

Laboratory for Atmospheric and Space Physics



Activity Report
2004
University of Colorado at Boulder

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Introduction

Please visit LASP's Website: <http://lasp.colorado.edu> for the latest developments at LASP plus many other interesting links.

A Message from the Director

LASP continues to grow and evolve. New scientific programs have been added and new staff members have joined the Lab. We can point with pride to the successful designing, building, and testing of new spacecraft instruments (as reported in these pages) and we can also report on scientific results from many ongoing projects. The combination of experiments, data analysis, and theoretical investigations provides for a remarkably complete scientific approach here at LASP. Based on our widely recognized engineering, mission operations, and information systems work and our science leadership, we believe that LASP is nearly unique in its abilities as a space research enterprise.

In order to carry out the wide range of work undertaken by the Laboratory, it has been clear for some time that more office and laboratory space has been (and certainly will be) necessary. We have been supported by the University administration to help meet space needs. I am very pleased to report that the Chancellor and the Provost have helped to move aggressively toward meeting our office and laboratory space needs. We are now nearing completion of a new building adjacent to the present LASP Space Technology Building in the Research Park. This new facility, which will be ready for occupancy on 30 November 2005, will provide new space comparable in area to the present LSTR building and should allow us to move smoothly to the next level of engineering, operations, and science that we have been striving for.

There are many challenges that must be confronted as an organization grows. Adding new people and facilities while maintaining the traditional LASP culture is a top concern for all of us. I have appreciated the strong support and thoughtful advice in these matters both by the University administration and by our External Advisory Committee (chaired by Prof. L.A. Fisk). I have particularly appreciated the patience and good spirit of our tireless staff here at LASP.

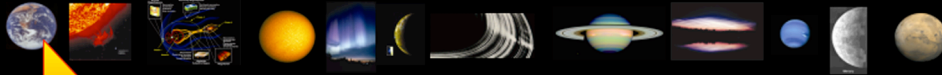
We express our appreciation to the University, to the local Boulder community, and to the national agencies for the continuing support that we receive. We look forward to working actively with the broad space research community in many new endeavors. Thank you to the students, staff, and faculty of LASP for all their hard work. Special thanks go to Ann Alfaro for her thorough and careful efforts in preparing this report.

Daniel N. Baker

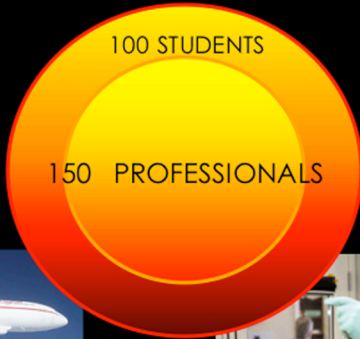
LASP: A Brief History

In 1946-47, a handful of American universities joined with the military and with industry to initiate the era of space exploration. The University of Colorado was one of those pioneering universities. The first experiments to be performed in space were lofted by sub-orbital rockets. A key obstacle to these first rocket flights was providing a stabilized platform for cameras and other experiments. With support from the Naval Research Center and the Air Force Cambridge Research Laboratory (now the Phillips Laboratory), the University of Colorado formed a research group called the Upper Air Laboratory (UAL) to solve this problem. Their solution — called the biaxial pointing platform — cleared the way for some of the first major scientific discoveries made in space. Researchers and engineers from the UAL flew experiments into space on over 50 rocket flights before Sputnik. By 1965, the UAL had grown substantially. Along with this growth came a new building on campus and a new name: the Laboratory for Atmospheric and Space Physics. The public is invited to tour our facility and to observe the work that LASP does today.

LASP SPACE RESEARCH CYCLE



SCIENTISTS STUDY DATA, PUBLISH DISCOVERIES
AND FORMULATE NEW QUESTIONS



LASP Appropriated Funding

During the period 1/1/2004 to 12/31/2004 LASP appropriated funding totaled \$44M for support of 144 grants and contracts.

Research Support: 2004 Fiscal Year

Source of Funding	Total Grant Dollars
<i>Federal Agencies:</i>	
Department of Energy	\$2,706
Naval Research Laboratory	\$15,600
National Aeronautics and Space Administration	\$12,431,868
National Science Foundation	\$324,364
<i>Non-Federal Agencies:</i>	
Arizona State University	\$110,828
Ball Aerospace Systems Division	\$641,588
Boston University	\$812,000
Hampton University	\$26,715,238
Jet Propulsion Laboratory	\$1,239,966
Johns Hopkins University	\$215,000
Northrop Grumman	\$567,000
Science Systems and Applications, Inc.	\$19,396
Southwest Research Institute	\$185,000
Universities Space Research Association	\$75,000
University of California at Berkeley	\$688,927
University of Arizona	\$36,278
Washington University	\$241,113
Totals:	<hr/> \$44,321,872

Daniel N. Baker

Director

LASP Faculty

Laila Anderssen
Linnea M. Avallone
Frances Bagenal
Charles A. Barth
Yi-Jin Su Caton
Emily CoBabe-Ammann
Joshua E. Colwell
Peter Delamere
Erica Ellingson
Scot Elkington
Francis G. Eparvier
Robert Ergun
Stefan Eriksson
Larry W. Esposito
Janet C. Green
Jerald W. Harder
Lynn Harvey
Noel Hinners

Mihály Horányi
Brian Hynek
Bruce M. Jakosky
Shri Kanekal
Greg Kopp
Kristopher Larsen
George M. Lawrence (Ret.)
Steven W. Lee
Xinlin Li
William E. McClintock
Tom McCollom
Sara Martinez-Alonzo
Michael Mellon
Michael Mills
Keiji Ohtsuki
Robert T. Pappalardo
Alexander Pavlov
William Peterson

Peter Pilewskie
Cora E. Randall
Erik C. Richard
E. Joshua Rigler
Gary J. Rottman (Ret.)
David W. Rusch
Theodore Sarris
Nicholas M. Schneider
Byron Smiley
Jamison Smith
Martin Snow
Miodrag Sremcevic
A. Ian F. Stewart
Glen R. Stewart
Gary E. Thomas (Ret.)
Owen B. Toon
Robert Weigel
Thomas N. Woods
Zoltan Sternovsky

Visiting Scholars

Dr. Joseph Ajello, Jet Propulsion Laboratory, Pasadena, California
Dr. Antal Juhasz, Research Inst. for Particle and Nuclear Physics, Hungary
Dr. Mark Lewis, Trinity University, San Antonio, Texas
Dr. Dolores Maravilla, Instituto de Geofisica, UNAM, Mexico
Professor Kap-Soo Oh, Chungnam National Univ., Daejeon, South Korea
Dr. Wayne Pryor, Central Arizona College, Arizona
Camilla Saetre, University of Bergen, Norway

Research/Technical/Administrative Support Staff

Ann Alfaro
Gregg Allison
Michael D. Anfinson
Judy Antman
Richard Arnold
Dennis L. Baker
Susan Batiste
Helmut P. Bay
Christopher Belting
Timothy Bendel
Robert P. Biro
Laura Bloom
Bryce Bolton
Mary Bolton
James S. Bowers
Brian D. Boyle
Shelley Bramer
Catherine Brant
Vanessa Briggs
Nancy Brooks
Jeff Brown
Patrick Brown
Chelsey Bryant
Michael T. Callan
Zachary G. Castleman
Tinapan Chanthawanich
Steve Chappell
Matthew Chojnacki
Wesley Cole
Lillian Connelly
Christopher Converse
Pamela Crandall
David Crotser
John Daspit
Randal L. Davis
Kip W. Denhalter
John Donnelly
Sharon Dooley
Michael Dorey
Virginia Drake
Kathryn Eason
Peter Elespuru
Steve Ericksen
Brian Evans
Phillip L. Evans
Jack Faber
Tawnya Ferbiak
Tim Flaherty
John Fontenla
Rodney Freeman
David Gathright
Michael Gehmeyr

Vanessa George
Judith (Dede) Gleason
Jeff Graw
Ken Greist
Elizabeth Grogan
Bonnie Kae Grover
Roger Gunderson
Scott Gurst
Christine Hathaway
Karl Heuerman
Caroline Himes
Rose A. Hoag
Timothy Holden
Bonnie W. Hotard
Vaughn Hoxie
Andrew Hunt
Curtis Iscaro
Christian Jeppeson
Edgar Johansson
James Johnson
Alain J. Jouchoux
David E. Judd
Michelle Kelley
Marjorie K. Klemp
Barry Knapp
Richard Kohnert
Jay Kominek
Bret Lamprecht
Mark R. Lankton
Sally Lasater
Ryan Lewis
Jennifer Loper
Debra McCabe
Beth McGilvray
Sherry McGlochlin
Michael McGrath
James Mack
Melanie McKinney
Jack Marshall
Patrick Meagher
Willie Mein
Russell Meinzer
Hannah Meyer
Nathaniel Miller
Jerel Moffatt
Steve P. Monk
Aref Nammari
Brian Nuel
Sara Ohrtman
John M. Padgett
Chris Pankratz
Norman C. Perish

Nicole Ramos
Thomas Reese
Dwight Reinhardt
Randy Reukauf
Pat Ringrose
Hans Rohner
Marissa Rusinek
Timothy Ruske
Cynthia Russell
Jill Ryan
Sean Ryan
Judith A. Salazar
Patti Sicken
Karen Simmons
John D. Smith
Thomas Sparn
Stephen Steg
Kenneth Stevens
Gail Tate
Trenton Taylor
Brian Templeman
Jane Thompson
Wayne Tighe
Susan Tower
Janet Tracy
Matt Triplett
Dale Troyer
Scott A. Tucker
Karen B. Turk
Gregory Ucker
Douglas Vincent
Tracy Vincent
Pamela J. Wagner
Paul Weidmann
Heather Weisacosky
James Westfall
Neil White
Kenneth Wiehe
Ann Williams
Ann Windnagel
Heather Reed Withnell
Peter Withnell
Donald Woodraska
Maria Woody
Ed Wullschleger
Alan Yehle
Jason Young
Jennifer Young
Torsten Zorn

2004 Graduates

Amy Barr, Ph.D., Astrophysical and Planetary Sciences

December 2004

"Convection in Ice I with non-Newtonian Rheology: Application to the Icy Galilean Satellites"

Thesis Advisor: Frances Bagenal

Erika Barth, Ph.D., Astrophysical and Planetary Sciences

December 2004

"Microphysical Modeling of Clouds in Titan's Atmosphere "

Thesis Advisor: Larry W. Esposito

Corinne Krauss, Ph.D., Astrophysical and Planetary Sciences

December 2004

"Electrical Discharges near the Surface of Mars: Laboratory Experiments and Numerical Modeling"

Thesis Advisor: Mihaly Horanyi

Erin Joshua Rigler, Ph.D., Aerospace Engineering Sciences

December 2004

"Predicting Radiation Belt Electron Flux with Adaptive Multi-Input Linear Filters"

Thesis Advisor: Daniel N. Baker

Graduate Students

Austin Barker

Charles Bardeen

Amy Barr

Erika Barth

Todd Bradley

Chelsey Bryant

Jeremy Carnahan

Phillip Chamberlin

Steve Chappell

Zane Crawford

Christopher Cully

Sean Davis

Nathan Farr

Anselm Fernandez

Tiffany Finley

Brandi Gamblin

Jennifer Gannon

Brennan Gantner

Damhnait Gleeson

Tyler J. Goudie

Alexa Halford

Anna Haugsjaa

Gregory Holsclaw

David Hume

David James

Christian Jeppesen

Amy Jordan

Lars Kalnajs

Bruce Kindel

Corinne Krauss

Nantawadee Kungsakawin

Lindsey Link

Timothy Lloyd

Kevin McGouldrick

Kevin McWilliams

Brian Madge

Lansing Madry

Daniel Main

Rebecca Matichuk

Patrick Meagher

Colin Mitchell

Nate Murphy

Katherine Nauert

Tania Nowell

Heather Passe

Radu Popescu

Manny Presicci

Than Putzig

Licia Ray

Erica Raine

Lonnie Riesberg

Eric Schleicher

Karen Schmidt

Sara Sheffler

Karie Michelle Shipley

Cynthia Shaw Singleton

Hanna Sizemore

Andrew Steffl

Heather Tollerud

Jennifer Uchida

John Weiss

Kaj Williams

Undergraduate Students

Keegan Amyx
Allyson Bieryla
Jerry Brown
Lottie Brown
Nicholas Bunch
Jeremy Carnahan
Anthony Carosa
Rhain Carpenter
Scott L. Chamberlin
Marcus Choi
Matthew Chojnack
Patrick Clary
Matthew Colgan
Pamme Crandall
Zane Crawford
Jane Crayton
Kimdao Dang
Janice Denard
Nathan Doyle
Jason Durrie
Loren Eason
Attila Elteto
Neal Evans
Nathan Farber
Elizabeth Grogan
Jenny Guo
Rachel Guryn
Andrew Hahn

Jessica Harano
Aaron Hayden
Andrew Jenkins
Matthew Kelly
Ervin Krauss
Otto Krauss
Davis Lawry
Kurt Lorhammer
Jennifer Lowell
Sharon Lutz
Kevin McWilliams
Ben Marsh
Danielle Massey
Patrick Meagher
McCall Mullen
Michael Neeland
John Neice
Jonathan Nikkel
Kostas Pagratis
Heather Passe
Curtis Paxton
Brian Payne
Kolt Peightal
Giordin Perlman
Amy Pham
Michael Phan
William Pisano
Radu Popescu

Andrew Poppe
Emily Kramer Quinty
Kathryn Rash
Tyler Redick
Zachary Rickert
Lauren Roemer
Alex Romanov
Matthew Route
Patricia Rubi
Joshua Rubin
Paul Ryan
Molly Selting
Laura Shaner
Patrick Smith
Jordan Spatz
Michelle Stempel
Linda Te
Edward Thiemann
Jane Thompson
Mark Trafton
Dustin Trail
Thu Yen Tran
Kelsey Urban
Cody Vaudrin
Veronica Vertucci
Marcus Wojtkowiak

Faculty Research Interests

Linnea Avallone

Experimental and theoretical studies of tropospheric and stratospheric chemistry, particularly of halogens and related species. Analyzing measurements of chemical species to understand dynamical processes in the stratosphere and troposphere. Development of instrumentation for autonomous in situ measurements of trace species related to understanding the lifetimes of anthropogenic pollutants.
Linnea.Avallone@lasp.colorado.edu (303) 492-5913

Frances Bagenal

Magnetic fields and plasma environments of solar system objects—mainly Jupiter and the Sun, but more recently, other planets, comets and asteroids.
Fran.Bagenal@lasp.colorado.edu (303) 492-2598

Daniel N. Baker

Research in space instrument design and calibration, space physics data analysis, and magnetospheric modeling. Study of plasma physical and energetic particle phenomena in the magnetospheres of Jupiter and Mercury, along with the plasma sheet and magnetopause boundary regions of the Earth's magnetosphere. Analysis of large data sets from spacecraft; involvement in missions to Earth's deep magnetotail and comets; the study of solar wind-magnetospheric energy coupling; theoretical modeling of magnetotail instabilities. Study of magnetosphere-atmosphere coupling; applying space plasma physics to study of astrophysical systems. Research to understand space weather and effects on human technology. Teaching of space physics

and public policy, as well as public outreach to space technology community and general public.
daniel.baker@lasp.colorado.edu (303) 492-4509

Charles A. Barth

Planetary ultraviolet spectroscopy; observation and theory of nitric oxide in the Earth's upper atmosphere; research on planetary atmospheres.
charles.barth@lasp.colorado.edu (303) 492-7502

Joshua E. Colwell

Origin and evolution of planetary rings, observational and theoretical studies of planetary rings, comets, and satellites including Earth's moon. Impact processes on asteroids, satellites, and ring particles. Dynamics of dust in ring-satellite systems. Dusty plasma dynamics. Thermal models of airless bodies.
josh.colwell@lasp.colorado.edu (303) 492-6805

Scot Elkington

Space physics theory and modeling, primarily understanding energetic particle dynamics in the inner magnetosphere in the context of radial diffusion and adiabatic transport processes within the radiation belts. Also working on models of plasma sheet access of energetic particles to the inner magnetosphere through convection/substorm injection, development of physical space weather radiation belt models, and magnetohydrodynamic/particle simulations.
Scot.Elkington@lasp.colorado.edu (303) 735-0810

Erica Ellingson

The study of the evolution of galaxies, galaxy clusters, and quasars. Investigation of dark matter in distant galaxy clusters, the evolution of the galaxies in these clusters, and the properties of the intra-cluster gas. Observations with ground-based telescopes and use of several orbiting space observatories, extensive computer analysis and modeling.
erica.ellingson@lasp.colorado.edu (303) 492-6610

Francis G. Eparvier

Research interests include the aeronomy of the upper atmosphere, the effects of solar irradiance and particle flux variability on the upper atmosphere, and the sources of that solar variability. Approaches include rocket and satellite measurements of the solar outputs and of the atmosphere, and data

analysis and theoretical modeling. Currently Co-Investigator on the Thermosphere-Ionosphere-Mesosphere Energetics and Dynamics (TIMED) satellite Solar EUV Experiment (SEE).
Frank.Eparvier@lasp.colorado.edu, (303) 492-4546, <http://stripe.colorado.edu/~eparvier>

Larry W. Esposito

Observational and theoretical studies of planetary atmospheres and rings; chemistry and dynamics of the Venus clouds; waves in Saturn's rings; numerical methods for radiation transfer.
Larry.Esposito@lasp.colorado.edu (303) 492-7325

Jerald Harder

Measurement and interpretation of solar spectral irradiance; Development of space-borne prism spectrometers.
Jerry.harder@lasp.colorado.edu (303) 492-1891

Mihaly Horanyi

Dusty space and laboratory plasmas. Electrodynamic processes and their role in the origin and evolution of the solar system. Comets, planetary rings, plasma surface interactions at moons and asteroids. Aerosol charging, in situ and remote observations of dust.
mihaly.horanyi@lasp.colorado.edu (303) 492-6903

Bruce M. Jakosky

Teaching and research activities focus on understanding the nature of planetary surfaces and atmospheres and the possibility for the existence of life in the universe. Specific activities include teaching undergraduate and graduate courses, training graduate students, research and grant activity pertaining to planetary science and exobiology, leading the campus effort in astrobiology, exploring the nature of the interactions between science and society, and outreach to the public.
bruce.jakosky@lasp.colorado.edu (303) 492-8004

Greg Kopp

Development and characterization of the SORCE, Glory, and NPOESS Total Irradiance Monitors for solar irradiance measurements. Solar physics. Electro-optical instrumentation and electrical substitution radiometry.
Greg.Kopp@lasp.colorado.edu, 303-735-0934

George M. Lawrence

Physical chemistry, laboratory spectroscopy, experiment design and analysis, signal condition-

ing, vacuum technology, IR detectors, UV detectors, imaging detectors, microchannel plates.
george.lawrence@lasp.colorado.edu (303) 492-5389

Steven W. Lee

Development of computer techniques for analysis and correlative study of multiple remote-sensing data sets; Digital image processing techniques; Physics of atmosphere/surface interactions; Mechanisms and rates of eolian sediment transport; Effects of topography on regional atmospheric circulation; Educational outreach: incorporating planetary science into K-12 curricula.
steve.lee@lasp.colorado.edu (303) 492-5348

Xinlin Li

Space physics, data analysis and modeling. Especially interested in understanding the dynamics of relativistic electrons in the magnetosphere: the source, loss, and transportation of these MeV electrons; also interested in charged particle injections into inner magnetosphere during magnetic storms and substorms, and magnetosphere-atmosphere coupling due to energetic particle precipitations.
Xinlin.Li@lasp.colorado.edu (303) 492-3514

William E. McClintock

Observational Astrophysics - Ultraviolet observations of the outer atmospheres of cool stars and the very local ($d < 20$ pc) interstellar medium. Ultraviolet Observations of Planetary Atmospheres. Development of state-of-the-art instrumentation for high resolution spectroscopy for the 900-2500/ wavelength range.
bill.mcclintock@lasp.colorado.edu (303) 492-8407

Michael Mellon

The history of water on Mars, the martian permafrost, surface-atmosphere interactions and the martian climate. Periglacial geology and geophysics on Earth and Mars. Use of ice-related geomorphic features as an indicating of the distribution of subsurface ice. Antarctic analogs to martian geomorphology. Laboratory research in transport processes in frozen soils, including gas diffusion and solute migration and the effects of water vapor, ice, and adsorbate on transport physics. Remote sensing and thermophysical properties of planetary regoliths, with specific emphasis on martian surface material. Planetary surface temperature behavior and geothermal heat flow.
Mike.mellon@lasp.colorado.edu (303) 492-1711

Michael Mills

Research has focused on stratospheric sulfate aerosol. The current research tool is a 2D micro-physical model of the troposphere, stratosphere, and mesosphere. A primary goal has been to assess the sources of the nonvolcanic stratospheric sulfate layer, and understand anthropogenic contributions. Because of the role of aerosol in stratospheric chemistry and radiative balance, this knowledge of its sources is critical to understanding global change. Recent efforts have attempted to understand discrepancies between observed and calculated aerosol mass at the top of the layer. Other work has examined the causes of observed particle nucleation in polar winter, the implications for aerosol of recently measured photolysis rates for H₂SO₄ and SO₃, and volcanic aerosol as a potential source for polar mesospheric clouds.
Mike.mills@colorado.edu (303) 492-7767

Keiji Ohtsuki

Theoretical studies of planet formation; origin and dynamical evolution of ring-satellite systems.
Keiji.Ohtsuki@lasp.colorado.edu (303) 492-0260

Cora E. Randall

Primary interests include atmospheric chemistry and dynamics, mainly of the stratosphere, and secondarily of the mesosphere and troposphere. Work is experimental in nature, relying on data from remote sensing satellites. The emphasis is on ozone, NO₂, and aerosol data from the Polar Ozone and Aerosol Measurement (POAM) instrument as well as from the Stratosphere Aerosol and Gas Experiment (SAGE). Measurements from instruments on the Upper Atmosphere Research Satellite (UARS) and the Solar Mesosphere Explorer (SME) are also used. Other interests include the spectroscopy of comets and laboratory polarization measurements.
cora.randall@lasp.colorado.edu (303) 492-8208

Gary J. Rottman

Accurately measure the solar spectral irradiance (Principal Investigator on sounding rockets, UARS, EOS, SORCE, TSIM, and GLORY and Co-Investigator on SME, TIMED, and SDO). Special emphasis is given to solar variability on all time scales and to comparisons of the solar irradiance with the output of other late type stars. Past work has concentrated on the ultraviolet ($\lambda < 300$) irradi-

ance, but emphasis has not extended to the visible and near-infrared. Application of ultraviolet spectroscopy and the development of new instrumentation for remote sensing.

gary.rottman@lasp.colorado.edu (303) 492-8324

David W. Rusch

The general fields of spectroscopy and aeronomy, emphasizing the measurements of minor constituents and aerosols in planetary atmospheres such as nitric oxide and ozone and the physical and chemical phenomena which determine their densities and temporal variations. Research in the atmospheric sciences including stratospheric, mesospheric, and thermospheric data analysis and modeling. Application of the principles of molecular and atomic spectroscopy in the measurement of ultraviolet, visible, and near-infrared emission and absorption features to obtain understanding of atmospheric phenomena. Current research involves the determination of atmospheric processes affecting ozone and the reevaluation of ozone trends from long-term satellite measurements.

David.rusch@lasp.colorado.edu (303) 492-8627

<http://lasp.colorado.edu/~rusch/dwr.html>

Nicholas M. Schneider

The physics of planetary magnetospheres, particularly the interactions between planetary plasmas and the satellites of the outer planets. Extensive groundbased observations of the Jupiter/Io system, especially imaging and spectroscopy of the Io atmosphere and plasma torus. Program has been expanded to include Hubble Space Telescope observations. Designing and building of a spacecraft to study the Jupiter/Io system.

nick.schneider@lasp.colorado.edu (303) 492-7672

Martin Snow

Primary research interests include ultraviolet spectroscopy of stars and the sun and the interaction of comets with the solar wind. The SOLSTICE instruments on UARS and SORCE provide a wealth of information about solar activity in the 115-300 nm range on a variety of timescales, ranging from minutes (solar flares) to decades (solar cycle). Understanding the variation in the solar output will lead to understanding its influence on the Earth. The interaction of comets with the solar wind is best studied using wide-field photography. Both amateur and professional astronomers contribute to

this effort, and one research activity has been to help coordinate the interaction of the two groups.

marty.snow@lasp.colorado.edu 303-735-2143

A. Ian F. Stewart

The investigation by ultraviolet emissions of the aeronomy of planetary and satellite atmospheres, cometary comae, and Io's plasma torus.

Ian.stewart@lasp.colorado.edu (303) 492-4630

Glen R. Stewart

Origin and evolution of the solar system, with an emphasis on modeling the solid-body accretion of the terrestrial planets and the solid cores of the giant planets. Accretion of the Moon after a giant impact on the Earth. Modeling of satellite wakes and spiral density waves in planetary rings. Nonlinear dynamics of the three-body problem as applied to problems in solar system dynamics.

glen.stewart@lasp.colorado.edu (303) 492-3737

Gary E. Thomas

Research concerning the middle atmosphere of Earth, in particular the mesosphere (50-100 km). Of interest are noctilucent clouds which occur in the high-latitude summertime mesopause region, around 83 km. These clouds were observed for five years by a CU LASP ultraviolet experiment onboard the LASP SME satellite, and more recently by instruments onboard the POAM II and UARS (Upper Atmosphere Research Satellite) spacecraft. In the last decade, interest involves global change in this region, possibly caused by anthropogenic emissions and by climate changes in the troposphere. Critical parameters studied are solar UV flux, water vapor, temperature and ozone which are being monitored by instruments onboard the UARS.

gary.thomas@lasp.colorado.edu (303) 492-7022

http://lasp.colorado.edu/noctilucent_clouds

Owen B. Toon

Theoretical studies of stratospheric aerosols; investigations of volcanic aerosols and studies of polar stratospheric clouds; theoretical studies of tropospheric clouds, aerosols and radiative transfer; experimental investigations of stratospheric and tropospheric phenomena; theoretical investigations of planetary atmospheres.

Brian.toon@lasp.colorado.edu (303) 492-1534

Robert Weigel

Dynamics and physics of solar wind/magnetosphere/ionosphere coupling. Modeling of high-energy electrons in the magnetosphere. Models of the dynamics of ground magnetic fields and their time derivatives based on the solar wind state. Prediction of temporal fluctuations in ground magnetic fields with high-dimensional nonlinear regression methods (neural networks). Low-dimensional physics-based models of geomagnetic storms and substorms. Characterization of the relaxation of ionospheric currents after passage of solar wind disturbance. Studies of short-time scale geomagnetic fluctuations and characterization of their probability distribution functions. Statistical and empirical model development for space weather prediction. Decision Theory applied to space weather forecasting problems.

Robert.Weigel@lasp.colorado.edu (303-492-2159)

Thomas N. Woods

Observational studies of the solar ultraviolet (UV) radiation, its variability, and its interaction with Earth's atmosphere. Principal investigator of NASA suborbital program to study the solar irradiance and thermospheric airglow. Principal investigator of the Solar EUV Experiment (SEE) on the TIMED mission. Co-investigator of the Solar Stellar Irradiance Comparison (SOLSTICE) experiment currently making solar UV irradiance measurements on the Upper Atmosphere Research Satellite (UARS) and planned for the Earth Observing System (EOS) missions.

tom.woods@lasp.colorado.edu (303) 492-4224

FACULTY ACTIVITIES

Air Force Technical Applications Center (AFTAC) Satellite Review Panel

Baker, Daniel (Chair)

American Association for the Advancement of Science (AAAS)

Jakosky, Bruce (Member, Program on Dialogue on Science, Ethics, and Religion Advisory Committee)

American Geophysical Union (AGU)

Avallone, Linnea (Member Atmospheric Chemistry Section, Atmospheric Chemistry Technical Committee)

Avallone, Linnea (Member Sullivan Award Committee)

Baker, Daniel (Chair, Nominations Committee)

Baker, Daniel (Convenor, Special Sessions)

Baker, Daniel (Chair, Electronic Publications Review Panel)

Baker, Daniel (President, Space Physics and Aeronomy Section)

Ergun, Robert (Member, Press and Public Affairs Committee)

Ergun, Robert (Chair, Session "Polar Magnetospheres of Jupiter and Earth, Fall AGU meeting)

Esposito, Larry (Main organizer and Chair of Organizing Committee, Chapman Conference on Venus Exploration)

Li, Xinlin (Member, Student paper evaluation committee)

Association of American Universities (AAU)

Esposito, Larry (Member, Science Working Group)

Astrobiology Science and Technology in Exploration Program (ASTEP)

Jakosky, Bruce (Co-Convenor, Principal Investigator's Workshop)

Astrophysical and Planetary Sciences Department (APS)

Ergun, Robert (Member of Executive Committee)

Ergun, Robert (Peer Teaching Evaluator)

Ergun, Robert (Member, Faculty Search Committee)

Ergun, Robert (Member, Undergraduate Committee)

Pappalardo, Robert (Department Representative, CU Geophysics Ph.D. Program)

Pappalardo, Robert (Member, Admissions committee)

Pappalardo, Robert (Member, Fiske Planetarium hiring Committee)

Pappalardo, Robert (Member, Course fees committee)

Boulder Matrix Space Advisory Group

Baker, Daniel (Chair)

CLUSTER Science Working Team

Baker, Daniel (Member)

Committee on Space Research (COSPAR)

Esposito, Larry (Main Scientific Organizer, COSPAR 34 : Planetary Atmospheres)

Conference on Space Weather

Baker, Daniel (Member, Organizing Committee)

Department of Energy Programs in Atmospheric Science

Toon, Owen B. (Member)

Dissertation/Thesis Advisor/Committee Member

Avallone, Linnea

Baker, Daniel

Ergun, Robert

Li, Xinlin

Pappalardo, Robert

Toon, Owen B.

Editorial Board Member

Avallone, Linnea (Associate Editor, Journal of Geophysical Research – Atmospheres)

Baker, Daniel (Associate Editor – Journal of Space Weather)

Jakosky, Bruce (Astrobiology)

Jakosky, Bruce (International Journal of Astrobiology)

Pappalardo, Robert (Associate Editor, Geophysical Research Letters)

Pappalardo, Robert (Guest Co-Editor, Special Issue of Journal of Structural Geology)

Education and Public Outreach

Woods, Thomas (Boulder Valley School District; Math in Science Lecture)

Woods, Tom (Assisted with LSTB tours)

Woods, Tom (Science Fair Judge)

Electronic Geophysical Year Steering Committee

Baker, Daniel (Chair)

International Assoc. for Geomagnetism and Aeronomy (IAGA)

Baker, Daniel (U.S. National Delegate)

Baker, Daniel (Chair, IGY+ 50 Task Force)

International Union of Geodesy and Geophysics (IUGG)

Baker, Daniel (Member, IGY+50 Advisory Committee)

Baker, Daniel (U.S. Representative)

International Heliophysical Year Planning Group

Baker, Daniel (Co-Chair)

International Space Science Institute Working Group

Baker, Daniel (Member)

International Space Weather Conference

Baker, Daniel (Member, Organizing Committee)

Laboratory for Atmospheric and Space Physics (LASP)

Avallone, Linnea (Member, Education and Public Outreach Committee)
Baker, Daniel (Chair, Business Committee)
Baker, Daniel (Chair, Executive Committee)
CoBabe-Ammann, Emily (Member, Executive Committee)
Colwell, Josh (Member, Executive Committee)
Davis, Randal (Member, Executive Committee)
Esposito, Larry (Member, Executive Committee)
Esposito, Larry (Member, Merit Evaluation Committee)
Himes, Caroline (Member, Executive Committee)
Horanyi, Mihaly (Member, Executive Committee)
Horanyi, Mihaly (Member, Library Committee)
Jakosky, Bruce (Member, Executive Committee)
Li, Xinlin (Member, Executive Committee)
Li, Xinlin (Member, Graduate Student Curriculum Committee)
Li, Xinlin (Member, Education and Public Outreach Committee)
Li, Xinlin (Member, Weigel Promotion Committee)
Li, Xinlin (Member, Ericksson Promotion Committee)
McClintock, William (Member, Executive Committee)
McGrath, Michael (Member, Executive Committee)
Randall, Cora (Member, Executive Committee)
Rottman, Gary (Member, Executive Committee)
Rottman, Gary (Chair, Project Steering Committee)
Stewart, Ian (Member, Executive Committee)
Woods, Tom (Member, Project Steering Committee)
Woods, Tom (Member, Executive Committee)
Woods, Tom (Editor, SORCE book published as special issue of *Solar Physics*)
Woods, Tom (Science Supervisor LASP Solar Group)

Mars Astrobiology Science and Technology Workshop

Jakosky, Bruce (Convenor)

Mars Global Surveyor Project Science Group

Jakosky, Bruce (Member)

Mars Odyssey Project Science Group

Jakosky, Bruce (Member)

Mars Sample Return Science Steering Group

Jakosky, Bruce (Member)

MESSENGER/Mercury Orbiter Science Working Team

Baker, Daniel

National Academy of Science (NSF)

Baker, Daniel (Chair, NAS/NC Committee on Solar and Space Physics (CSSP))

Baker, Daniel (Member, Space Studies Board)

National Aeronautics and Space Administration (NASA)

Baker, Daniel (Chair, Living With a Star MOWG)

Baker, Daniel (Advisor, Sun-Earth Connections Roadmap Committee)

Baker, Daniel (Member, Magnetospheric Multiscale Mission Study Team)

Esposito, Larry (Member, NASA Nuclear Systems Initiative Science Definition Team)

Horanyi, Mihaly (Member, Micro-Gravity Fluids Science Review Panel)

Jakosky, Bruce (Chair Astrobiology Institute Lunar Astrobiology Working Group)

Jakosky, Bruce (Chair, Mars Aeronomy Working Group)

Jakosky, Bruce (Chair, Mars Exploration Program Analysis Group)

Jakosky, Bruce (Member, Mars Science Laboratory Planetary Protection Working Group)

Jakosky, Bruce, (Convenor and Session Chair, Astrobiology Institute Workshop on Subsurface Life)

Li, Xinlin (Team Member, Science and Technology Study and Definition Team)

Pappalardo, Robert (Member, Science Definition Team)

Pappalardo, Robert (Member, Solar System Exploration Subcommittee)
Pappalardo, Robert (Member, Local Organizing Committee, NASA Astrobiology institute)
Toon, Owen B. (Member, Aura Validation Activities Organizing Committee)
Toon, Owen B. (Member, Tropical clouds Mission Organizing Committee)
Woods, Tom (Member, LWS Climate Review Panel)
Woods, Tom (Member UARS, TIMED, SORCE, and SCO science working groups)
Woods, Tom (Chair/Main organizer for Solar XUV Irradiance and FUV Airglow Validation Workshop)

National Center for Atmospheric Research (NCAR)

Avallone, Linnea (Member: Upper Troposphere/Lower Stratosphere Initiative Progressive Science Campaign Committee)

National Oceanic and Atmospheric Administration (NOAA)

Baker, Daniel (Member, Strategic Planning Group)

National Science Foundation

Baker, Daniel (Member, Advisory Panel on Faculty Development)

Panel on Nonlinear Modeling in Geophysics

Baker, Daniel (Member)

Physics Department Comps Committee

Horanyi, Mihaly (Chair)

Physics Department Undergraduate Committee

Horanyi, Mihaly (Member)

Planetary Society Advisory Board

Jakosky, Bruce, (Member)

Polar Science Working Team

Baker, Daniel (Member)

Program in Atmospheric and Oceanic Science (PAOS)

Toon, Owen B. (Director)

Reviewer of Manuscripts, Grants, or Creative Work

Avallone, Linnea (External expert reviewer: Big Bend Regional Aerosol and Visibility Observational Study (BRAVO))

Avallone, Linnea (Review panelist: National Science Foundation Integrative Graduate Education and Research Traineeship (IGERT) program)

Avallone, Linnea (Reviewer of proposals for creation of research centers (Helmholtz (Germany) Association of National Research Centers))

Avallone, Linnea (Proposals: National Science Foundation Office of Polar Programs)

Ergun, Robert (Manuscripts: Journal of Geophysical Research, Physics of Plasmas, Geophysical Research Letters)

Ergun, Robert (Proposals: NASA, NSF)

Esposito, Larry (Manuscripts: Journal of Geophysical Research and Icarus)

Horanyi, Mihaly (Icarus, Journal of Geophysical Research-Space, National Academy of Sciences, Nature, Physics of Plasmas)

Horanyi, Mihaly (Proposals: NSF, DOE, and NASA)

Jakosky, Bruce (Manuscripts: Icarus, Science)

Jakosky, Bruce (Proposals: NASA Institute for Advanced Concepts)

Jakosky, Bruce (Proposals: NASA Mars Fundamental Research Program)

Jakosky, Bruce (Proposals: NASA Planetary Geology and Geophysics Program)
 Li, Xinlin (Proposals: NASA and NSF)
 Li, Xinlin (Manuscripts: Journal of Geophysical Research, Geophysical Research Letters, Advanced Plasma Physics, and Earth, Planets, and Space)
 Pappalardo, Robert (Manuscripts: Icarus and Journal of Geophysical Research – Planets)
 Pappalardo, Robert (Proposals: NASA)
 Pilewskie, Peter (Proposals: NASA Earth Science Enterprise, and NSF)
 Sternovsky, Zoltan (Manuscripts: Physics of Plasmas, Physical Review Letters, IEEE Transactions on Plasma Science, and Vacuum)
 Woods, Tom (J. Geophys. Res., Solar Phys., and Adv. Space Res.)
 Woods, Tom (Proposals: NASA, NOAA)

SAMPEX Science Working Team

Daniel Baker (Member)

Space Physics Research Lab (U. of Michigan)

Baker, Daniel (Member, Review Committee)

Universities Space Research Association (USRA)

Baker, Daniel (Member, Astronomy and Space Physics Council)
 Baker, Daniel (Member, Council of Institutes)
 Baker, Daniel (Representative, Council of Institutes)
 Jakosky, Bruce (Member, Lunar and Planetary Institute Science Council)
 Jakosky, Bruce (Member, NASA Institute for Advanced Concepts Science Council)

University of Colorado Aerospace Engineering Sciences (AES) Department

Baker, Daniel (Member, External Advisory Board)
 Li, Xinlin (Member, Graduate Committee on Curriculum)
 Li, Xinlin (Member, AES/LASP Cooperation Committee)

University of Colorado

Baker, Daniel (Deputy Director, Center for Limb Atmospheric Sounding)
 Baker, Daniel (Member, Chancellor's Federal Relations Advisory Committee)
 Baker, Daniel (Member, Graduate School/Institute Directors Group)
 Baker, Daniel (Member, Vision 2010: University without Walls Committee)
 Toon, Owen B. (Core Faculty Member, Environmental Studies Program)

FACULTY HONORS/AWARDS

National Academy of Science (NAS)

Baker, Daniel (Chosen National Associate)

Courses Taught by LASP Faculty

Spring 2004

Linnea Avallone	ATOC 4800-5000	Critical issues in climate and policy
Linnea Avallone	ATOC 6020	Group meeting / Journal Club
Daniel N. Baker	ASTR 5300	Intro to Magnetospheres
Robert Ergun	ASTR 1110	Intro to Astronomy: Solar System
Larry Esposito	ASTR/ ATOC 3720	Planets and their atmospheres
Xinlin Li	ASEN 4010	Intro to Space Dynamics

Robert Pappalardo	ASTR 1010-001	Intro to the Solar System
Owen B. Toon	ATOC 6020	Seminar on aerosols

Fall 2004

Robert Ergun	ASTR 1030	Accelerated general astronomy: Solar system
Mihaly Horanyi	PHYS 3310	Principles of Electricity and Magnetism I
Mihaly Horanyi	PHYS 3320	Principles of Electricity and Magnetism II
Bruce M. Jakosky	GEOL 5830 / ASTR 5830 / PAOS 5830	Astrobiology
Xinlin Li	ASEN 2002	Thermal Dynamics / Aerodynamics
Robert Pappalardo	ASTR 1110-002	Intro to the Solar System
Robert Pappalardo	ASTR 5835	Planetary Science Seminar: Saturn System
Peter Pilewskie	ATOC / ASTR 5560	Radiative Processes in Planetary Atmospheres
Owen B. Toon	ATOC 6020	Seminar on aerosols
Owen B. Toon	ATOC 5810	Planetary Atmospheres

Colloquia and Informal Talks* ***Spring 2004***

Sandra Baldauf, Univ. of York, UK, The tree of life; new discoveries about relationships among eukaryotes

Amy C. Barr, CU/LASP, Convective Instability in Ice I: Application to Callisto and Ganymede

Corey Cohn, Stony Brook University, Pyrite-generated radicals and the destruction of nucleic acids

Peter Colarco, U. MD/NASA Goddard Space Flight Center, A Combined Use of Satellite Data and Transport Models to Understand the Composition and Distribution of Climatically Important Aerosols

Matthew DeLand, Science Systems and Applications, Inc. (SSAI), SBUV/2 Observations of Solar Variability and Atmospheric Response

David DesMarais, NASA/AMES, The Mars Exploration Rovers unveil new horizons for astrobiology

Charles Delwiche, U. of Maryland, Key events in the evolution of eukaryotic phototrophs

Andrea Ghez, UCLA, Unveiling a supermassive black hole at the center of our galaxy.

Juan Fontenla, CU/LASP, Modeling the Solar Atmosphere

James Garvin, NASA/HQ, Discovering the new Mars with SPIRIT and OPPORTUNITY

Janet Green, CU/LASP, The Earth's Radiation Belts: Scientific Questions and Societal Impacts

Kevin Hand, Stanford Univ., The surface radiation chemistry of Europa and implications for a habitable ocean

Jerry Harder, CU/LASP, Solar Spectral Variability as Measured by the SORCE SIM Instrument

Noel Hinners, CU/LASP, Humans to the Moon and Mars: The dream revived

Bryan Hynek, CU/LASP, Martian water on the brain

Diego Janches, CU/CIRES, Micrometeors in the Upper Atmosphere Studied Using Big Radars

Bruce Jakosky, LASP/Astrobiology/Geological Sciences, Life Elsewhere, Science and Religion

David Johnson, NASA Langley Research Center,
Dehydration of the upper troposphere: What
can we learn from isotope ratios?

Dave Johnston, University of Maryland, Isotopic
fingerprints of sulfur metabolisms: using the
minor isotopes to distinguish between process

Nicole King, Univ. of California/Berkeley, Ani-
mal origins: our unicellular ancestry

Doug Kinnison, NCAR, Introduction to the
Whole Atmosphere Community Climate Model
(WACCM)

Alex Klimas, NASA/GSFC, Mean-Field Self-
Organized Criticality in a Driven Current Sheet
Model

Greg Kopp, CU / LASP, The Total Irradiance
Monitor: What's in a Part Per Million?

Gentry Lee, NASA/JPL, The exploration of
Mars: past and present

Xinlin Li, CU/LASP, The predictability of the
magnetosphere and space weather.

Ken Mankoff, Honeybee Robotics, Rock Abra-
sion Tool (RAT) onboard the MER rovers

Victoria Meadows, JPL/Caltech, Exploring the
living cosmos: The Spitzer Space Telescope

Terry Onsager, NOAA/SEC, Radiation Belt Elec-
trons - Where do They Come From and Where
do They go?

Peter Pilewskie, NASA Ames Research Center,
Solar Radiation, Clouds, and Climate: A Multi-
Spectral View from Airborne and Satellite Ob-
servations

Cora Randall, CU/LASP, Occultation Science:
A Rising Star?

Erik C. Richard, NOAA Aeronomy Labora-
tory/CIRES, The Development and Use of Air-
craft In-situ Diode Laser Instruments for At-
mospheric Research: From Trace Gases to
Aerosols

Theodore Sarris, CU / LASP, Energetic Particle
Injections in the Earth's Magnetosphere

Roger Summons, MIT, Organic biosignatures:
Earthly biomarkers, analytical approaches, old
rocks and meteorites

Mark Tyra, Univ. of Maryland, Terrestrial altera-
tion of CM chondritic carbonate

Joe Vellinga, Lockheed Martin Space Systems,
Stardust - Close Encounter with a Comet

Benjamin Weiss, MIT, Records of ancient Mar-
tian magnetic fields, climate and life in
ALH84001.

John Wise, GE-Panometrics, Calibration of the
GOES solar EUV detector at the Brookhaven
NSLS

Fall 2004

Daniel Baker, CU/LASP, Space Environment
Effects of the Solar Events of October-
November 2003

John Bally, Dept. of Astrophysical & Planetary
Sciences, Center for Astrophysics & Space
Astronomy, & **Center for Astrobiology**,
Small is Beautiful: Survival of Protoplane-
tary Disks in Hazardous Star Forming Envi-
ronments

Phillip B. Chilson, CIRES / CU, Atmospheric
Radar Imaging: Theory and Applications

Carol Cleland, CU/Philosophy/Astrobiology,
Searching for extraterrestrial life without a
definition of 'life'

Joshua Colwell, CU/LASP, Cassini UVIS Obser-
vations of Saturn's Rings

Geoffrey A. Dorn, BP Center for Visualization,
University of Colorado, Applications of
Visualization and Virtual Reality in Research
and Engineering

Larry Esposito, CU/LASP, Cassini UVIS Obser-
vations Show an Active Saturn System

Bruce Jakosky, CU/LASP, Geological Sciences,
and Center for Astrobiology, Liquid water
and the biological potential of Mars

Brian R. Johnson, Ball Aerospace, New Sensor
Technologies for Measuring CO and CO₂
from Space

Bill Kurth, U. of Iowa, Physics/Astronomy Dept.,
Results from the Radio and Plasma Wave
Science experiment on Cassini - Radio emis-
sions from Saturn

Charles Lineweaver, Australian National Univer-
sity, The Galactic Habitable Zone and the
Age Distribution of Complex Life in the
Milky Way

Jerry Lumpe, Computational Physics, Inc., Re-
mote Sensing of Earth's Atmosphere by Ab-
sorptive Occultation

Thomas McCollom, Center for Astrobiology, Laboratory for Atmospheric and Space Physics, Iron-oxidizing bacteria: Inhabitants of the deep subsurface biosphere, early Earth, and Mars?

Stephen J. Mojzsis, CU/Geological Sciences, Center for Astrobiology, Renaming the Hadean: A progress report from the Mission to Really Early Earth

Alexander Pavlov, CU/LASP, Mass-Extinctions and Severe Glaciations due to Changes in the Galactic Environment

Pilewskie, P.A., Measuring aerosol, cloud, and surface radiative properties and effects during the NEAQS-ITCT 2004 field campaign

Cora Randall, CU/LASP, Stratospheric Effects of Energetic Particle Precipitation in 2003-2004

Ralf Srama, MPIK Heidelberg, Germany, Dust Measurements With Cassini

Ian Stewart, CU/LASP, Titan Observed by Cassini-UVIS or Your Face is Familiar - Don't I Know You From Somewhere?

Melissa G. Trainer, Chemistry/Biochemistry/CIRES, Organic Aerosols in Planetary Atmospheres: Titan and the Early Earth

James White, INSTAAR/CU, Humans and Climate Change: Latest News From Ice Cores

Mike Yarus, Dept. of MCD Biology & Center for Astrobiology, Origin(s?) of the Genetic Code

Leslie Young, SwRI, Observing Pluto's Post-Perihelion Atmosphere

*Boldfaced names indicate members of LASP Faculty or Staff.

Publications

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Andersson, L., W.K. Peterson, and K.M. McBride, Dynamic Coordinates for Auroral Ion Outflow, *J. Geophys. Res.*, 109, A08201, 10.1029/2004JA010424, 2004.

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Bagenal, F., Timothy Dowling, and William McKinnon, Chapter 1 - Introduction, in *Jupiter: The Planet, Satellites and Magnetosphere*, Fran Bagenal, Timothy Dowling, William McKinnon (eds), Cambridge University Press, 2004.

Baker, D.N., Balancing science and exploration, *Space News*, 13, 2004.

Baker, D.N., C. Barton, A. Rodger, B. Fraser, B. Thompson, and V. Papitashvili, Moving beyond the IGY: The electronic Geophysical Year (eGY) Concept, *Eos*, AGU, 85, No. 11, 105-109, 2004.

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