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2018: A look ahead

From tremors on Mars to ripples on Earth, JPL spacecraft set to launch this year promise to alter and deepen our understanding of planetary processes.

By Carl Marziali

JPL's gaze will turn inward this year with missions to reveal the bones and sinews of rocky planets.

Launching in May, the **InSight** probe is scheduled to mark Thanksgiving on Martian soil, latching onto the scrabbly crust and drilling 15 feet below.

The mission is billed as a quest to study the planet's vital signs, and InSight's instruments make up the first planetary doctor's bag. The first seismometer in more than 40 years to leave Earth's orbit will act as a Martian stethoscope, listening for faint motions in the core and mantle, for the aural signature of meteorite impacts, and for any tremors that may develop even in the absence of tectonic plates.

InSight also will deploy a heat flow probe that will hammer five meters (about 15 feet) below the ground to try to map the planet's heat flow and thermal history. A third instrument will track the wobble of the planet as the lander communicates with Earth, helping to determine the mass and density distribution within Mars.

Also launching this spring, **GRACE-FO** (Gravity Recovery and Climate Experiment Follow-On) succeeds the original GRACE, which over 15 years proved that

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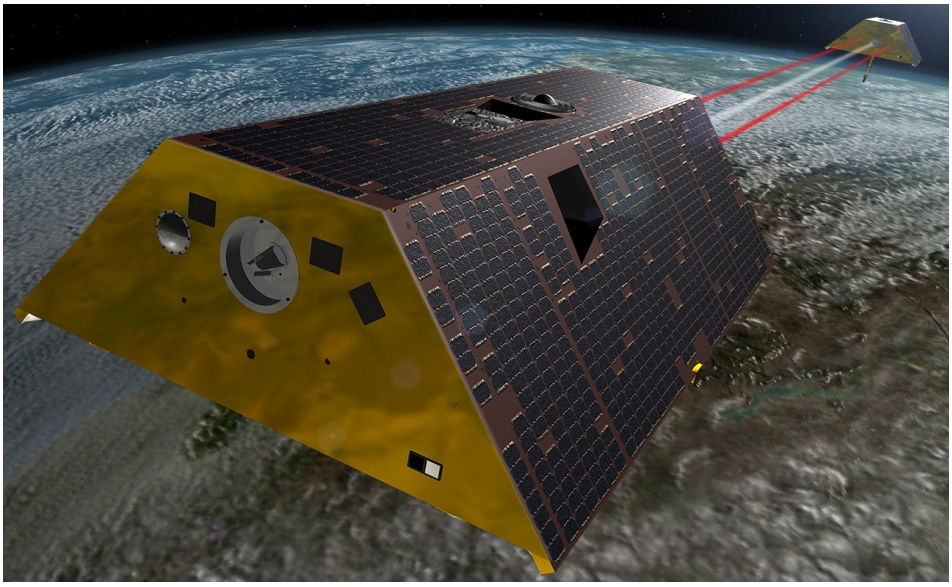
InSight



GRACE-FO

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water movements on Earth can be measured by minute changes in their gravitational pull on orbiting satellites. Using the global positioning system as a fixed reference, and microwave ranging to measure the distance between twin satellites, GRACE succeeded in mapping changes in ice sheets and glaciers, aquifers deep underground, large lakes and rivers, and ocean levels around the globe.

GRACE-FO will deploy new technology that should dramatically improve the precision of its measurements, providing a unique and comprehensive view of Earth's life-sustaining circulatory system.

If the GRACE mission maps the planet's veins and arteries, **ECOSTRESS** tracks its capillaries. A high-resolution thermal infrared radiometer that works like a giant thermometer, ECOSTRESS will measure the temperature of plants and the amount of heat radiating from Earth's surface. The instrument will be sensitive to the point of monitoring the loss of water attributable to the respiration of leaves through their pores. ECOSTRESS, formally named the ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station, is scheduled to launch in June.

Scheduled to launch as early as June, the **Compact Ocean Wind Vector Radiometer** will provide accurate and low-cost measurements of ocean wind speed and direction. as well as parameters such as water vapor, cloud liquid water, precipitation rate and sea ice. JPL built the instrument for the Air Force.

And to keep all those spacecraft on track, JPL's **Deep Space Atomic Clock** will launch sometime in mid-2018. A technology demonstration of a small and extremely stable atomic timekeeper, the clock will be 50 times more accurate than today's best navigation clocks, enabling more precise navigation and data collection.

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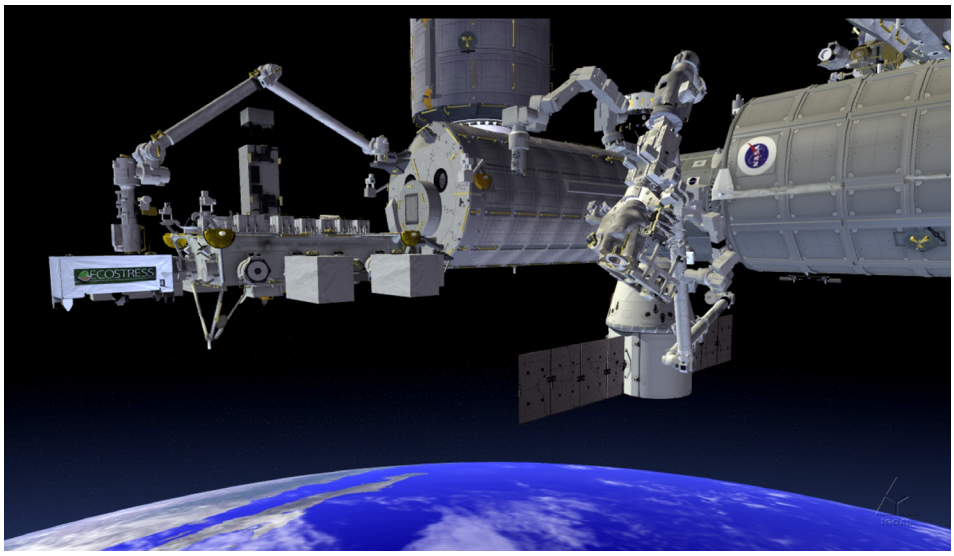
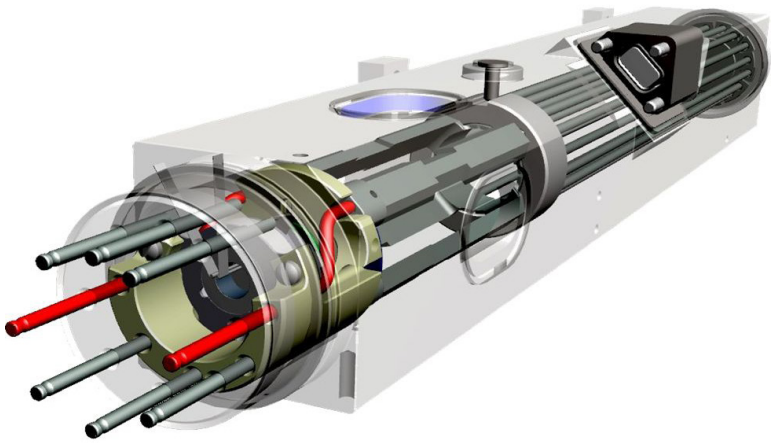


ECOSTRESS

Compact Ocean Wind Vector Radiometer



Deep Space Atomic Clock

‘Line of Sight’ points to cosmic destinations

By Leslie Mullen

Signposts for the sky were installed on the Mall Dec. 15.

The three rotating signs, called “galactic wayfinders,” orient travelers by pointing to far-off destinations of space missions, such as Jupiter, Mars and even exoplanets beyond our solar system.

The signs’ LED screens change their display and pivot to a new direction every 20 seconds as they receive data on spacecraft and planet positions.

Lois Kim, a visual strategist with The Studio, came up with the concept and led the “Line of Sight” design project.

“I was walking around the Lab and noticed the quirky street signs with funny names,” she says. “I wondered what it would be like to have signs pointing to all of JPL’s spacecraft and missions.”

Her idea included the use of real-time mission data, similar to the Deep Space Network display in the lobby of Building 180. She doodled a sketch on a napkin and shared it with her colleagues in 312D, the Advanced Design Engineering Group.

“I didn’t know it would require so much engineering for this simple idea,” she says. “Once I started talking to contractors and engineers and data-coding people, I realized there are so many aspects that need to get pulled together for this to work.”

Beyond developing a sign that could turn in every direction, she had to find an LED screen that was waterproof and bright enough to be viewable in daylight. She also wanted the signs to have a sleek, modern look.

She worked with a team of contractors to design the motors, gears and screens. They had a prototype in just a few days, but it took several months to fabricate the materials, build the signs, and prep the ground with wiring and pipes.

Kim says the data for the signs comes from a server that is constantly being updated, so the signs can add newly-discovered exoplanets or new mission locations. The signs even could be used to point to specific places on Lab during special events.

She hopes the signs will spark the imaginations of visitors to JPL, and also educate them about JPL’s missions and space science.

Another benefit, she notes, is “the signs could remind JPLers of the great work they’re doing.”

“So much of JPL’s work is in places that we can’t see, which can make it abstract and maybe feel less real,” says Dan Goods, who leads The Studio. “Line of Sight reminds us, our stakeholders, and the public in a visceral way that our destinations are right over there.”

Car aficionados' holiday delight

Photo courtesy of Mike Carter

Ranging from a 105-year-old Overland to a 2017 Chevy Corvette, JPL's annual car show, a pre-holiday event held on Lab since the early 1950s, displayed a wide variety of classic vehicles Dec. 21.

All 44 vehicles at the event were privately owned by JPL employees and contractors, said organizer Mike Carter of Fleet Management. Some of the rarities included a 1952 Muntz Jet Roadster (owned by Chris and Michelle Roth), a fully restored 1967 Ford Shelby GT500 (owned by David and Christine Ferguson) and an extreme performance ECO-1 buggy with a NASA JPL theme (owned by Richard and Sarah Lay).

Photo courtesy of Mike Carter

Photo by Leslie Mullen

Photo by Leslie Mullen

Passings

Dudley Lillam

JPLer Dudley Killam Jr., 70, died Nov. 23.

Killam joined JPL in 2002 after a 30-year career managing satellite programs such as the Defense Support Program for the U.S. Air Force, retiring as a colonel. At JPL, he exhibited expertise in image science, systems engineering and quality assurance, serving as operations manager in the Office of Safety and Mission Success for several years and then as a manager in Special Projects until 2010.

Killam is survived by his wife, Jennifer, daughter Emily, and son Daniel. His family requests that donations in his name be considered to the International Waldenstrom's Macroglobulinemia Foundation (*iwmf.com/give)*, which supports research into his wife's rare blood disease.

Retirees

The following JPL employees recently announced their retirements:

January

John Gieselman, 44 years, Section 329E; **Carolyn Chester,** 12 years, Section 5020.

December

Witold Sokolowski, 32 years, Section 353C.

Universe

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Other launches and highlights for 2018 include:

Mars Cube One: Launching with InSight, these are the first planetary CubeSats — small, modular, inexpensive satellites weighing less than 20 pounds. They will relay crucial information about entry, descent and landing.

COSMIC-2 A: A fleet of satellites working together to observe the climate and ionosphere, and to improve weather forecasting, this is a collaborative mission between JPL, the U.S. Air Force, the National Oceanic and Atmospheric Administration, and Taiwan's National Space Organization.

RainCube: The first radar instrument on a CubeSat, RainCube is a technology demonstration mission for highly accurate measurement of precipitation.

TEMPEST-D: Short for Temporal Experiment of Storms and Tropical Systems – Demonstrator, this mission also uses a CubeSat to carry a radiometer that will study cloud processes.

The Deep Space Network will deploy the first phase of its new signal processing system, the Common Platform, and support multiple mission launches.

Classifieds

Ads submitted Dec. 16-29.

For Sale

COFFEE MAKER, Keurig 500 Plus, bought a few weeks ago from Costco for about $100, includes reusable pod, perfect except the taste is not the same I'm used to from drip-coffee maker, asking $50. 818-859-3860, Murthy Gudipati.

PET CARRIER, airline approved, quality, expandable, soft-sided, best for small or medium dog/cat, fits under front airplane seat, never used, photos available; $30. nuyrstar@hotmail.com.

Vehicles / Accessories

'12 BMW e93 M3, white with red interior, fully loaded with navigation and 19" aluminum rims, $32,500/obo. Text 626-716-1754.

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, 818-790-8523, Marc Rayman.

WASHER & DRYER, gas. Sarah: 310-749-6018, Sarah1zerga@gmail.com.

Real Estate for Sale

NE ALTADENA, beautifully maintained home w/ guest house; front house: 4 beds + 2 baths, back house: 2 beds + 2 baths; sep. yards and covered patios for each; $1,198,000. Samuel Darahdgian: 818-512-0622 or text, Samuel@aaroe.com.

For Rent

ALTADENA, room in a sweet, comfortable home; bike or scooter to JPL; create in the kitchen, garden in the backyard, fireplace, fruit trees, washer and dryer, kind neighbors; sharing the home with a father busy with work and school, a bright teen who enjoys her room and a gentle dog who sleeps more these days; female is preferred; $800, includes all utilities. 626-658-5582, Chris.

ALTADENA: cozy, quiet cottage w/3 rooms: bedroom, study/living room/kitchen, bathroom; great for an intern; fully furn. (optional) w/bed, desk, dresser, large full closet, fridge, kitchen table & chairs, small appliances, bedding, towels; high-spd. WiFi, full kitchen + washer/dryer use, carport parking or bike; 1/2 mile/JPL; $1,300 furn., $1,200 unfurn., includes all utilities. Christina: geminipowers1@gmail.com or 213-268-9940, call or text.

PASADENA, Jan. 15-June 15, 2 bedroom, furnished 2-bath home in historic Bungalow Heaven District; features include dining and living rooms, washer-dryer, enclosed backyard patio area, tree-lined street and nearby park; $2,400 monthly. 626-376-7975 or *lumg@oxy.edu.*

PASADENA, furn. room in a lovely 4-bd./2-bath house, big backyard, hardwood floor, big closet, shared bathroom, kitchen/laundry privileges; 2 miles to JPL, close to public transportation; short- or long-term lease avail.; must like dogs and be very clean; $900 + $900 deposit. 818-960-8654.

Vacation Rentals

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, 626-840-3749 or valeriee@caltech.edu.

MAMMOTH, Snowcreek, beautiful updated condo, 2 bd., 2 ba. + loft (sleeps 6-8), near pond/meadow, new appliances, TVs, DVD players, free wireless internet, washer/dryer, no pets. 818-952-2696 or BigMtnPrettySky@gmail.com.

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

PALM DESERT, Waring Place community, 4 bd, 3 ba, pool, spa, BBQ, fully equipped kitchen, wireless internet, washer/dryer, photos available. 626-487-9437 or nuyrstar@hotmail.com.