

2014 in review

In 2014, with JPL leading the way, NASA launched more Earth missions than in more than a decade and prepared two others for launches in early 2015. Elsewhere in the solar system, JPL's assets at Mars remained busy and were kept safe. JPL contributed to the first-ever comet landing and scouted a distant Earth cousin. Future technologies for better spacecraft were verified. And JPLers found a new place to park. Following are some of the year's major highlights.

HOME PLANET FIRST



Scientists are analyzing preliminary data products from JPL's first Earth mission of the year, Orbiting Carbon Observatory 2, launched in July. It's measuring carbon dioxide, the largest human-generated contributor to global warming. RapidScat, an instrument launched to the International Space Station Sept. 21, has begun its two-year science mission and is delivering ocean wind speed and direction data to weather and marine forecasting agencies worldwide.

Launch is set for Jan. 29 for the Soil Moisture Active Passive satellite, which will provide the most accurate, highest-resolution global measurements of soil moisture ever obtained from space. The data will enhance scientists' understanding of

Earth's water, energy and carbon cycles. The Jason 3 mission, which follows JPL and the French space agency's longtime collaboration on Topex/Poseidon and Jason 1 and 2, will monitor sea-level heights to better understand ocean circulation and climate change. Launch is scheduled for March.

RED PLANET DIARIES



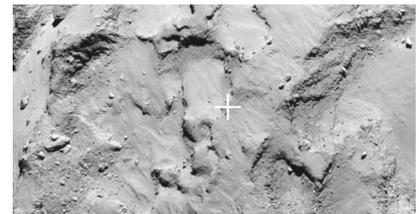
The Curiosity rover reached its ultimate physical goal—Mount Sharp—but the trip wasn't without incident. As Curiosity approached the mountain, rover drivers changed course to minimize risks after the discovery that unexpectedly sharp rocks were punching holes in four of its six aluminum wheels. The rover is now back on course.

JPL's other Martian rover, Opportu-

nity, now active for more than 10 years, set the record for the longest-distance travel by any vehicle on another world—40 kilometers, or 25 miles—and found multiple layers of clay minerals at the rim of Endeavour Crater near Mars' equator.

Mars Reconnaissance Orbiter detected lines appearing and darkening down the steep walls of craters, suggesting possibly limited flows of water. If proven, flowing water on the planet today would be a major finding.

NEW WORLDS



By measuring volatile substances like water, carbon dioxide and ammonia, JPL's Microwave Instrument for the Rosetta Orbiter, or MIRO, contributed to Europe's Rosetta

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mission to Comet 67P/Churyumov-Gerasimenko. MIRO also helped pick the target spot for Rosetta's lander, Philae, which on Nov. 12 became the first spacecraft ever to land successfully on a comet.

The Kepler Space Telescope, analyzing 150,000 stars, found the first "Goldilocks" planet, just the right size and right distance from its star to be similar to Earth and possibly host liquid water on its surface. But scientists call the newfound Kepler 186f an Earth cousin, not a twin, and far too hot for life.

ASCENT OF TECHNOLOGIES



At Kauai, Hawaii, JPL in June tested the delivery of bigger and heavier payloads to other planets as the Low-Density Supersonic Decelerator rose to 120,000 feet before heading downward to simulate a spacecraft arriving at a Mars-like planet. A test of an inflatable, doughnut-shaped device that slowed its descent was a success. Also deployed was a next-generation parachute that shredded. But armed with enough data for their next phase, in the fall the team conducted further parachute tests on a rocket sled in California's desert. The project was recognized in Popular Science magazine's "Best of What's New" spotlight for 2014. Another flight test in Hawaii is planned for 2015.

Future space missions may be able to transfer much greater amounts of

information, thanks to JPL's Optical Payload for Lasercomm Science, or OPALS, an experiment flown on the International Space Station in 2014. The mission used a laser to beam a video down to a ground station at JPL's Table Mountain observatory. In 3-1/2 seconds, it was able to send as much data as a planetary spacecraft is able to transmit in 10 minutes using today's radio technologies.

HAIL TO THE CHIEF



JPL welcomed Thomas F. Rosenbaum as Caltech's ninth president at an Oct. 24 ceremony, held the same day as his formal inauguration on campus.

Rosenbaum had served as the University of Chicago's provost for the prior seven years and was also a professor of physics. Among his achievements as provost was the establishment of the Institute for Molecular Engineering, the University of Chicago's very first engineering program.

LOOKING EAST TO PARK



What many considered fantasy actually became real in September. After being in JPL's master plan for close to 50 years, a new parking structure came to life in the West Arroyo lot. Constructed for JPLers without on-Lab parking, the five-story, 900-foot structure has 1,450 spaces.

New export regulations to affect JPL



Reed Wilcox

Nearly all JPL technical employees deal with U.S. restrictions on exporting information in one form or another. The government's regulations changed significantly last month under a federal effort to reform export controls. Reed Wilcox, the JPL manager responsible for export compliance, explains how these changes impact JPL.

Why is this reform taking place?

The administration and Congress have been besieged by concerns from the aerospace industry for several years that the State Department's International Traffic in Arms Regulations, or ITAR, have been overly restrictive and have resulted in a loss of U.S. exports and competitiveness. This led to a broad review of the ITAR and to bipartisan support for transferring a significant number of technologies controlled under the ITAR regulatory regime to the less-restrictive Department of Commerce Export Administration Regulations, or EAR. The end result is that the ITAR now focuses on our country's most sensitive defense technologies and has reduced, but not removed, the restrictions for a broad

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LOOKING FORWARD

Team sees positives despite the loss of their cubesat project

By Mark Whalen

Despite the Oct. 28 launch mishap that prevented their experiment from flying to the International Space Station, JPL's Radiometer Atmospheric CubeSat Experiment (RACE) team has still accomplished a lot.

The errant liftoff occurred at NASA's Wallops Flight Facility in Virginia during the attempted launch of Orbital Sciences Corp.'s Antares rocket and Cygnus cargo spacecraft. Onboard was the RACE payload, a microwave radiometer intended to measure the liquid water path and water vapor that is pertinent to the water cycle and Earth's energy budget.

The team of about 20 employees in JPL's Phaeton Program, which delivers hands-on flight project training and experience to early career hires, wasn't necessarily expecting such stark reality.

"The launch failure was a disappointment, but I think all of us know that that's a risk we take," said Project Manager Shannon Statham. "You can do everything right. You can do your job 100 percent. But there are certain elements in this business that are

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RACE Project Manager
Shannon Statham

completely out of your control that can end your project."

"Definitely, at the time it was heartbreaking, and we saw all our hard work effectively go up in flames. But I think everyone on the team is taking this as a very positive experience in general, and we're all moving on to new and exciting endeavors at JPL."

Instead of dwelling on what could have been, Statham is proud of what the project did accomplish and how the technology demonstration could boost future projects for JPL.

Built in partnership with the University of Texas at Austin, RACE sought to advance the technology readiness level (TRL) of the receiver subsystem from TRL 4 to TRL 6 and the cubesat radiometer system from TRL 4 to TRL 7. The radiometer was designed to fit within a 1.5 U volume (10 x 10 x 15 cubic centimeters) such that any cubesat platform with a larger volume (2U, 3U, or 6U) can be used. A radiometer within the cubesat platform has the potential to

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RACE team members, from left: Boon Lim, Shannon Statham, Sid Misra, Karl McDonald (UT Austin graduate student), Joel Steinkraus, Jessica Clark, Kenny Donahue, Max Bryk.

revolutionize systems by moving from traditional large-scale missions to distributed smaller missions.

“For us, in moving from level 4 to 6, we completed testing on the ground and were confident that it would perform well in space,” said Principal Investigator Boon Lim. “The difference between 6 and 7 is a big jump,” he added, noting that had the launch been successful, TRL 7 would have been achieved.

The RACE cubesat was targeted as a free flyer once released from the International Space Station. Lim said future generations of the technology could feature propulsion and other capabilities.

The science team had hoped to show their instrument’s performance could rival that of traditional big satellites, resulting in potential cost savings down the line.

“You can’t do everything on a small satellite. But if you can pick the low-hanging fruit, if you can get strong science return for significantly reduced cost and that’s cost-efficient,” Lim added. “Furthermore, this particular technology has the opportunity to be integrated onto the larger platforms.”

RACE was one of the first fully funded and managed cubesat projects at JPL, said Statham. But it’s not likely the last.

JPL recently selected proposals from 10 universities to analyze cubesat concepts that could enhance a proposed Europa Clipper mission. The concepts will be incorporated into a JPL study on how small probes could be carried as auxiliary payloads.

JPL’s next cubesat mission, GRIFEX, is targeted for launch in January 2015 as part of NA-

SA’s Cubesat Launch Initiative program. The mission will advance the technology required for future measurements of atmospheric composition from geostationary Earth orbit, relevant to climate change, as well as future missions that require advanced detectors in support of the Earth Science Decadal Survey.

The GEO-CAPE ROIC In-Flight Performance Experiment (GRIFEX) is a 3U cubesat that will perform engineering assessment of a JPL-developed all digital in-pixel high frame rate Read-Out Integrated Circuit (ROIC). It will enable the proposed Geostationary Coastal and Air Pollution

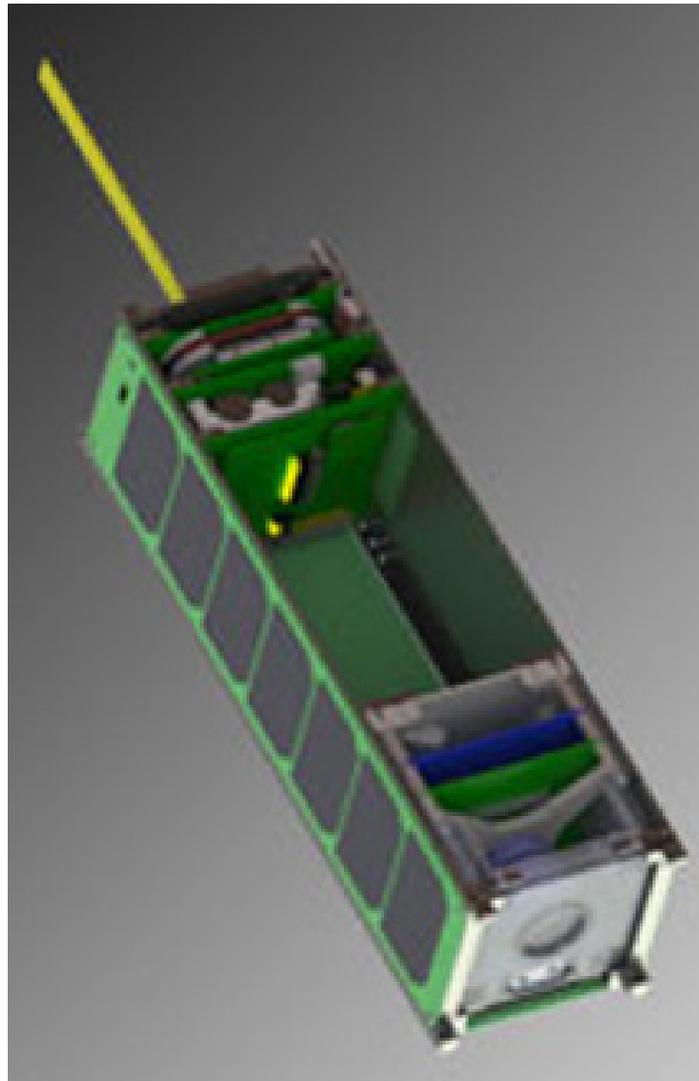
Events (GEO-CAPE) mission concept to make hourly high spatial and spectral resolution measurements of rapidly changing atmospheric chemistry and pollution with the Panchromatic Fourier Transform Spectrometer instrument in development.

Also in the pipeline is TEMPEST-D (Temporal Experiment for Storms and Tropical Systems – Demonstrator), a 6U cubesat technology demonstration that will use the low-noise amplifiers and a direct-detect topology similar to RACE. “It is a more capable radiometer and a logical extension from the work done on RACE,” said Lim.

Despite not completing their goal, team members can look back on their efforts with confidence.

“For most of us, RACE is our first flight project,” said Statham. “The team dynamic was excellent and we all worked well together. We had a very small team, and everyone contributed.

“Without a doubt, and I believe I speak for the whole team, this was a great experience.” she added. ■



JPL’s next cubesat mission, GRIFEX, is targeted for launch in January 2015



array of aerospace technologies—a significant number of which are used by JPL.

How will these changes affect the Laboratory?

Our policies and procedures will not change. JPL has always had a mix of ITAR and EAR technologies, so none of the JPL Rules! involving import/export control will be changed. However, a significant portion of our scientific and technical information will move from being controlled under the ITAR to now being controlled under the EAR. This change will affect JPL in several areas. For example, the performance characteristics of the hardware and the country with which we're collaborating will dictate the relevant controls for technology controlled under the EAR. Also, less stringent controls will apply for conference attendance and scholarly publications where the subject matter is covered under the EAR.

JPL authors who have been working on and writing about ITAR-controlled items in the past may find their technology has moved to the jurisdiction of EAR. If so, then the rules for what they can publish will change. In addition, changes to existing ITAR licenses will take added time since any license modification will first require a determination of whether the involved technology is controlled under the ITAR or the EAR.

What is JPL doing to transition into implementation of the new regulations?

My office is working with other JPL organizations such as Document Review Services to facilitate a smooth transition, but it will take some time to adjust and familiarize ourselves to operate more frequently under the EAR. A vast majority of our export licensing has been for ITAR-controlled activities. A significant proportion of our activities will now be under the EAR. We will be on a learning curve for several months as we transition to this new environment.

We're updating our training programs and will make them available online. We also will be reclassifying JPL's technologies and collaborations, starting with new activities that have not yet applied for export licenses. Current ITAR licenses will remain valid during a two-year grace period so we have time to transition our training programs and update our projects' export control management plans.

What do JPLers need to be aware of when it comes to these changes and export compliance in general?

Our Import/Export Control Office has prepared a supplemental training module that gives a brief overview of export control reform along the same lines as the

annual general awareness training. This training module is now available online at secrtraining.jpl.nasa.gov.

You mentioned meeting attendance and scholarly publication as two areas being impacted. How will the changes affect document clearance via the Unlimited Release System?

JPL personnel who are qualified to export reviews for the Unlimited Release System will require new training to understand which technologies will remain on the ITAR. They will have until the end of February 2015 to be retrained. Classes will be advertised in the Learning Management System and on the Import/Export Control Office website exportcompliance.jpl.nasa.gov.

We are also introducing another role, called Export-Certified Author, which will allow U.S.-person authors to self-review their documents through the Unlimited Release System for export compliance. Authors who choose to do this will have to take a class. The addition of this option should significantly improve the efficiency of the Lab's approval process for releasing scientific and technical information to the public. ■

News Briefs



Son Van Nghiem

Nghiem named IEEE fellow

Son Van Nghiem of JPL's Radar Science and Engineering Group has been named a fellow of the Institute of Electrical and Electronics Engineers.

Nghiem, a 23-year JPL employee, is the science applications development lead for the Radar Science and Engineering Section. He was cited by IEEE for his contributions to cryospheric sciences and Earth remote-sensing applications.

Nghiem has previously received JPL's Lew Allen Award for Excellence, NASA's Exceptional Achievement Medal and NASA's Exceptional Scientific Achievement Medal.

JPL in airborne campaigns in 2015

JPL will lead one of five new NASA airborne field campaigns in 2015 to investigate how long-range air pollution, warming ocean waters and fires in Africa affect climate.

The studies were competitively selected as part of NASA's Earth Venture-class projects, which are funded at a maximum of \$30 million over five years. Funding covers initial development, field campaigns and data analysis.

Josh Willis of JPL's Ocean Circulation Group will lead the Oceans Melting Greenland mission to investigate the role of warmer, saltier Atlantic subsurface waters in Greenland glacier melting. The study will help pave the way for improved estimates of future sea-level rise by observing changes in glacier melting where ice contacts seawater. Measurements of the ocean bottom as well as seawater properties around Greenland will be taken from ships and from several aircraft.

Also, the African Fires and Atlantic Clouds mission, led by NASA's Ames Research Center, will include two contributions from JPL. David Diner is principal investigator for the Airborne Multi-angle SpectroPolarimetric Imager, which previously participated in several field campaigns in NASA's ER-2 aircraft. JPL's Airborne Precipitation Radar 2nd Generation and Airborne Cloud Radar together provide Doppler radar measurements of clouds and precipitation at three frequencies. Simone Tanelli is principal investigator.

This is NASA's second series of Earth Venture suborbital investigations—regularly solicited, quick-turnaround projects recommended by the National Research Council. Seven NASA centers, 25 educational institutions, three U.S. government agencies and two industry partners are involved in these Earth Venture projects. The five investigations were selected from 33 proposals.

For more information, visit www.nasa.gov/earthrightnow.

Lab in Earth surface and interior studies

Five JPL researchers will lead studies recently awarded through NASA's Research Opportunities in Space and Earth Sciences program, in the area of Earth surface and interior.

Donald Argus is principal investigator for "Availability of Water Resources in the Western U.S.

Determined at Near Real Time Using GPS and GRACE." The project could be a major breakthrough in that the Gravity Recovery and Climate Experiment and GPS will yield comprehensive knowledge of water change with unprecedented accuracy.

Yoaz Bar-Sever is principal investigator for "New Positioning Products and Pilot Service for Natural Hazard Monitoring," which proposes to develop and refine Global Navigation Satellite System positioning techniques and products with an aim to optimize monitoring of natural hazards.

Susan Owen will lead "Advanced Rapid Imaging and Analysis for Natural Hazards," a JPL-Caltech collaboration to develop algorithms and analysis systems that rapidly provide near real-time geodetic data products from GPS and synthetic aperture radar with a focus on hazard monitoring, response, and research.

Jay Parker is principal investigator for "Rapid Surface Fracture Identification From Radar Interferograms," which proposes to establish a reliable technique for characterizing surface fractures from repeat-visit interferometric phase images, accounting for bad or missing pixels.

Y. Tony Song will lead "Automating Real-Time GPS Tsunami Source and Scale Determination," which proposes an enhancement to automate a series of recently developed algorithms and models for determining sources for earthquakes and tsunamis that can be used for early warnings. The objective is to complete the automation system for detecting tsunami hazards in real time directly from GPS stations.

Letters

I would like to thank JPL for the lovely plant sent to my family after the passing of my husband Robert Risher, who retired from JPL July 7. I would especially like to thank Bob's JPL colleagues for the many cards, kind words and expressions of sympathy and support. Your thoughtfulness has meant a lot to me and our family.

Marcia Risher

Many thanks to my co-workers for their cards, gift and kind words of support after the passing of my father, who maintained his sense of humor to the end. Thank you also to JPL for the beautiful plant.

Cheryl Wysocki

Retirees

The following employees retired in November: **Vickie Baxter**, 40 years, Section 2724; **Stuart Dejesus**, 38 years, Section 313A; **Kurt Liewer**, 36 years, Section 335D; **David Nichols**, 34 years, Section 3000; **Robert Ando**, 18 years, Section 398F.

Passings



Robert Risher

Robert Risher, 65, a retired principal contract administrator, died Oct. 16.

Risher joined JPL in 1984 and worked in the Acquisition Division for 16 years, serving as a negotiator and advisor to several source evaluation boards.

In the Contract Management Section, Risher supported the NASA-wide Consolidated Space Operations Contract, a communications agreement with Lockheed Martin that included management of the Deep Space Network.

Risher was supervisor of two groups: Research and Development, Construction and Architect Engineering and Support Services, and Labor Hour Subcontracts and Consulting Agreements. Most recently, he had managed task orders for the Human/Robotic Mission Systems Office, the Solar System Exploration Technology Office, the Office of the Chief Engineer and the Office of the Chief Information Officer. He retired in July 2014.

Risher is survived by his wife, Marcia, daughter Erin Haven and son Matthew. A memorial service was held Nov. 2 at First Presbyterian Church in Monrovia. The family requests donations in Risher's memory to the Foothill Unity Center, 415 W. Chestnut Ave, Monrovia, CA 91016.



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<http://jplspace>

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Classifieds

Ads submitted Nov. 29–Dec. 4. To submit an ad, e-mail universe@jpl.nasa.gov.

Wanted

ROOMMATE for 3-bedrm./2-bath house in north Pasadena, just west of Lake Ave.; all appliances included, large yard, garage and gated off-street parking; close to Old Town, Rose Bowl and JPL; prefer early career hire, male, someone who will keep common areas clean; preference to those looking to lease ASAP and/or for more than one year; ~\$1,000/mo., with 1 month security deposit. Jeff: 765-620-4342, jrstuart1986@gmail.com.

SPACE INFO/memorabilia, U.S. & other countries, past/present, for personal use (<http://www.youtube.com/watch?v=S7PvjGp7mCU>). mrayman@alumni.princeton.edu, 818-790-8523, Marc Rayman.

Lost & Found

LOST: activity notes, April 2006–March 2007. SOSNotez@riseup.net.

Real Estate for Sale

ALTADENA house, 3/2 newly renovated bathrms. on a beautiful corner lot; 400 sq. ft. screened-in patio, perfect for dining alfresco in front of the brick fireplace; newer carpet, paint, updated landscape, detached two-car garage; located among many historical sites: Millionaires Row, Christmas Tree Lane, hiking trails and JPL; see <http://www.californiamoves.com/property/details/4084462/MLS-14-809591/289-E-Mariposa-St-Altadena-CA-91001.aspx>; \$494,000. Nick: 909-560-4618, vanderwe.ulv@gmail.com.

PASADENA, beautiful 4-bedrm., 2-bath, single-family home; cathedral ceilings, fireplace, marble floors in kitchen & bathrms., hardwood laminate floors, fresh carpet, central & heating units, 2-car attached garage; appliances (refrig., stainless-steel Frigidaire range & dishwasher) & DirecTV ready; walking dist. to JPL, Rose Bowl, Angeles Nat'l Forest; \$596,500. 281-798-4427. lancewyndon@yahoo.com, Lance.

For Rent

ALTADENA, one room in a lovely 3-bd./2-bath house, big backyard, hardwood floor, big closet, furnished or unfurnished, shared bathroom, kitchen and laundry privileges; 5-minute drive to JPL, close to public transportation; short- or long-term lease available; must like dogs and be very clean; \$750 furnished, \$700 not furnished, including utilities + \$650 deposit. 626-712-3451.

LA CRESCENTA duplex on Mary St., avail. Jan. 5; newly remodeled 2-bed., 2-bath front unit w/ updated kitchen/granite/new appliances; laundry/water/trash incl.; walk to La Crescenta Elementary and CV High School; cent. air/heater, garage w/1 space, bonus rm + driveway parking space incl. w/ additional storage out back; \$2,500/mo. + \$2,500 deposit. 818-415-8334.

Vacation Rentals

BIG BEAR lakefront, luxury townhome, 2 decks, tennis, pool/spa, beautiful master bdrm. suite, sleeps 6. 949-786-6548.

BIG BEAR LAKE, newer cabin, 3 bdrms., 3 baths, slps. 9, knotty pine on quiet cul-de-sac, 50" HDTV w/HBO, spa tub in master, central heat/AC, BBQ, WiFi, 2-car garage, no pets. 818-952-2045.

BIG BEAR LAKE, huge mountain chalet, 8 bdrms., 7.5 baths (2 spa tubs), sleeps 18, cable TV in each room, pool table, deluxe kitchen w/prof appliances, <1 mi. to slopes, no pets. 818-952-2045.

JACKSON HOLE, WY: Luxurious bed and breakfast nestled on 3 acres of solitude on the Snake River and down the road from the Jackson Hole Mountain Resort and the south entrance to Grand Teton National Park; see <http://www.bentwoodinn.com/>; mention JPL for employee discount. info@bentwoodinn.com, 307-739-1411.

MAMMOTH, Snowcreek, 2 bd., 2 ba. + loft, sleeps 6-8, fully equip'd kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. vv., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount, no pets. 626-798-9222, 626-794-0455 or valeriee@caltech.edu.

MAMMOTH, Snowcrk, beautiful updated condo, 2 bd., 2 ba. + loft (slps. 6-8), great loc. by pond & meadow, new appliances, TVs, DVD players, free wireless Internet access + washer/dryer, no pets. 818-952-2696 or BigMtnPrettySky@gmail.com.

OCEANSIDE beachfront condo, charming 1 bd., panoramic view, walk to pier or harbor, pool/spa, game room, sleeps 4. 949-786-6548.

OCEANSIDE white-water view beach condo; virtual tour: <http://www.previewfirst.com/mls/33034>; 2 bd., 2 ba., sleeps 6; well decorated and equip'd: boogie boards, wet suits, full kitchen, all linens, beach towels; Wi-Fi ready, new flat-screen TVs, daily paper, grocery stores nearby; 2-min. walk to sand, no roads; JPL and Caltech rates: winter \$1,195/week, summer \$2,150/week; monthly and nightly rates available, reserve with \$500 deposit; see www.beachvisitors.com. 760-433-4459, Grace; 831-425-5114, Ginger. ■