



Features: MAVEN gets down to business • Kepler lives on • SORCE, back from the edge

Letter from the director

Dan Baker



The passing of Noel Hinners on September 5 and of Charles Barth on October 14 is a sober reminder of the inevitability of change. But their

lives and careers also remind us that individuals matter—a lot.

As director of LASP in the 1970s, Barth had a vision to design, build, and operate a small spacecraft mission in a university setting. The concept—in partnership with Ball Aerospace—grew to become the Solar Mesosphere Explorer (SME) program. To become reality, however, this effort required NASA approval. Hinners, then associate administrator of NASA, had the vision and courage to take a chance on SME. This convergence of two great people with great ideas made the difference and set LASP on a path for science, engineering, and operations that is unparalleled.

The world has changed in important ways since then, but what remains constant is that choices need to be made and visions need to be relentlessly pursued. LASP continues its record of remarkable achievements yet still needs strong state and federal government support. We need courageous and decisive people such as

Continued on page 3

IN FOCUS

MAVEN gets down to business

The MAVEN spacecraft successfully entered orbit around Mars on September 21. It completed its commissioning activities on November 16, formally beginning its science mission. Measurements up to that point included discoveries surrounding the close passage of Comet Siding Spring on October 19. Observations suggest that debris from the comet entered the Mars atmosphere, creating a new ionospheric layer that was very intense but decayed away within a couple days. We expect debris from that layer to survive in the upper atmosphere long enough to affect chemical processes for months or longer.

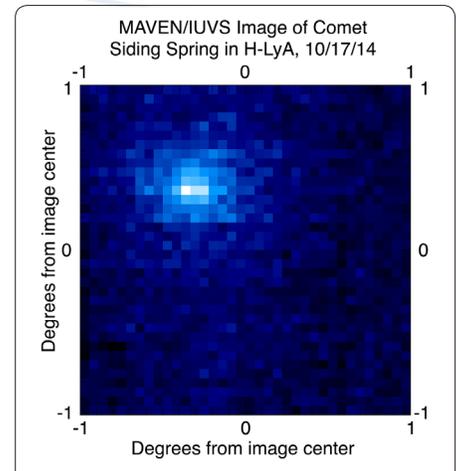
In addition, MAVEN made observations of the extended hydrogen, oxygen, and carbon clouds that surround Mars, extending up to tens of thousands of kilometers above the surface. These data will tell us about the escape to space of the key atoms that make up the climate-forming gases of H₂O and CO₂, and help us to understand their histories.

MAVEN is now making regular observations of the upper atmosphere and of the solar energetic inputs into it. It is the first spacecraft dedicated to studying the upper atmosphere of Mars. MAVEN's goal is to understand the processes active today, and to allow us to determine the role that interaction with the Sun and escape of gases to space have played in the history of the atmosphere and climate of Mars.

The MAVEN mission is being led out of LASP, and LASP provided two of the science instruments and leads the science operations.

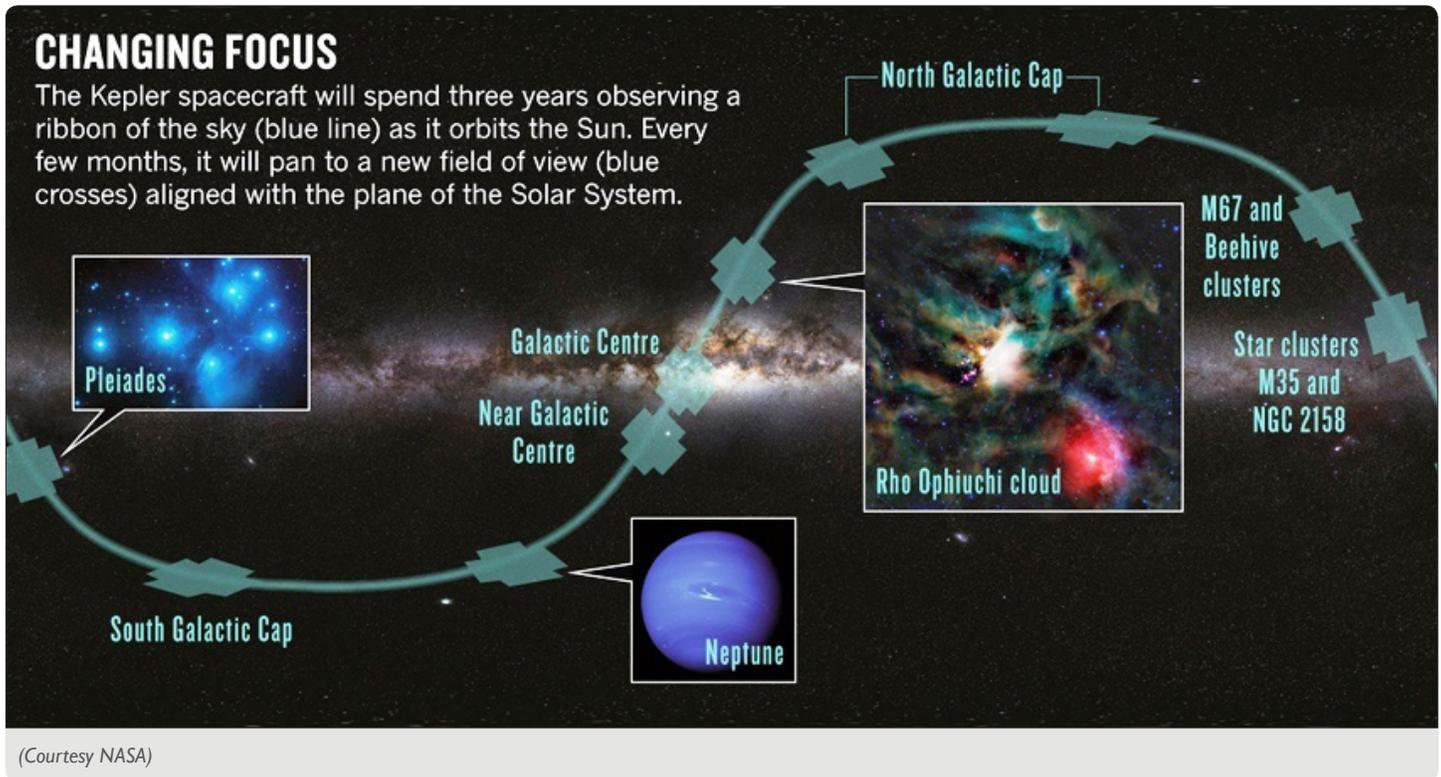
For more information, visit the MAVEN mission website at <http://lasp.colorado.edu/maven/>.

By Bruce Jakosky, associate director of science at LASP and a professor of geological sciences at CU-Boulder.



Ultraviolet (Lyman-alpha) image of Comet Siding Spring shows scattering of sunlight by H atoms. The cloud, about 150,000 km across, appears roughly twice the size of the full Moon from Earth. Taken by LASP's IUVS instrument on 17 October (two days before the comet's closest approach to Mars). (Courtesy LASP/NASA)

Kepler lives on—the K2 mission



When Kepler lost its second reaction wheel in May 2013, many considered the mission over. Kepler required three out of the four reaction wheels to properly point the spacecraft. In July 2012, it lost one wheel, so losing a second wheel was heartbreaking. But the disappointment completely turned around on May 16, 2014, when NASA announced that the Astrophysics Senior Review Panel approved a new mission for Kepler, with the creative name of “K2.” The

LASP and Ball Aerospace operations teams clearly demonstrated that the spacecraft could achieve the necessary pointing accuracy to make long-term, high precision photometric observations of galactic and extragalactic sources, as well as some Solar System objects.

K2 will obtain this unique data over a 75 to 80 day period by observing thousands of objects in a single 100 square degree field of view. The K2 mission will

explore the astrophysics of all different classes of stars versus Kepler’s original objective to find exoplanets in habitable zones. The Ball Aerospace and LASP teams are excited that there will be several more years of productivity from this wonderful observatory.

For more information on Kepler’s K2 mission, visit <http://lasp.colorado.edu/home/missions-projects/quick-facts-kepler-more-info/>.

By Bill Possel, director of mission operations and data systems at LASP

SORCE, back from the edge

For several tense days in 2013, the Solar Radiation and Climate Experiment (SORCE) mission was at the edge of a power brown-out due to the low capacity of its battery. But due to the dedicated mission operations staff at LASP and Orbital Sciences Corporation, a creative solution was found. The team developed new flight software to operate SORCE and return it to making daily solar

observations, while carefully monitoring the spacecraft 24/7 to maintain battery capacity. Highlights of this effort include:

- Operating SORCE through an extended six-month emergency period (July 2013–February 2014), requiring the mission operations team to do real-time commanding to keep the spacecraft thermally stable
- Managing a highly successful solar

- observing campaign in December 2013, overlapping SORCE and TSI Calibration Transfer Experiment (TCTE) measurements, to maintain the solar irradiance climate record
- Returning SORCE to daily solar observations in late February 2014 via a hybrid operating mode, allowing SORCE to make solar observations during the daylight portion of orbit

Letter from the director

Continued from front page

Noel Hinners to do the right things at the right times. If LASP continues to advance great ideas and those in authority are willing to pursue them, the U.S. space program can continue to flourish well into the future. What a fitting legacy to Barth and Hinners this would be. 🐦

Mission & technical stats

- LASP operates five satellites.
- LASP has 22 instruments in space on 12 different satellites.
- LASP is currently developing 12 instruments for 7 different missions.

Education events

Events are held at LASP in Boulder, CO unless otherwise noted.

MAVEN Red Planet Workshop, for elementary educators

February 7–8 (San Antonio, TX)
February 27–28 (Chandler, AZ)

Bringing Planets to Coloradans, public lecture and K–12 visit

January 27–29 (Hayden, CO)
February 18–19 (Trinidad, CO)

For more information, visit
<http://lasp.colorado.edu/education>.



when there is sunlight on the solar panels, then go into a scheduled safe-hold during every eclipse

During a ceremony in August, NASA honored the SORCE team for their heroic efforts with the SORCE Return To Science NASA Group Achievement.

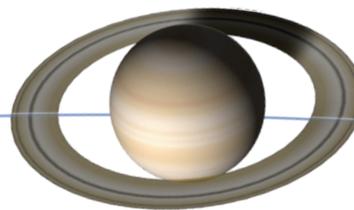
SORCE, which launched in 2003, continues to gather solar irradiance data well beyond its five-year nominal mission. This data is used to model the Sun’s output and to explain and predict the effect of solar radiation on the Earth’s atmosphere and climate.

For more information on SORCE, visit
<http://lasp.colorado.edu/home/missions-projects/quick-facts-sorce/>. 🐦

By Tom Woods, associate director of technical divisions at LASP



The Solar Radiation and Climate Experiment (SORCE) is a NASA-sponsored satellite mission that is providing state-of-the-art measurements of incoming x-ray, ultraviolet, visible, near-infrared, and total solar radiation. (Courtesy NASA)



LAB NOTES

Public outreach

LASP visits rural Colorado to inspire K–12 students

When reflecting on the vast mountains and valleys of Colorado one word that probably doesn’t come to mind is “underserved.” Rural regions of Colorado never experience the world-class science and engineering of LASP. Nationally, lack of exposure to science-technology-engineering-mathematics, or STEM, careers has been identified as one problem facing our techno-focused economy—students will not enter these fields if they do not know they exist.

A new program, *Bringing Planets to Coloradans*, brings LASP science to the rural communities of Hayden and

Trinidad, Colorado in January–February 2015. Fran Bagenal, along with science educators Tom Mason and Erin Wood, will visit K–12 classrooms, conduct hands-on activities, and answer questions about the New Horizons mission to Pluto. Activities will include a public lecture for the general community and undergraduate students, as well as a family night for elementary students.

“These events generate a lot of discussion about STEM careers students might not typically experience at the dinner table,” said Mason. “We hope that discussion continues even after we’ve left.”

Mission status

Instrument Development (Pre-Phase A)

IIP Compact SIM (cSIM)
 MatISSE LAMA
 Europa Clipper Instruments (2)

Phase A/B (funded concept study)

GOLD

Phase C (design and fabrication)

Solar Probe Plus

Phase D (assembly and test)

GOES-R/EXIS
 TSIS
 MMS Fields/Boom
 MinXSS CubeSat

Launch/Early Orbit [launch date]

Prime Mission [end date]

Van Allen Probes REPT/FIELDS [2014]
 MAVEN [2015]
 STPSat-3/TCTE [2015]
 SDO/EVE [2015]
 New Horizons/SDC [2020]

Extended Mission [end date]

Kepler [2016]
 MESSENGER/MASCS [2015]
 AIM [2015]
 THEMIS and ARTEMIS [2015]
 TIMED/SEE [2015]
 QuikSCAT [2015]
 SORCE [2015]
 Cassini/UVIS [2017]
 CubeSat CSSWE [open-ended]

For more information on current missions, as well as full instrument and mission names, visit <http://lasp.colorado.edu>.

Achievement awards

On November 20, **Dan Baker**, director of LASP and professor of astrophysical and planetary sciences, was honored as Distinguished Professor of Planetary and Space Physics by the CU Board of Regents and CU President Bruce Benson. Distinguished Professor is the most prestigious honor for faculty at CU and is awarded to those who demonstrate exemplary performance in research or creative work, a record of excellence in classroom teaching and supervision of individual learning, and outstanding service to the profession, university and its affiliates.

Bruce Jakosky, associate director of science and a professor of geological sciences, was named the recipient of NASA's 2014 Distinguished Public Service Medal. This is one of NASA's highest awards and the highest honor awarded to a non-government employee for extraordinary accomplishments that contribute substantially to the NASA mission. Jakosky was also awarded CU's

Robert L. Stearns Award on October 23. This medal recognizes faculty or staff for extraordinary achievement or service in teaching, work with students, university or off-campus service, or research.

Michael King, senior research scientist, was recognized as a 2014 fellow of IEEE for fundamental research in remote sensing of clouds and aerosols. This distinction is reserved for members with an extraordinary record of accomplishments in an IEEE field.

Tom Woods, associate director of technical divisions, was elected fellow of the AGU and was recognized during the honors ceremony at the 2014 AGU fall meeting in San Francisco this past December. This is an honor to AGU members who have made exceptional contributions to Earth and space sciences.

The mission teams for SORCE and EXIS both received 2014 NASA Group Achievement Awards. (Also see "SORCE" story.)

Inner space

National Solar Observatory move to LASP campus

LASP facilitated the second major phase of the National Solar Observatory's (NSO) move—from Tucson, AZ and Sunspot, NM—to CU Boulder. NSO Director Valentin Pillet and senior NSO staff members moved into LASP's Space Sciences building this past summer. Pillet leads the vanguard for the consolidation of NSO activities at CU and the eventual relocation of more than 80 personnel. NSO is co-locating with LASP scientists in pursuit of common goals in solar research.

Capital improvements

LASP is in the midst of significant equipment recapitalization and infrastructure

refurbishment throughout the lab. We are refreshing our labs and equipment in preparation for upcoming opportunities. Building upgrades include a new backup power system to accommodate the increasing load and reliability requirements, a main building boiler, furniture, and the completion of long-awaited repairs to damage from the flood of September 2013.

Distinguished visitors

LASP hosted the official "Welcome to Boulder" event for the National Solar Observatory (NSO) last March. Congressman Ed Perlmutter, the principal advocate in facilitating NSO's move to CU Boulder, gave the keynote address.

On April 18th, LASP was honored

Administrative stats

(November 1, 2014)

| | |
|------------------------|------------|
| Scientific researchers | 54 |
| Tenure-track faculty | 16 |
| Professionals | 213 |
| Graduate students | 47 |
| Undergraduate students | 63 |
| Total | 393 |

Visit LASP online



LASP homepage



Newsletter archives

Links to a variety of social media networks can be found on our homepage, <http://lasp.colorado.edu>.

If you know someone who might like to receive LASPSPACE, please encourage them to email [Laura Bloom](mailto:laura.bloom@lasp.colorado.edu), publisher, at laura.bloom@lasp.colorado.edu to subscribe. Should you prefer not to receive future issues, please email with "Unsubscribe" in the subject line.

To view LASPSPACE archives, visit <http://lasp.colorado.edu/home/about/publications/newsletters/>.



to host a talk by, and provide a facilities tour to, NASA Administrator Charles Bolden. Others in attendance included US Congressman Ed Permuter, CU Chancellor Phillip DiStefano, and other notable individuals from the state of Colorado and city of Boulder.

Congressman Jared Polis followed the administrator's visit to gain more insight into student involvement at LASP and our

interaction with Boulder County.

Last summer, LASP hosted a variety of visits and events that brought preeminent scholars, top researchers, space industry leaders, and government representatives to the lab. Interest in space research is growing and the reputation of LASP and CU Boulder as a leader in space science, engineering, and operations attracts particular interest.

Student news

Lauren Blum received her PhD last summer and now works on Van Allen Probes data and CubeSat development at the Space Sciences Laboratory at the University of California, Berkeley.

Chip Bollendonk, after working at the Sierra Nevada Corporation, joined LASP in November as a student intern working on the GOLD team. On October 23, he was awarded the 2014 Forever Buff award from the CU Alumni Association.

Michael Cox currently develops web applications for LASP and has accepted a full-time position at the Jet Propulsion Laboratory after he graduates in May.

Laura Holt graduated in the summer of 2013. After working at LASP as a postdoc, she recently started a new position at Colorado Research Associates.

Samuel LeBlanc successfully defended his PhD thesis in January 2014 and was awarded a post-doctoral fellowship at NASA Ames Research Center. He began his two-year appointment last February.

Emma Marcucci graduated in August 2013 with a PhD in Geological Sciences and received a remote sensing post-doctoral fellowship at the University of Alaska, Fairbanks.

Ethan Peck received his PhD in December and will begin a postdoc at Columbia University in January.

Anthony Rasca graduated in December 2013. After working at LASP, he joined the Plasma Physics Division of the Naval Research Laboratory as a postdoc to study solar physics.



Student Rachael Collins and Jason Beech in the LASP Mission Operations Center. (Courtesy Glenn Asakawa/ University of Colorado)