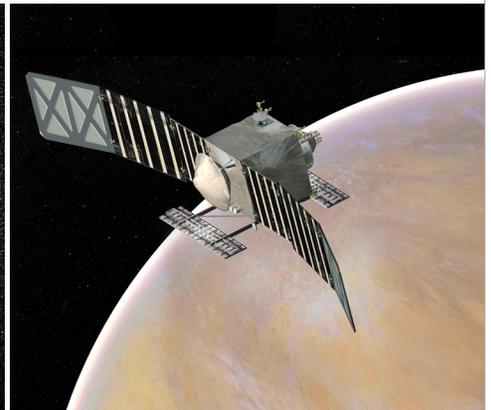
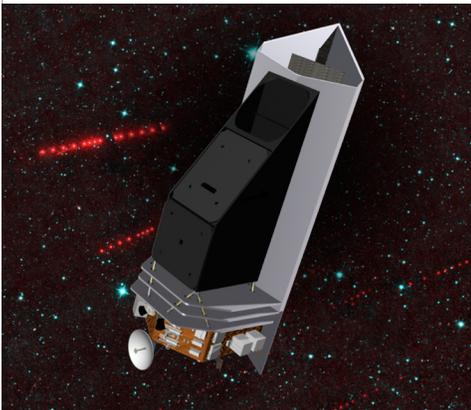


## Three JPL concepts picked in Discovery's first round

By Franklin O'Donnell



JPL's Discovery Program proposals are (from left) NEOCam, Psyche and VERITAS.

Significant good news for JPL arrived at the end of September when NASA announced the selection of three mission concepts managed by the Lab for possible development under the agency's Discovery Program.

The three proposals – a Venus orbiter, a mission to a metal asteroid and a space telescope to search for more near-Earth asteroids – are among five concepts that NASA will fund for further concept design studies during the coming year. In September 2016, the agency expects to pick one or two for final development for flight.

The Venus orbiter, called VERITAS,

would map the planet with a radar vastly more capable than that on JPL's Magellan mission of the early 1990s. The mission would obtain global maps of high-resolution radar imaging and altimetry, and make other measurements designed to penetrate Venus' thick carbon dioxide atmosphere.

JPL planetary scientist Sue Smrekar, VERITAS principal investigator, said the mission is designed to reveal Venus' geologic history, determine how active it is, and search for the fingerprints of past and present water. "The overarching question is, 'How Earthlike is Venus?'" said Smrekar.

"As more and more exoplanets are discovered, this information is essential to predicting whether Earth-sized planets are more likely to resemble Earth or Venus."

Tony Freeman was the VERITAS capture lead for Step 1. Dave Lehman of JPL is project manager, Scott Hensley is the project scientist, and Leon Alkalai will be the capture lead for Phase A. Lockheed Martin would be the spacecraft contractor. VERITAS stands for Venus Emissivity, Radio Science, InSAR, Topography And Spectroscopy.

The huge metal asteroid Psyche

*Continued on page 2*

**JPL CONCEPTS PICKED** *Continued from page 1*

is the destination for the second selected JPL proposal. Also known as Psyche, this spacecraft would use ion propulsion to reach and orbit the 250-kilometer-wide object that circles the sun in the main asteroid belt between Mars and Jupiter. Discovered in 1852, Psyche is unusual for its composition later found to be 90 percent iron and nickel, making it the largest metal asteroid ever identified.

According to the mission's principal investigator, Lindy Elkins-Tanton of Arizona State University in Tempe, Psyche could be the remnant of a massive collision in the early solar

Earth – perhaps yielding 10 times more near-Earth objects than all discovered to date.

NEOCam builds on JPL principal investigator Amy Mainzer's previous mission, the Wide-field Infrared Survey Explorer, which found 34,000 asteroids and 135 near-Earth objects. The new space telescope would have a larger diameter and would feature a much wider field of view.

Following launch, NEOCam would be stationed at the L1 Lagrange point between Earth and the sun. That location provides a stable, cold environment allowing the infrared tele-

NEOCam is being shepherded by the Lab's Astronomy, Physics and Space Technology Directorate (7X).

"NEOCam is a solar system mission observing solar system objects, but because of 7X's involvement with space telescopes it made sense for us to develop this proposal," said Roger Lee, deputy manager of 7X's Astrophysics and Heliophysics Formulation Office.

"All of these proposals have benefited from hard work, innovative solutions and development approaches in many offices across JPL, including the Foundry and 3X, that contributed

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**“JPL’s representation in these selections is a very strong reflection of the quality of proposal work at the Lab and our success in teaming with science investigators,” said JPL Director Charles Elachi.**

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system that stripped the mantle from a protoplanet then forming, leaving only its metal core.

Because the asteroid is so unusual, Elkins-Tanton said her mission concept is “truly exploration.” “Nobody has ever seen a metal world before,” she added. “We have no idea what it’s going to look like.”

David Oh continues as the capture lead for Psyche, Carol Polansky is the project scientist, and a JPL project manager is expected to be named soon. The spacecraft would be built by JPL, using a power-propulsion chassis provided by Space Systems Loral.

JPL's third proposal, NEOCam, is the latest project designed to survey potentially hazardous asteroids near

scope to function for many years without the need for cryocoolers.

“Everyone wants to know about asteroids hitting Earth,” said Mainzer. “NEOCam is designed to settle the issue.”

George Sprague was the NEOCam Step 1 capture lead. A JPL project manager is expected to be named soon. Ball Aerospace would be the spacecraft contractor for NEOCam.

In addition to the three JPL proposals, two mission concepts from NASA's Goddard Space Flight Center were selected in the current Discovery Program announcement.

VERITAS and Psyche are being developed by JPL's Solar System Exploration Directorate (4X), while

significant content and technical review,” said Kim Reh, deputy manager of 4X's Solar System Mission Formulation Office.

Lab Director Charles Elachi added, “JPL's representation in these selections is a very strong reflection of the quality of proposal work at the Lab and our success in teaming with science investigators.”

“The Discovery competition remains extremely tough,” said Brent Sherwood, manager of 4X's Solar System Mission Formulation Office. “NASA received 28 proposals this time. Congratulations go to the hundreds of JPLers who supported our Step 1 campaign. Now the hard work of competing in Step 2 begins.” ■

# EXOPLANETS MARK THE SPOT

Thousands  
discovered since  
the first finding  
20 years ago

By Mark Whalen



An artist's rendering of exoplanet 51 Pegasi b, discovered in October 1995. It's about half the size of Jupiter and orbits its star in about four days.

In 1995, a breakthrough for the world of astronomy came when two Swiss scientists announced the discovery of the first planet ever found orbiting a sun-like star beyond our solar system. Known as 51 Pegasi b the planet was a “hot Jupiter,” much larger and closer to its parent star than Earth is.

That event ushered in an extraordinarily productive period for planet-finding. Over the past two decades more than 1,800 confirmed exoplanets have been discovered, some much more similar to Earth. Throughout that time, JPL has played a major role in both existing discoveries as well as in helping chart the future of exoplanet exploration.

JPL's Spitzer Space Telescope originally was not designed to study planets around other stars, but one of the mission's biggest surprises is its abilities with exoplanets. Thanks to its steady gaze and some clever engineering, it has pioneered the study of atmospheres and weather on large, gaseous exoplanets.

Spitzer can help narrow down the sizes of exoplanets too, and recently confirmed the closest known rocky planet to Earth, HD 219134b. The infrared observatory also works in tandem with other telescopes that use a planet-hunting technique called microlensing to find some of the most distant exoplanets known.

By far the lion's share of exoplanet discoveries, however, have been the work of NASA's Kepler mission. JPL was asked by the agency to manage Kepler's spacecraft development, and continues to support science activities.

In its most recent major discovery, in July of this year, Kepler confirmed the first near-Earth-size planet in the “habitable zone”

around a sun-like star. This finding, Kepler-452b, brings the total number of confirmed planets to 1,030. In addition, the Kepler team has increased the number of new exoplanet candidates by 521 based on their analysis of observations conducted from May 2009 to May 2013. This raises the number of planet candidates detected by the Kepler mission to 4,696.

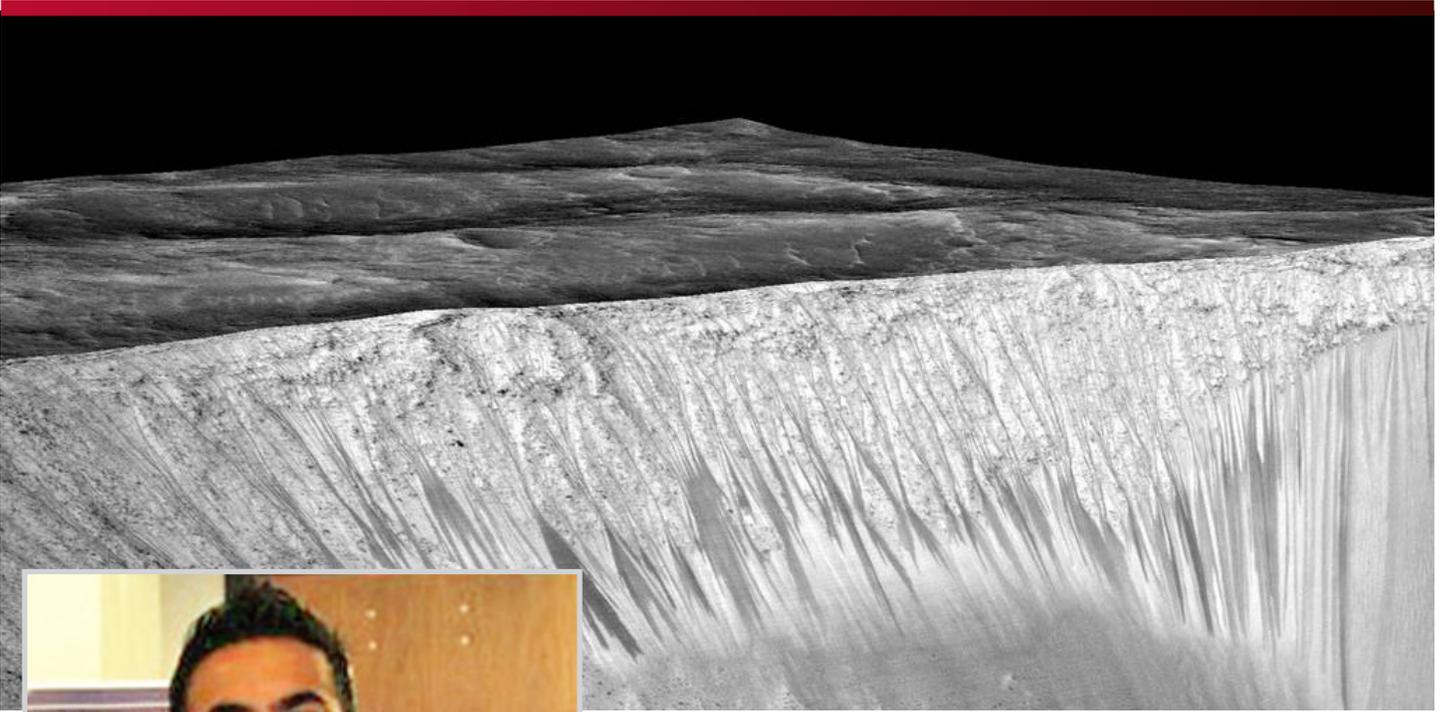
Such candidate exoplanets require follow-up observations and analysis to verify they are actual planets. Twelve of the new candidates have diameters between one to two times that of Earth, and orbit in their star's habitable zone. Of these, nine orbit stars that are similar to our sun in size and temperature.

“The number of planets Kepler has discovered is pretty amazing,” said Leslie Livesay, JPL's director for engineering and science who previously served as Kepler project manager. “It's shown us that exoplanets are more abundant than stars. One in five stars is going to have an Earth analog planet.”

NASA's Exoplanet Exploration Office, which is based at JPL, leads all planet-seeking study themes across the agency. The office coordinates work to define scientific investigations and the missions that carry them out, building on each other's success.

Looking to the future, JPL is working with NASA's Goddard Space Flight Center on Wide-Field Infrared Survey Telescope, or WFIRST, a space-based observatory designed to settle essential questions in both exoplanet and dark energy research. It was the top priority space mission identified in the 2010

*Continued on page 5*



Lujendra Ojha, the former JPL graduate fellow whose research revealed the strongest evidence yet for water on present-day Mars.

# Following the water

By Mark Whalen

## Former JPL researcher finds evidence of water on Mars today

When NASA announced in late September that JPL's Mars Reconnaissance Orbiter provided the strongest evidence yet that liquid water flows intermittently on Mars today, Suzanne Smrekar felt an extra sense of pride.

Smrekar, deputy principal investigator for JPL's InSight mission to Mars that launches next year, had served as a mentor for Lujendra Ojha, the youthful researcher who was the lead author of a report on these findings published by Nature Geoscience.

Ojha had received a graduate fellowship from JPL's Education Office in summer of 2013.

Ojha first noticed puzzling downhill flows—known as recurring slope lineae, often described as possibly related to liquid water—as a University of Arizona undergraduate student in 2010. Images from Mars Reconnaissance Orbiter's High Resolution Imaging Science Experiment (HiRISE) now have documented recurring slope lineae at dozens of sites on Mars. The new study paired HiRISE observations with mineral mapping by the orbiter's Compact Reconnaissance Imaging Spectrometer for Mars.

Ojha's work at JPL culminated with a presentation on an in-depth investigation of the geophysical properties of Elysium

Planitia. Although unrelated to the Mars water findings, Smrekar recalls a dedicated, hardworking but modest researcher.

"He was very focused on science and worked hard to pin down evidence," she said. "He was kind, thoughtful and extremely self-motivated as a scientist."

Asked whether Ojha's water findings are anywhere near the landing zone for InSight, Smrekar replied, "Absolutely not! We want to avoid that type of soil to drill in. We're looking to be at the most boring site on Mars."

Smrekar said she's looking forward to a bright future and more great work from Ojha. ■

## United Way campaign targets homelessness



JPL's 2015-16 United Way campaign gets underway Thursday, Oct. 29 with a kick-off event on the mall from noon to 1 p.m. Pop-up cafes will be available for lunch.

A representative from United Way will be present to pass out information and answer any questions, and employees may begin signing up online that day. The campaign will continue through Friday, Dec. 4.

As part of the campaign, JPL will again participate in United Way's annual HomeWalk, a 5K run/walk at Exposition Park in Los Angeles set for Saturday, Nov. 21. The event aims to reduce homelessness in Los Angeles. In the past, many JPL employees joined the Caltech team, but for the first time, a JPL team is being formed for the event.

For more information on the campaign, please visit <http://www.unitedwayla.org>. ■



Mars Program Director Fuk Li (right) presents a Curiosity image to county Supervisor Mike Antonovich.

## Supervisors honor DSN, Mars

The Los Angeles County Board of Supervisors in September honored JPL's Deep Space Network and Mars teams.

The Deep Space Network was recognized for its support of all interstellar missions, while the Mars program was recognized for its 50th anniversary.

In attendance for the DSN were Interplanetary Network Director Keyur Patel, project managers Alaudin Bhanji and Wayne Sible and Tracking, Telemetry, and

Command Office Manager Ana Maria Guerrero.

Mars program personnel in attendance were Director Fuk Li, Deputy Director Roger Gibbs, Chief Scientist Richard Zurek, Mars Exploration Rover Project Manager John Callas, engineering applications software engineer Bevin Duckett, Mars Science Laboratory mission lead Deb Chattopadhyay and MSL systems engineer Amanda Steffy. ■

### EXOPLANETS *Continued from page 3*

National Academy of Sciences decadal survey. JPL's role includes developing a telescope and coronagraph for the mission. JPL is also conducting technology-development research for a starshade that could be used for exoplanet studies.

"Finding that there are billions of other planets out there is turning out to be one of the most exciting things in science," said JPL astronomer Nick Gautier, project scientist for Kepler. "Discovering that there are planets around every star has really fired up people's imagination."

NASA has tracked these discoveries since 2002 with its award-winning "PlanetQuest" website, located at <http://planetquest.jpl.nasa.gov>. Managed at JPL, the site features a continuously updated discovery dashboard along with exoplanet news, interactives, visualizations and multimedia. ■

## Honorary doctorate for van Zyl

JPL Associate Director of Project Formulation and Strategy Jakob van Zyl has been awarded an honorary doctor of engineering from the University of Stellenbosch in South Africa.

Van Zyl, who earned an engineering degree from the university and is currently an Extraordinary Professor in Electrical Engineering there, will receive the honor in December.



Jakob van Zyl

## Chan honored as 'Rising Star'

The Federal Computer Week 2015 Rising Star awards program has recognized Evan Chan, manager of JPL's Web and Mobile Application Development Group with the Office of the Chief Information Officer.

Chan led the successful implementation of JPL's paperless procurement system and the introduction of mobile and wearable development patterns, allowing JPL to be the first within NASA to deploy a 3-D-enabled mobile application environment. He is the only NASA representative on the 2015 list.



Evan Chan

## JPL Fellows appointed

Three researchers have been named JPL Fellows, an honor recognizing those who have made extraordinary technical and institutional contributions to the Lab over an extended period of time. Fellows are sought out for advice on strategic decisions that help guide the course of the Laboratory's future.

The honorees:

**Darius Divsalar:** For pioneering work in the field of telecommunications and signal processing through the development of elegant, simplistic solutions in coding and modulation that have increased data return from spacecraft and advanced 3G/4G cellular standards for terrestrial communications.

**Todd Gaier:** For visionary leadership in the field of microwave radiometry for scientific remote sensing, ultra-low-noise millimeter wave amplifiers, and microwave monolithic integrated circuit technologies, enabling cutting-edge instrumentation for Earth science, astrophysics and planetary science applications.

**Brian Wilcox:** For pioneering innovations in robotics technology and supporting systems enabling

JPL's preeminence in robotic rover development and deployment, conceptualizing a feasible solution for robotic asteroid redirection and retrieval, and devising robotic solutions to enable human habitation of Mars and the moon.

## Passings

**Emmerich Koehler,** 85, a retired senior instrument specialist in Section 357, died Aug. 4.

A native of Hungary, Koehler worked at JPL from 1969 to 1995, specializing in custom fabrication of machined parts for spacecraft. He contributed to Voyager, Galileo, Mariner, the Hubble Space Telescope and Wide Field Planetary Camera 2. As part of his work at JPL, he also traveled several times to Oxford University in England to mentor their employees on specialized machining techniques.

Koehler is survived by his wife, Karolina; sons Harold, Robert and John; and grandchildren Britney, Ziggy, Bridget, Corey and Kasey.



Emmerich Koehler

**Richard Kemski,** 60, mission assurance manager for Mars Science Laboratory, died Aug. 15.

During his career of more than 25 years at JPL, Kemski also contributed to Cassini, Orbital Carbon Observatory 2 and the Deep Space Network. He received numerous NASA and JPL awards, including NASA's Exceptional Achievement Medal and Exceptional Services Medal.

He is survived by his wife, Liz, his mother Joan, sister Kathleen Gibson and many nieces and nephews.

Kemski's family is asking that donations in his name be considered to <http://www.mds-foundation.org/donate>.



Richard Kemski

## Letters

I would like to pass along my appreciation and thanks to my JPL friends for their condolences and card on the passing of my mother. The thoughts and support have helped my family and me during a rough time.

**Steve Waldherr**

## Classifieds

Ads submitted Sept. 26–Oct. 2. To submit an ad, e-mail [universe@jpl.nasa.gov](mailto:universe@jpl.nasa.gov).

### For Sale

**BICYCLES:** one Magna kid's bike, 20" wheel, single speed, black/red; 2 Univega Mountain Force 103 mountain bikes (boy & girl), 5 speed; photos available, best offer. [mb275c@gmail.com](mailto:mb275c@gmail.com).

**DESK (corner),** solid wood, with built-in shelves, storage space with filing cabinets and locking feature for cabinets, perfect in a home office or for students or professionals, \$250. <http://ventura.craigslist.org/fuo/5246808857.html>.

**DESK:** steel, 6 drawers, black with wood lookalike Formica top, 60" W x 30" D x 29" H, photo available, best offer. [mb275c@gmail.com](mailto:mb275c@gmail.com).

**MODEL AIRPLANE:** large Proctor 1917 Albatros DVA bi-plane with engine, 1/4 scale, 89" wingspan, 73" length, fully assembled with wings detached, photos at <https://www.dropbox.com/sh/ggnfnn2qha5vupo/AADGbDVSjuGaCBRJA0kQV5-Fa?dl=0>. [mb275c@gmail.com](mailto:mb275c@gmail.com).

**WASHER & DRYER,** exc. cond., a few years old, Samsung, front loaded, looks brand new and functions perfectly; both for \$750. [tjglasshouse@gmail.com](mailto:tjglasshouse@gmail.com).

### Wanted

**ROOMMATE** for 3-bedrm./2-bath house in north Pasadena, near Woodbury, just west of Lake Ave.; all appliances incl., large yd., garage and gated off-st. parking; close to Old Town, Rose Bowl and JPL; prefer early career hire, someone to keep common areas clean; preference to those looking to lease ASAP; ~\$1,000/month, with 1 month security deposit. Call/e-mail Jeff: 765-620-4342, [jrstuart1986@gmail.com](mailto:jrstuart1986@gmail.com).

**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. [SOS-Notez@riseup.net](mailto:SOS-Notez@riseup.net).

### Real Estate for Sale

**LEBEC-area** mountaintop retreat, spectacular views, 4 br./2 ba., 3,210 sq. ft. custom-built house on 20 acres, surrounded by vast fields of wildflowers in spring, but stunning year-round; only about an hour from JPL north on I-5; includes spacious workshop or artist's studio; see <http://www.tourfactory.com/idxr1308594>; \$599,000. 805-358-1626 or [Robert.A.Preston@icloud.com](mailto:Robert.A.Preston@icloud.com).

### For Rent

**ALTADENA** foothills home, available November; comprehensively furnished for extended stays: 2 bedrooms, study (guest room), office, 3 mi. from JPL, view, fireplace, oak floors, antiques, fine furniture, beds, dinnerware, starter kitchen supplies, linens, towels, and most necessities included, just bring toothbrush & clothes; TV/DVD/Dish satellite, wireless DSL, garden, fruit trees, garage, secluded, quiet, safe neighborhood near trails. 626-798-3235, [gaboon@sbcglobal.net](mailto:gaboon@sbcglobal.net).

**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.

**ALTADENA,** furnished room with view for lease; non-smoker to share a 4-bedroom, 3-bath house; close to local colleges, route to Kaplan, Pasadena schools, including Caltech, walking distance to JPL; utilities are included, central air/heat, Internet access; near 210/134/110 freeways, bus stop, shopping, banking, entertainment and restaurants; must see; \$740/month. 818-370-0601.

**ALTADENA** apt, ground floor, appliances optional, freshly painted, 2 bedrooms, 1 bath, fireplace, good size closets and bedrooms, carpeting TBD, tile in kitchen and bath, mini blinds throughout, carport parking, storage, laundry room; very close to bus stop, JPL, Odyssey Charter School, grocery stores, shops, pharmacy, 24-Hour Fitness, clean; option: \$740 share or \$1,375 rent entire apt. 818-370-0601.

**ALTADENA (91001),** 2-bedroom, 1 3/4-bath condo; security access and gated, security alarm, cable Internet ready, central air/heat, well maintained, carport parking, nice closet organizers, kitchen w/marble floors, washer/dryer, den, fireplace, patio with garden and hot tub, community pool and more, you pay utilities, excld. trash; \$1,875/month. 626-798-6185.

**PASADENA,** 1923 craftsman home completely remodeled; 1 bedroom, 1 bathroom, living room, dining room, stackable washer/dryer hookup, new stove, new microwave, newly refinished hardwood floors, new paint, 1-car garage; 2 houses on a large lot, JPL'er occupies the front house; common patio/BBQ/fireplace area between the houses; nice quiet neighborhood; no pets; available Nov. 1; \$2,100/month. 626-394-5946.

**SIERRA MADRE CYN.,** perched next to the canyon creek, this circa 1910, 1-bdrm., 1-bath, 2-story house is a gem; new paint, hardwood floors, commercial-grade Maytag stove & fridge, walk-in dressing room w/attached washer/dryer, copper lighting, w/artisan wood/rock work throughout yard; \$2,300/mo., utilities & gardening service included. 626-485-0197 or [canyonclan@gmail.com](mailto:canyonclan@gmail.com).

### Vacation Rentals

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

**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).

**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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