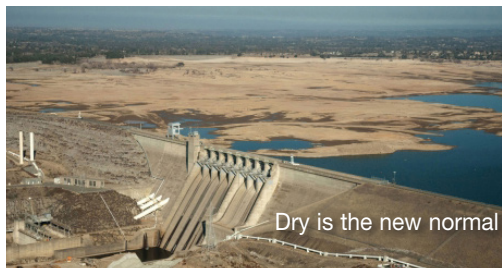


## 2015: Mystery spots, briny waters

The Dawn spacecraft's arrival at Ceres and the strongest evidence yet of water flowing on Mars today were among the highlights of a busy 2015 for JPL. The Lab's scientists studied California's drought, while technologists aided the response to a massive earthquake in Nepal. Cassini flew through a cryovolcano plume at Saturn's moon Enceladus, and Kepler and Spitzer discovered exoplanets. JPL Director Charles Elachi said he will retire in June 2016. Read on for details.



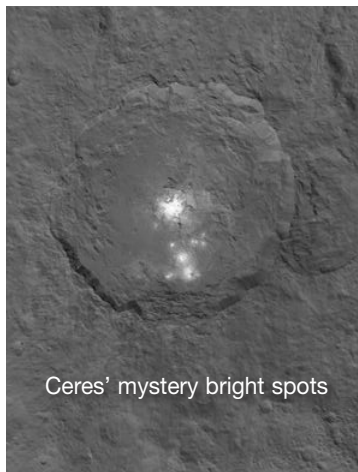
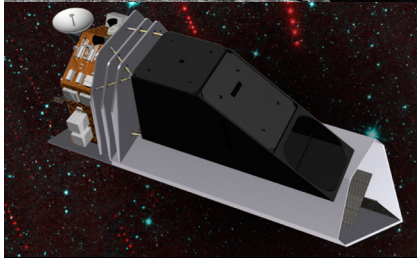
Discovery proposals



Dry is the new normal



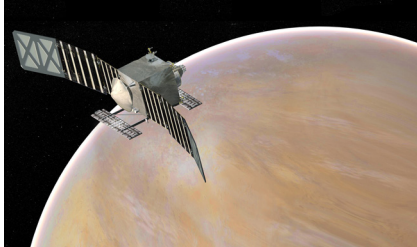
Elachi to retire



Ceres' mystery bright spots



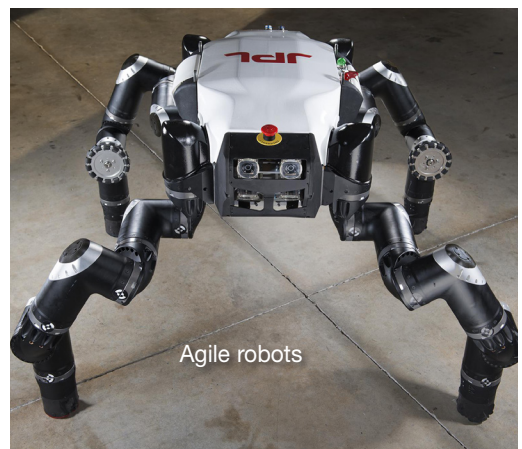
Martian spotlight



Enceladus closeup



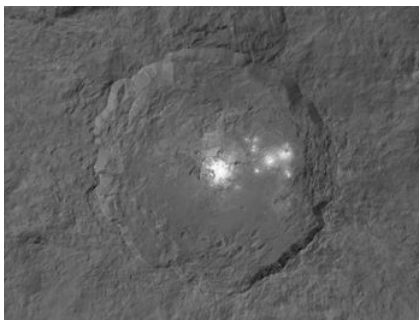
High-tech lifesaver



Agile robots

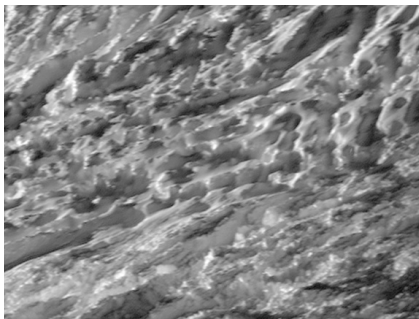
*Continued on page 2*

## LAST SPIN COMING UP



Dawn, the first mission to visit a dwarf planet and the first to orbit two distinct solar system targets, arrived at Ceres March 6, 2015 after orbiting protoplanet Vesta for 14 months in 2011 and 2012. Bright spots on Ceres that fascinated scientists for months were revealed as a type of salt with evidence of ammonia-rich clays, according to recent studies.

## MORE FIRSTS AT SATURN



Now in its second extended mission, Cassini remains as busy as ever after 11 years at Saturn. Researchers revealed that the moon Enceladus shows signs of present-day hydrothermal activity and that a global ocean lies beneath its icy crust.

On Oct. 28 the spacecraft skimmed just 30 miles above Enceladus' sur-

face in its deepest-ever dive through the moon's icy plume. Earlier, Cassini revealed the rugged landscape of Saturn's fracture-faced moon Dione, buzzing within 321 miles of the surface, and also flew by moons Hyperion and Tethys.

## MARS AT JPL

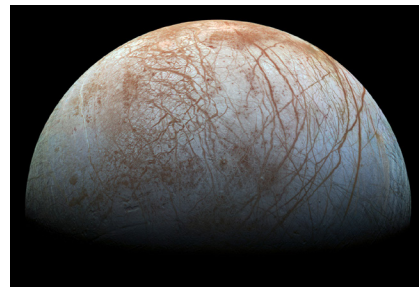


At the Red Planet, Mars Reconnaissance Orbiter detected streaky hydrated minerals, providing the strongest evidence yet that liquid water flows intermittently on Mars today. On the surface, the Curiosity rover is heading to higher ground to investigate mobile sand dunes. JPL played important roles in the movie and book "The Martian," and the Lab hosted some of the principal players of the story. Book author Andy Weir joined a panel discussion, while actor Matt Damon toured JPL and visited the Mars Yard.

## NEW OPPORTUNITIES

NASA gave the green light to the JPL-managed Europa Mission to enter its formulation phase. The mission planned for the 2020s will make multiple flybys of the Jovian moon to investigate its habitability.

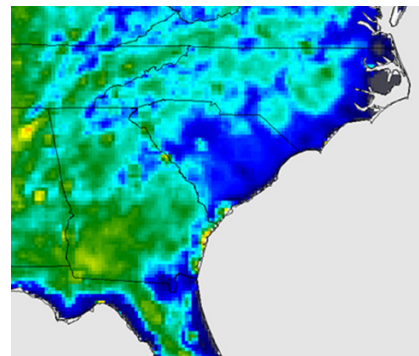
Three JPL-managed mission proposals meanwhile were selected for possible development under NASA's



Discovery Program.

The proposals—VERITAS, a Venus orbiter; a mission to the metal asteroid Psyche; and NEOCam, a space telescope to search for more near-Earth asteroids—are among five concepts NASA will fund for further concept design studies. Next September, the agency expects to pick one or two for final development for flight.

## SURVEYING SOILS



Soil Moisture Active Passive, a mission to measure and map Earth's soil moisture and freeze/thaw state to better understand water, carbon and energy cycles, launched Jan. 31 from Vandenberg Air Force Base. Due to an anomaly, the mission's radar can no longer return data, but it continues to produce high-quality science with its radiometer instrument, which measures soil moisture in the top five centimeters of the

*Continued on page 3*

**2015 IN REVIEW** *Continued from page 2*

ground. Data from the mission have produced maps of flood-ravaged South Carolina and provided visualization of Hurricane Patricia's path.

After four years in orbit, the Aquarius mission to study ocean salinity came to an end when its Argentina-supplied spacecraft stopped operating. Aquarius revealed how extreme floods impact seas and how low-salinity river plumes affect hurricane intensity.

## DRY IS THE NEW NORMAL



JPL researchers say drought is the likely culprit for land sinkage in the San Joaquin Valley that is moving faster than ever before due to increased pumping of groundwater. Subsidence was mapped along the California Aqueduct, which carries water from the Sierra Nevada Mountains and Northern and Central California valleys to Southern California.

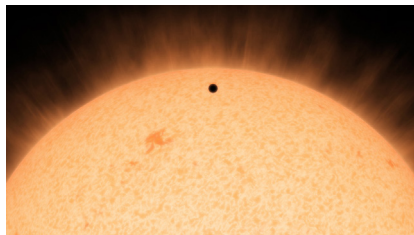
In order to provide actionable information for organizations like the California Water Resources Board, JPL is leading the Western States Water Mission, a new science data system that takes advantage of all satellite observations for a comprehensive view. The system's web-based user interface provides assimilated data and standard reports on water use and availability, regardless of the source.

## HIGH-TECH LIFESAVER



Finding Individuals for Disaster and Emergency Response (FINDER), a technology developed at JPL, helped rescue four men trapped under bricks, mud and other debris by detecting their heartbeats after a major earthquake in Nepal. The Department of Homeland Security and JPL have transitioned the final prototype of the radar technology for commercial manufacture.

## APPROACHING EXOPLANETS



Using JPL's Spitzer Space Telescope, astronomers in September confirmed the discovery of the nearest rocky planet yet found outside our solar system, larger than Earth and a mere 21 light-years away. Meanwhile, the JPL-developed Kepler mission confirmed Kepler-452b as the first near-Earth-size planet in the "habitable zone" around a sun-like star. The number of confirmed planets is at 1,030.

## TECH UPDATE



RoboSimian, a JPL-developed ape-like robot, competed in the Defense Advanced Research Projects Agency Robotics Challenge Finals in June. The device has stereo cameras to see and four limbs for maneuvering and manipulation. Also in June, technologies that could enable larger payloads to land safely on Mars were tested in Hawaii, the second technology test of the Low-Density Supersonic Decelerator.

## ELACHI TO RETIRE



After 46 years on Lab including 15 years as director, Charles Elachi announced he will retire from JPL next June. Elachi will become a professor emeritus at Caltech, where he now teaches, and will continue his research on Cassini radar and other projects. ■

# JPLers are there when it counts

Recent drives to benefit active-duty military personnel and to help the needy in local communities and have shown JPLers' holiday spirit and generosity.

More than 300 pounds of toiletries, electronics, batteries and personal items were collected for the Veterans Day active duty drive. In a separate food and clothing drive, 27 large bags of clothing, 19 boxes of food and four boxes of toiletries were collected and donated to a local charity.

The donation drives were held in conjunction with JPL's annual United Way campaign, which ended Dec. 4. JPLers donated \$438,973 to United Way, which is about 88 percent of its goal of \$500,000. Twenty-four percent of JPL employees participated, said Susan Sulak of Human Resources.

In addition, the JPL Rovers Team raised \$2,000 for United Way's HomeWalk, an annual 5K walk/run to help end



Members of the JPL Rovers team meet up with their Caltech campus counterparts (orange shirts) at United Way's Homewalk Nov. 21 at Exposition Park in Los Angeles. JPL's team raised \$2,000.

homelessness in Los Angeles. All funds will help move more homeless individuals, families and veterans into permanent

housing next year.

JPL's Employee Involvement Committee oversaw the charitable activities. ■

## Passings

Kenneth Curry, 87, a retired manager who supported JPL's efforts that enabled the Apollo Program, died Nov. 2.

Curry joined JPL in 1962. He supervised mechanical design for the Mariner spacecraft and the Ranger program, and also contributed to the Surveyor program, which resulted in five moon landings in 1966. Curry led development of the Voyager deployable appendages and launch latches, as well as mechanisms on the Hubble Wide Field Planetary Camera, Galileo, Spaceborne Imaging Radar, Topex and other Earth-observing instruments.

He also supervised the Design Section before becoming supervisor of the new Mechanical Devices Group in Section 352 in 1976.

Curry retired in 1989. He is survived by his wife, Helen; daughters Judy McNulty, Jane Kane and

Laura Wending; six grandchildren and one great-grandchild. A memorial mass was held Nov. 21 at St. Bede Church in La Canada.

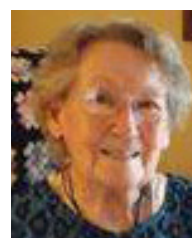


Carl Sauer

Carl Sauer Jr., 84, a retired principal flight mechanics engineer, died Nov. 12.

Sauer worked at JPL from 1952 to 2006. He was recognized as the originator of the formulation of low-thrust trajectory optimization. He also created a mathematically rigorous chemical propulsion trajectory optimizer, playing significant roles in enabling missions such as Magellan, Cassini, Stardust and Messenger. Software Sauer developed was used in the preliminary design phase of every JPL planetary mission flown in the last 40 years.

Sauer is survived by daughters Vicki and Karen and grandchildren Katrina, Corinna and Samuel. Services will be held in La Crescenta at a future date.



Maxine Koop

Maxine Koop, 86, a retired secretary, died Nov. 26.

Koop is survived by daughters Deborah Colella, Sandra Hunt and Lavonna Butters; son Scott Koop; grandchildren Andrea Kunze, Ashley Koop, Brant Butters and Amber Koop; and great-grandchild Alex.

In lieu of flowers, memorial donations may be made to the YMCA, Rogue Valley Humane Society or Lovejoy Hospice, all in Grants Pass, Oregon. ■

## Retirees

The following employees retired in October:

**Cindy Coryell, 37 years, Section 2202; Louie Hermosillo, 17 years, Section 357; Gary L. Smith, 14 years, Section 393F; Katherine Randall, 11 years, Section 3011.**

## Letters

I would like to thank my JPL family for their support for the recent passing of my father. Thanks to JPL Hospitality, too, for the lovely plant. As always, the JPL support comes shining through especially during the toughest of times.

Martha Avina

## Classifieds

Ads submitted Nov. 21–Dec. 1. To submit an ad, e-mail [universe@jpl.nasa.gov](mailto:universe@jpl.nasa.gov).

### For Sale

GATE, for pets or kids, auto lock, cardinal white, brand new in the box, \$55. [mlq5weJh@yahoo.com](mailto:mlq5weJh@yahoo.com)

MISC.: Pedometer, mini steam iron, Rollerblades (men's 8), head/neck/shoulder massager, soft-sided cooler, bloody Mary set, stemless decanter set, woman's M "Galileo Fit. Team Mbr" LS red turtle-neck, white roller rink skates (size 7); prices upon request. 818-272-3262.

WINTER SPORT ITEMS, everything from boots to helmets, M/F sizes M-XL. 818-272-3262.

### Vehicles / Accessories

'09 HARLEY-DAVIDSON Street Glide touring bike, 5,000 miles, Screaming Eagle pipes, customized seat, fairing w/LED lights across front, saddlebags, custom paint, flat black and beautiful, \$15,500. 626-482-1444.

### Free

BED: last chance, Ikea kid's half bunkbed with all the parts, mattress available, pick up in La Crescenta. Timothy Koch, 818-458-0524 text/cell.

IGNITION ANALYZER, Heathkit model CO-1015, solid-state, for "old style" (non-electronic) 6- and 12-volt systems, w/ops. handbook. [chactionjr@yahoo.com](mailto:chactionjr@yahoo.com).

### Wanted

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

### Lost & Found

LOST: activity notes, April 2006–March 2007. [SOSNotez@riseup.net](mailto:SOSNotez@riseup.net).

### For Rent

ALTADENA, master bedrm & bath in beautiful 4 bd., 2-bath house; share w/2 considerate professional women, avail. January; beautifully furnished /decorated, lg. kitchen w/ample storage, French doors lead from bedrm. to patio; quiet/safe neighborhood; large, fenced yard w/mature fruit and shade trees, detached garage; easy bike distance to JPL (1 mile); includes all utilities, high-speed

Internet; \$1,100/mo. Louise, 818-653-9600, [louise@louiseh.org](mailto:louise@louiseh.org).

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

GLENDALE, 12 miles from JPL, rear guest house (650 sq. feet), 1 bedroom, 1 bath, kitchen, own private patio with laundry hookups, walking distance to Galleria and Americana, no pets; \$1,175/month. 818-720-7432 or [rmarin12@hotmail.com](mailto:rmarin12@hotmail.com).

### Vacation Rentals

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

HAWAII: Kauai condo, Pacific Fantasy, Kapaa, 1 bedroom, sleeps 4, \$950 per week; MEXICO (1 bedroom), Mayan Palace: Acapulco, Nuevo Vallarta, Riviera Maya, Puerto Vallarta; Sea Garden: Acapulco, Nuevo Vallarta, Mazatlan; trades also available with II and RCI based upon availability. 818-272-3262.

JACKSON HOLE, WY: Luxurious bed and breakfast on 3 acres of solitude on Snake River near Jackson Hole Mountain Resort and south entrance to Grand Teton Natl. Park; see <http://www.bentwoodinn.com/>; mention JPL for discount. [info@bentwoodinn.com](mailto: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. vw., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount, no pets. 626-798-9222, 626-794-0455 or [valeriee@caltech.edu](mailto:valeriee@caltech.edu).

MAMMOTH, Snowcreek, beautiful updated condo, 2 bd., 2 ba. + loft (sleeps 6-8), great location by pond/meadow, new appliances, TVs, DVD players, free wireless Internet and washer/dryer, no pets. 818-952-2696 or [BigMtnPrettySky@gmail.com](mailto:BigMtnPrettySky@gmail.com).

MAMMOTH, remodeled 2 bed/2 bath + loft, short walk to Canyon Lodge; Courchevel 6 features full kitchen, cable and Internet TV, DVD & Blu-Ray, wireless high-speed Internet, 2-car garage, Jacuzzis, summertime grill and pool; no pets. <http://Courchevel6.com>.

OCEANSIDE condo, on the sand, watch the beautiful sunsets, charming, 1 bedroom, panoramic view, walk to pier or harbor, pool/spa, game room, sleeps 4 max, all amenities. 949-786-6548. ■



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E-MAIL US AT  
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