



Features: Decadal survey • Student-built satellite launch • Multi-spacecraft mission • LASP firsts • Space plasma workshop

Letter from the director

Dan Baker



Welcome back to LASPSPACE, and thank you for helping to make our inaugural issue a grand success! Space physics is at a watershed moment:

Society has become vitally dependent on space- and Earth-based technological systems, which are increasingly susceptible to the hazards of space weather. Meanwhile, scientific research has reached a new level of sophistication, where observations, theory, and modeling are poised to serve society's pressing needs to better understand and mitigate these hazards.

On August 15, 2012, the National Research Council of the U.S. National Academies issued its second Decadal Survey for the heliophysics discipline, entitled *Solar and Space Physics: A Science for a Technological Society*. Completed over the course of 18 months, the report examines achievements of the past decade and the current state of heliophysics knowledge, prioritizing scientific targets for the next ten years. As Chair of the survey, I'm pleased with its focus on the very real and urgent societal relevance of the space physics discipline.

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IN FOCUS

Student-built satellite studies solar storms

A small satellite built by CU-Boulder students launched on September 14, from Vandenberg Air Force Base, California. The Colorado Student Space Weather Experiment (CSSWE) is studying violent activity in the solar atmosphere.

Students are monitoring incoming CSSWE data from a ground station at LASP to study how particles released during solar flares affect Earth's radiation belt.

Lauren Blum, graduate student and CSSWE Program Manager, said, "These particles can penetrate through spacecraft shielding, mess up electronics, or be harmful to humans in space. We'll be characterizing the energetic particle environment and what causes their fluctuations."

A nerve-wracking series of milestones have led to CSSWE's success. Quintin Schiller, graduate student and instrument lead, said, "After waiting for what seemed like forever, the satellite finally started beaconing and told us how it was doing. That was the first major step to confirm it was working, and was really exciting."

The NSF-funded CubeSat mission is led by LASP scientist Xinlin Li in collaboration with the CU-Boulder Aerospace Engineering Sciences department. It carries a scaled-down version of the LASP-built payload onboard the Van Allen Probes spacecraft.

For a podcast with Blum and Schiller, please visit <http://lasp.colorado.edu/home/?p=12426>.

Marisa Lubeck is a science writer with the LASP Office of Communications & Outreach (OCO).



An Atlas V rocket blasts off carrying a classified payload for the National Reconnaissance Office and 11 small science CubeSats—including CSSWE—on September 13, 2012. (Courtesy Pat Corkery/United Launch Alliance)

Multi-spacecraft mission a valiant venture for LASP

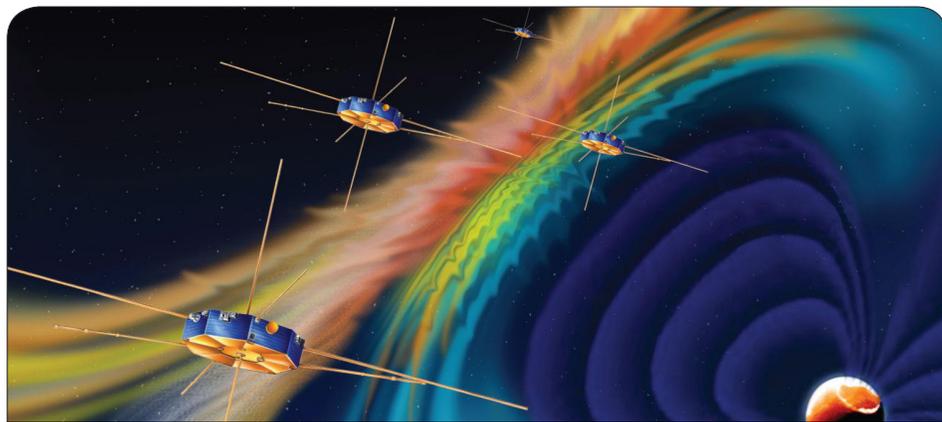
One of the most exciting and demanding missions in development at LASP is the Magnetospheric Multi-Scale (MMS) mission. Launching in late 2014, MMS will use four identical spacecraft to study the magnetospheric boundary regions and magnetic reconnection.

LASP scientists and engineers have key roles on the MMS project, building several components of MMS instrumentation. In addition, we provide the Science Operations Center (SOC), which will be responsible for monitoring and controlling the 96 science instruments on the four spacecraft. The SOC team will collect

requirements from the science team and turn these requirements into commands to the spacecraft. We will also host and disseminate the science data—24 gigabytes per day per observatory—to the science community. LASP students participate in all aspects, including operations, software development, and science data processing. This challenging mission will push the boundaries in areas such as multi-spacecraft, multi-instrument operations, and large data distribution and storage.

For more information on MMS, visit <http://lasp.colorado.edu/home/?p=4486>. 

Bill Possel is the director of Mission Operations and Data Systems at LASP.



In this artist's rendition, the four identical spacecraft of the Magnetospheric Multi-Scale (MMS) mission orbit Earth. (Courtesy NASA)

Letter from the director

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While the 2003 survey emphasized the effects of solar activity on space weather, this 2013–2022 strategy introduces new scientific goals that stress the need for space weather forecasting. My committee of over 85 physicists and engineers recommends that heliophysics research focus on the near-Earth environment in order to better understand how the Sun and space weather impact phenomena on Earth.

The four overarching research goals that the committee proposes include predicting variations in the space environment that are caused by solar activity; understanding how Earth's atmospheric layers respond to forces generated by the Sun; investigating relationships among the Sun, Solar System, and interstellar matter; and delving into the core processes of the heliosphere.

This Decadal Survey portrays an integrated research strategy among space research agencies like NASA and NSF and operational agencies including NOAA and DOD, while recognizing our nation's fiscal constraints. I'm proud of LASP's leadership in this critical national mission. 

A series of firsts for LASP on Van Allen Probes

Far above Earth, battered by high-energy particles in an inhospitable environment known as the Van Allen Radiation Belts, two recently launched spacecraft orbit our planet. The zone, which is made up of two concentric donut-shaped particle layers, is so harsh that it can electrically charge unshielded spacecraft, disabling or destroying them. Our communications, weather, and military satellites—technologies we depend on for

our every-day lives—regularly operate in and pass through this Earth-enveloping environment.

The twin satellites form the innovative Van Allen Probes mission (formerly known as RBSP). LASP Director Dan Baker said, “We’re looking into the throat of a high-energy accelerator right here in our neighborhood, just a few thousand miles above our heads. We have used similar kinds of electronic techniques, but

this is the first time that a dedicated high-energy particle detector has really been built at LASP.”

LASP built instrumentation for two suites aboard the Van Allen Probes: The first is the Relativistic Electron Proton Telescope (REPT), which Baker leads as principal investigator. This instrumentation directly measures near-Earth space radiation belt particles to understand their intensity, acceleration, number, and

Student news

Addie Dove—Dove recently began a postdoctoral position at the University of Central Florida in Orlando. She is working on microgravity experiments on NASA KC-35 parabolic flights under former LASP scientist Josh Colwell.

Are you a former LASP student employee? Let us know what you're doing now.

Email: rose.hoag@lasp.colorado.edu

Administrative stats

Scientific researchers	45
Tenure-track faculty	17
Professionals	267
Graduate students	62
Undergraduate students	70
Total	461

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LASP homepage



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

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LASP provides scientific guidance and instrumentation for the Van Allen Probes mission, pictured here at dawn on August 10, 2012, at the NASA Kennedy Space Center in Florida. The mission will shed light on the dynamics of Earth's radiation belts and improve scientists' ability to predict space weather. (Courtesy NASA KSC)

Stephanie Renfrow interviewed Dan Baker for this article; she leads LASP OCO.

LASP hosts international space plasma workshop

More than 130 geospace and space plasma experts from 14 countries gathered at LASP October 1–5, for the third joint Cluster-THEMIS Workshop. Based on the 2008 joint meeting in New Hampshire and the 2010 workshop in Corfu, Greece, the conference featured the latest research on Earth's dynamic magnetosphere.

The Cluster quartet of identical European Space Agency spacecraft and the THEMIS mission study processes like solar wind, which drives activity in Earth's magnetosphere. This year's conference also highlighted the dual-satellite ARTEMIS mission, which studies how our Moon interacts with the Sun; the Van Allen Probes mission; and the LASP/CU-Boulder Colorado Student Space Weather Experiment (CSSWE).

The workshop was held in the LASP

Marisa Lubeck is a science writer with LASP OCO.

direction. Second is the Digital Fields Board that will study the electric fields that energize the belt's particles.

The Van Allen Probes instrumentation represents a series of firsts for LASP in science, engineering, and implementation—firsts that are made possible by the dedication of LASP engineers and other staff at the laboratory, Baker said. "My unapologetic view is that LASP builds the best instruments in the world for space science and Earth science applications, and I think this set of instruments joins LASP's already very impressive list."

Download a podcast of Dan Baker as he discusses recent Van Allen Probes (RBSP) discoveries and the importance of space physics to LASP at <http://lasp.colorado.edu/home/?p=12426>.

Space Science building. Organized by scientist Xinlin Li, LASP Director Dan Baker, and assistant Cheryl Haugen, it was the largest conference held to date at LASP.

For more information on the Cluster-THEMIS Workshop, please visit <http://lasp.colorado.edu/home/?p=11402>.



LASP hosted the third joint Cluster-THEMIS workshop on October 1–5, 2012. These missions study processes like solar wind, which drives activity in Earth's magnetosphere, such as the aurora. (Courtesy ESA/NASA)

LAB NOTES

Achievement awards

Kepler team wins top space program award

The Kepler mission won the highest honor for space programs at the 2012 Aviation Week Laureate Awards on March 7, in Washington, D.C. Students and professionals in the LASP Mission Operations Center control the Kepler spacecraft, which is surveying our region of the Galaxy for Earth-sized planets with the potential to support life.

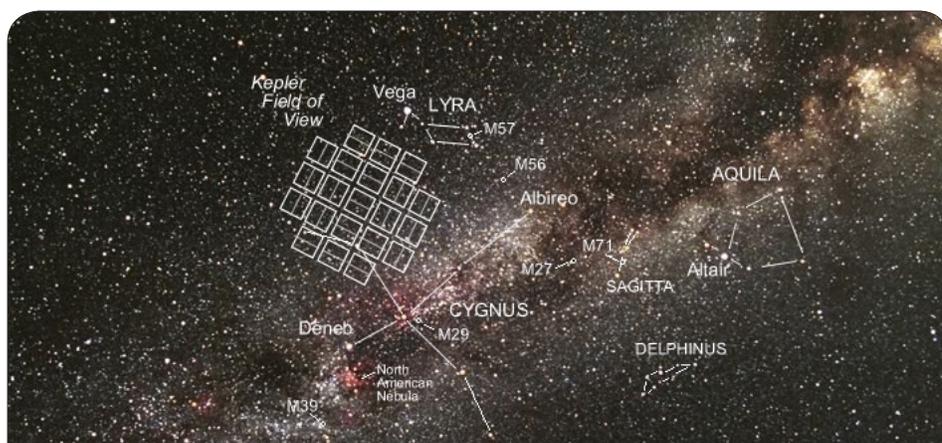
The Laureate Awards recognize extraordinary accomplishments in aviation and space sciences. The Kepler team won in the Space category based on the

development, launch, flight operations, and science data processing of its program.

Bill Possel, director of LASP Mission Operations & Data Systems, said, "This is a tremendous award for Kepler and for the LASP team. We're honored to be part of this important science mission."

CU-Boulder students work with LASP professionals to perform Mission Operations for Kepler.

For more information, see <http://lasp.colorado.edu/home/?p=4269>.



This image represents the field of view of the Kepler spacecraft. Kepler searches for Earth-like planets in our region of the Galaxy. (Courtesy Carter Roberts)

LASP director receives prestigious writing award

The American Astronomical Society (AAS) presented LASP Director Dan Baker with its 2012 Popular Writing Award on June 12, in Anchorage, Alaska.

The AAS Solar Physics Division offers its annual award to authors of popular Sun-related articles. Baker and co-author James Green, director of the NASA Solar System Exploration Division, won in the scientist category for their February 2011 *Sky & Telescope* article, "The Perfect Solar Superstorm." The article outlines the potential hazards of solar storms to technology.

Baker said, "It's a great honor to be recognized by the AAS through this award. It's a duty and a privilege for scientists to communicate clearly and effectively about their work."

Coronal mass ejections have caused damaging geomagnetic storms on Earth. In their article, Baker and Green describe how the U.S. power grid is increasingly vulnerable to blackouts and equipment damage during solar storms.

For more about the award, please visit <http://lasp.colorado.edu/home/?p=10762>.

Mission status

Phase A/B (funded concept study)

Solar Probe Plus
Ohmic Explorer (decision pending)
GOLD (decision pending)

Phase C (design and fabrication)

None this quarter

Phase D (assembly and test)

MAVEN
LADEE/LDEX
MMS Fields/Boom
GOES-R/EXIS
JPSS/TSIS

Launch/Early Orbit [launch date]

None this quarter

Prime Mission [end date]

Van Allen Probes REPT/FIELDS [2014]
NSF CSSWE CubeSat [2013]
SDO/EVE [2016]
MESSENGER/MASCS [2013]
New Horizons/SDC [2020]

Extended Mission [end date]

Kepler [2014]
QuikSCAT [2015]
SORCE [2015]
AIM [2014]
Cassini/UVIS [2017]
THEMIS & ARTEMIS [2014]
TIMED/SEE [2014]

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

Mission & technical stats

- LASP currently has 12 instruments in space on eight different NASA satellites.
- LASP currently operates four satellites for NASA.
- LASP is currently developing 12 instruments for six different satellite missions that are expected to launch between 2013 and 2018.

Education Events

Dancing Lights Teachers Workshop
January 26, 2013

Was Ancient Mars Earth-Like?
**Public Lecture (Trinidad State
Junior College)**

February 13, 2013

*Related Elementary and High School
Programs and Family Night*

February 14, 2013

*MAVEN Red Planet: Read, Write,
Explore! Teacher Professional
Development (Berkeley)*

April 27, 2013

Space Science Teachers Summit

June 3–7, 2013

Solar Teachers Summit

June 9, 2013

**Research Experience for
Undergraduates (REU) Program**

June 9–August 3, 2013

*MAVEN Education Ambassadors
Teacher Professional Development*

July 8–12, 2013

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

Public outreach

**Space science stars align at
LASP New Media workshop**

Seventeen New Media communicators gathered at LASP July 20–22, to discuss future exploration of the Moon and small bodies with renowned experts. Sponsored by the LASP Colorado Center for Lunar Dust and Atmospheric Studies (CCLDAS), the workshop offered professional development for bloggers, podcasters, and other science communicators.

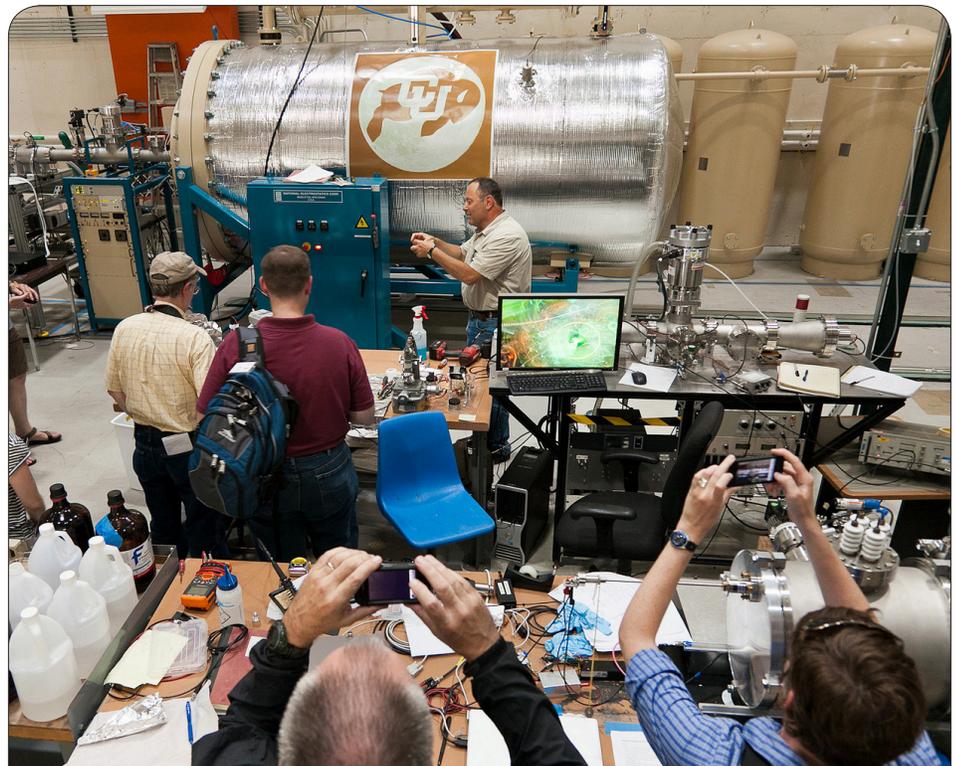
Attendees live-reported as scientists discussed their work in an informal, give-and-take atmosphere. Topics included the dangers of near-Earth objects and the Osiris-REx mission; the debate over scientific definition of a planet; lunar dust; and the Deep Space 1 comet and asteroid fly-bys. The results were a Twitter trending topic and material for

communiqués including blog posts, photo essays, and a space science video game.

The workshop's speakers were CCLDAS PI Mihály Horányi; Daniel Britt, co-investigator for Mars Pathfinder and Deep Space 1; Richard Dissly of Ball Aerospace & Technologies Corporation; Ed Beshore, deputy PI for Osiris-REx; Hal Levison of the Southwest Research Institute (SwRI); and Alan Stern, New Horizons PI and associate vice president of SwRI.

Workshop attendees toured LASP and visited the CCLDAS dust accelerator, which LASP researchers use to study high-velocity dust impacts on the Moon. The most-photographed star of the weekend was a sample of Moon dust from Apollo 17.

For more information and presentation videos, please visit <http://lasp.colorado.edu/home/?p=10284>.



LASP 2012 New Media Workshop attendees snap photographs as CCLDAS PI Mihály Horányi provides a tour of the CCLDAS dust accelerator. (Courtesy Kevin Baird)