm called Sequoia Solar. He even married another participant from that year, Jennifer Bergen.

"JPL has definitely gotten me where I am today," McLaughlin says.

So far the employee exchange program has been one-way, since no JPLers have gone to work at the Air Force base. But Baroff, the program coordinator, says he is still working to set up a full exchange in which JPL sends senior systems engineers and project managers to the Air Force base for six months to learn how the Air Force handles systems contracting and project management.

The other Air Force officers working at JPL this year are Capt. Ryan Downing and Lt. Andrew-Jan Garcia, both working with Hamid Hemmati in free space laser communications; Lt. Minchull Paul Kim, working with Dan Dvorak on human-robotic interaction research; Lt. Paul Jacobs, working with Nagin Cox on the flight systems-systems engineering team for Mars Science Laboratory; and Lt. Rupinder "Roop" Sekhun, working with Kelly Moran on preliminary design review for the new Orion spacecraft being developed to send astronauts back to the moon.

Several of these officers have their sights set on the Astronaut Corps. Many are currently pursuing master's degrees in science or engineering fields, and while some will spend their careers with the Air Force, some may not. Richie-Halford says he's not sure what the future holds, but he'd like to stay with technical work for as long as possible before he's back to management. He's got at least five more months to do so. ■



## Like grandfather, like grandson



Yuri Malina, third from right, with colleagues at their rocket launch. At top is Yuri's grandfather, Frank Malina, with the WAC Corporal.

The grandson of Frank Malina, American rocket pioneer and co-founder of JPL, has become a third-generation rocket scientist following the successful launch of a rocket experiment in Provence, France.

Yuri Malina, along with fellow students and rocketry club members, made the launch Aug. 2 during a five-day experimental rocket launch campaign organized by Planete Sciences, a branch of the French Space Agency.

Frank Malina and colleagues, under the leadership of Theodore von Kármán, initiated the first successful American rocket program that also led to the founding of the Aerojet General aerospace company. The team led by Frank Malina launched America's first successful high-altitude rocket, the WAC Corporal, in 1945, which was the first man-made object to reach outer space when it was launched in 1949 as the second stage on a captured V2.

Yuri is the son of Roger Malina, a space astronomer who successfully led sounding rocket flights from the White Sands Missile Range where Frank Malina and team launched the WAC Corporal. Roger Malina was also a co-principal investigator for the NASA Extreme Ultraviolet Explorer satellite at UC Berkeley, and is a current co-investigator on the SuperNova Acceleration Probe satellite project. ■



Carol Lachata / JPL PhotoLab

# Big goals for minority education

By Mark Whalen

**“I meet a lot of fantastic young minds; I want to get them to a point where they say, ‘Why would I want to work anywhere else?’”**

A lot of prospective JPLers look up to Wendell Tull, newly hired as the lead for minority education initiatives in JPL’s Education Office. But not so much for the reasons you might think.

Tull, an imposing 6’6” and a former basketball star at Northern Arizona University, does command attention for his size. But fortunately, spurred on by those who helped him realize that basketball was the way to an education, and likely not to the NBA, Tull found his calling helping college students achieve success. Now, he tries to convince the best and brightest that JPL can be a great career choice.

In his first few months on Lab, Tull, working primarily with Historically Black Colleges and Universities, Hispanic-serving institutions and tribal colleges, led a group of about 65 student interns this summer.

“We do a good job here of attracting students for internships but we have a long way to go in terms of retaining those students of color and women, making sure that they are considering JPL as a long-term career opportunity,” Tull said. “A big part of my job is to make sure we stay in contact with them once they’ve finished their collegiate careers, and make sure they understand we want them back.”

Tull uses his background in higher education to connect with students. The former director of enrollment for Arizona State University’s Polytechnic campus, he spent a lot of time recruiting underserved student populations to the school, and later worked with recruiters looking to hire Arizona State graduates.

“The combination of still being able to work with students, which I truly love to do, and do it from the corporate side, trying to get graduates to come to JPL, is the best of both worlds,” he said.

Tull realizes that JPL faces a lot of competition in hiring those who have served internships here. “The students, particularly if they’re underrepresented or minority, are going to have their pick of job opportunities,” he said. “The thing we have in our favor is this place is unique—there is no other place like it in the world.”

However, he noted, getting the best young minds to choose JPL is no slam-dunk.

“JPL has a great reputation, but we can’t rest on our laurels,” Tull said. “There’s a lot of other places that do tremendous work, so we need to care about what happens to them in their careers and show them why we think this is the best place for them.

“It’s really about relationship building,” he said. “In my experience in higher education, the best way I was able to tap into the underrepresented population was to go into school districts in urban areas, and let them know that I’m not just there to take, but also to contribute to the community—by doing speaking engagements, giving workshops and seminars—particularly to minority-focused schools. That’s what we need to do here, in our outreach efforts.

“Also, when we go to colleges we’re not just there to take their students and get them into jobs at JPL; we should see how we can help them improve their education process.” Tull’s goal is to see JPL work closely with minority-serving institutions “in the same way that it works with majority schools like Caltech, MIT and Georgia Tech.”

Also among Tull’s challenges is the fact that many of the underrepresented colleges lie east of the Mississippi. “All of a sudden you’re asking someone to move across the country to a place where the cost of living is one of the highest in America, and be away from his or her family,” he noted. “Some students just don’t want to do that.”

For others, Tull said, “it’s a matter of ‘I don’t see enough people like me’ working in senior-level positions at the Lab, so they want to see more of a commitment from management for opportunities to grow and be a leader. But I know that’s something that will change as we continue the recruitment efforts.

“What I’ve been really happy about is that the people I’ve met here, from the managers to the support staff, all understand that this recruitment goal is a Labwide undertaking,” he added. “So far, I’ve gotten a lot of positive feedback.”

Tull is heartened by coordinated recruitment efforts between Human Resources and the technical divisions seeking potential hires and streamlining the process of offers and acceptance.

Tull also supports the development of an advisory committee, comprised of veteran JPLers, to help in this regard. “The vets know what the challenges are for new employees as well as how we might recruit for the underrepresented population,” he said. “I would like that group to address prospective employees, to tell them how they’ve developed such a long career at JPL and why they chose to stay here. There are a number of people who have been here for a lot of years, because they genuinely enjoy what they do. That is one thing we need to convey to people.

“That’s what keeps me motivated,” Tull said. “I meet a lot of fantastic young minds; I want to get them to a point where they say, ‘Why would I want to work anywhere else?’” ■

# News Briefs



Bob Wilson



Leigh Fletcher



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AT JPL'S ONLINE NEWS SOURCE

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# Universe

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Universe is published by the Office of Communications and Education of the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.

### Spitzer manager receives honors

Robert K. Wilson, project manager for the JPL-managed Spitzer Space Telescope, has won the International Space Ops Distinguished Service Medal for 2008.

Space Ops is an international forum whose objective is to "increase cooperation and exchange of ideas in the domain of space operations among the space fairing organizations of the world."

The Distinguished Service Award is presented to a member of the Space Operations community who has distinguished himself or herself with service to the Space Ops organization or to the field of space operations and support.

Wilson was recognized for "outstanding dedication, leadership, operational excellence, innovation and sustained technical performance, significantly contributing to the success of NASA astronomy, physics, planetary and Earth-observing missions and the Spitzer Space Telescope."

Wilson's role as project manager on Spitzer, the largest infrared telescope ever launched into space, began in 1994.

### Fletcher wins astronomical prize

Leigh Fletcher of the Earth and Planetary Atmospheres Group has been awarded the Keith Runcorn Prize for 2008 by the Royal Astronomical Society in London.

Fletcher's winning entry, "Saturn's Atmosphere: Structure and Composition from Cassini/Composite Infrared Mapping Spectrometer," was honored for the best doctoral thesis in exploration geophysics; physics of Earth's atmosphere, ionosphere or magnetosphere; planetary physics; solar physics; or solid-Earth geophysics.

Fletcher's prize of 1,000 pounds (about \$1,780) was administered by the society's Higher Education Committee.

### Judd joins Keck Institute

Michele Judd, a senior engineer in the Science Division, has been named managing director for the Keck Institute for Space Studies, a joint project of Caltech and JPL.



Michele Judd

The primary purpose of the institute is to develop new planetary, Earth and astrophysics space mission concepts and technology by bringing together a broad spectrum of scientists and engineers for sustained scientific and technical interaction. This organization links the study elements of a think tank with the implementation elements of designing and developing prototypes.

A JPL employee since 2001, Judd has managed numerous special projects throughout the Lab, including the Foreign National Task Force,

the annual Research and Technology Development Poster Session, and the Onboard Autonomous Science Investigation System, ServoGrid and QuakeSim research teams.

Although Judd's appointment is primarily at the Caltech campus, she will also retain an affiliation to JPL through the offices of the chief scientist and chief technologist.

### Dalton recognized for imaging

Brad Dalton of the Planetary Ices Group has received the U.S. Department of Interior Cooperative Conservation Award for his work applying imaging spectroscopy to the Animas River Watershed in the San Juan Mountains of Colorado.

The project utilized hyperspectral observations from JPL's Airborne Visible and Infrared Imaging Spectrometer to ascertain distributions of minerals related to hydrothermal alteration and related mining operations, both of which affected water quality in the region.

Dalton's analysis involved mapping minerals over a 1,400-square-kilometer area using advanced automated spectral processing algorithms. The suite of about 35 minerals mapped included hematite, jarosite, clays and carbonates, which are also of relevance to the surface of Mars.

## Passings

**Stewart (Andy) Collins**, 60, retired from the Space Experiments Systems Section (382), died March 5.

Collins joined JPL in 1969 and retired in 2007. He contributed software and imaging-system requirements documents to the Voyager mission.

He is survived by his wife, Robin Scott Collins, daughter Robin M. Collins and son Michael.

**Frank Barath**, 73, retired instrument specialist and chief scientist of the Science Division, died July 3.

Barath joined JPL in 1961 and retired in 1998. He pioneered the development of microwave instruments for scientific use on spacecraft, including the first spacecraft to Venus in 1962. Later he led a team to develop instruments to measure temperature and water vapor in Earth's atmosphere. He also led the team that developed the Microwave Limb Sounder flown on the Upper Atmosphere Research Satellite, which provided critical data on chlorine depletion of stratosphere ozone. He received two medals from NASA for outstanding leadership and exceptional achievement.

Barath is survived by his wife, Annette; daughters Cindy and Athena; granddaughters Arielle and Destiny; and sisters Madeline and Yolande. Ashes will be scattered in a family graveyard in Louisiana.

**Arlene Villaseñor-Cure**, 77, a former employee in the Photo Lab, Section 6747, died July 8.

Villaseñor-Cure was employed at JPL from 1987 to 1997. She is survived by children George Villaseñor, Daniel Villaseñor, Lisa Estrada, Pamela Trujillo, Richard Cure, Richelle Outfleet and Robert Cure, as well as by her brother George Shultz (a JPL retiree, 2001),

## Moving seven miles of cable in six days



Photo courtesy of Charlette Marsh

Alex McKee, left, and Camilo Trevino work on some of the miles of cables that were moved.

Academic part-time employees Krista Andersen, Alex McKee, Timofey Ovcharenko and Camilo Trevino recently completed a major task of mapping, disconnecting and reconnecting more than 2,000 node interconnect cables for Cosmos—the Dell Xeon cluster of 1024 CPU multi-processors—when it was moved from Building 126 to Building 600.

Since downtime for the supercomputer affects many JPL engineering, technical and scientific activities, performing the detailed job quickly was critical.

Reassembly under the supervision of a senior member of the Supercomputing and Visualization Group involved installing the fiber in cages under the floor and reconnecting all the Myrinet switch parts. Six days after the system was turned off and 25 cabinets, each weighing 2,500 lbs., were relocated, Cosmos was available again for all users.

sister Dianna Cook, 13 grandchildren and two great grandchildren.

A memorial service was held July 18 at Oakdale Memorial Park in Glendora.

**Guy Man**, 57, a project manager in the Solar System Exploration Directorate, died July 21.



Guy Man

After joining JPL in 1979, Man worked on numerous missions including Galileo, Cassini, Deep Space 1 and the Space Interferometry Mission. He made many important technical and leadership contributions to precision control systems, modeling and simulation tools, systems engineering, advanced spacecraft autonomy, gravitational research and more. Among his honors were NASA Software of the Year awards for Dynamics Algorithms for Real-Time Simulation and for Remote Agent, a system for autonomous spacecraft reasoning and control.

Man is survived by his wife, Jean, and brother, Lawrence.

A memorial service was held at San Marino Community Church. Man's family requested that gifts in his memory be considered to

Doctors Without Borders, 333 7th Ave., 2nd Floor, New York, NY 10001 ([www.doctorswithoutborders.org](http://www.doctorswithoutborders.org)), or to California State Parks Foundation, 714 W. Olympic Blvd., Suite 717, Los Angeles, CA 90015 ([www.calparks.org](http://www.calparks.org)).

## Letters

I would like to thank everyone for their thoughtfulness on the passing of my mother in law, Stella Medina. Thanks also to JPL for the lovely plant my wife received.

Geoff Laugen

I would like to express my sincere appreciation to my friends and co-workers for their support and expressions of sympathy that I received after the passing of my father. Your e-mails, cards and the JPL plant were much appreciated. Your thoughts and prayers were a source of comfort and blessing to not only myself but also to my entire family. Sincerely,

John Klohoker

Many thanks to all of you for your kind words, thoughtfulness and support upon the passing of my father. Thanks also for the beautiful plant we received, which will go into our garden as a living reminder of my dad and his full, rich 92 years of life. Fortunately my family and I had a chance to say goodbye to him before he passed on and it was a truly remarkable and memorable experience for all of us. Thanks again.

Rob Kocsis