

# ASTROPHYSICS

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## newsletter

### 2000 EXECUTIVE COMMITTEE DIVISION OF ASTROPHYSICS

#### CHAIR

**Virginia Trimble**  
University of California  
Dept. of Physics & Astronomy  
Irvine, CA 92697-4575  
phone: (949) 824-6948  
fax: (949) 824-2174  
vtrimble@uci.edu

University of Maryland  
Dept. of Astronomy  
College Park MD 20742  
phone: (301) 405-5822  
fax: (301) 314-9067  
vtrimble@astro.umd.edu

#### CHAIR-ELECT

**Charles Dermer**  
NRL – Code 7653  
4555 Overlook Ave SW  
Washington, DC 20375-5352  
phone: (202) 767-2965  
fax: (202) 767-6473  
dermer@gamma.nrl.navy.mil

#### VICE-CHAIR

**Susan Lamb**  
University of Illinois  
Dept. of Physics  
1110 W. Green Street  
Urbana, IL 61801-3080  
phone: (217) 333-5550  
fax: (217) 244-7638  
slamb@astro.uiuc.edu

#### PAST-CHAIR

**Trevor Weekes**  
Harvard-Smithsonian Whipple  
Observatory  
Ctr. Astrophysics, PO Box 97  
Amado, AZ 85645  
phone: (602) 670-5726  
fax: (602) 670-5713  
tweekes@cfa.harvard.edu

#### SECRETARY-TREASURER

**Neil Gehrels**  
NASA/GSFC – Code 661  
Building 2, Room 250  
Greenbelt, MD 20771  
phone: (301) 286-6546  
fax: (301) 286-0677  
gehrels@gssc.nasa.gov

The Division of  
Astrophysics

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American  
Physical Society

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November 2000

## Changing of the Guard

*Virginia Trimble, Chair DAP*

At the end of the April business meeting, Josh Grindlay completed four valiant years in the chair sequence of your division. Trevor Weekes is now past chair (and we count on him for equally wise counsel). Virginia Trimble is the current chair (no comment), Charles Dermer the chair-elect, and Susan Lamb the new vice chair. In the committee, sequence Patricia Boyd and Gerald Fishman have rotated off (many thanks for your service), Michael Cherry and C. Megan Urry continue, and Joel Primack and Mel Ulmer (to whom congratulations and welcome) are the new members.

## The Next Election Cycle

*Virginia Trimble, Chair DAP*

Scarcely do we complete one election and congratulate the winners when it is time to start over again.

### Positions to be filled:

**VICE-CHAIR** (becomes chair elect, then chair, then past chair, a four-year task)

**COMMITTEE** (two members-at-large, to serve two years each)

**SECRETARY-TREASURER** (a multi-year task with real work attached)

### The nominating committee consists of:

**Gerald Fishman, Chair**

(jerry.fishman@msfc.nasa.gov, 256-544-7691)

**Jean Swank**

(swank@pcasun1.gsfc.nasa.gov, 301-286-9167)

**Vassiliki Kalogera**

(vkalogera@cfa.harvard.edu, 617-495-7379)

In accordance with Division bylaws, the first two were appointed by the current DAP chair and the third by APS headquarters in the person of Judy Franz.

The slate must be complete by December 15th in order for the election to take place by January 15th, so please contact any member of the committee quite soon to suggest candidates or volunteer. Candidates may also be put forward by petition signed by 2% of the Division membership (something like 35 signatures).

### Candidates selected by the Nominating Committee will be asked to provide:

a. A statement of willingness to run and serve (the inverse of General Sherman's famous "if nominated I will not run; if elected I will not serve").

b. A platform statement, consisting of a mini-CV or list of qualifications and a position statement on the goals and future of the Division, astrophysics in general, or the state of the universe.

## Fellowship Nominations Sought

Members of the Division of Astrophysics are invited to submit nominations for Fellowship in the APS. The number of new Fellows is limited to one-half percent of the current membership. Every year, our division nominates 6 or 7 APS members for Fellowship. If you would like to recommend a member for Fellowship, you may do so by filling out the nomination form which may be found, along with related information, at <http://www.aps.org/fellowship/>

Please submit nominations by **MAY 1** to:

Executive Officer  
American Physical Society  
One Physics Ellipse  
College Park, MD 20740-3844  
ATTN: Fellowship Program

Unsuccessful nominations submitted for the first time last year will be reconsidered this year by the Fellowship Committee (though additional supporting letters would be still welcome). Beyond one year, nominations must be resubmitted.

## In This Issue

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# DAP Student Travel Grants and Award

Neil Gehrels, Secretary/Treasurer DAP

The future of the Division of Astrophysics (DAP) depends on its younger members and we must do everything we can to ensure that they join the division, attend its meetings and participate in its sessions. Last year the DAP Executive Committee decided to take some measures to encourage this participation; these are described below. You, as existing members, should see that this information is brought to the attention of the graduate students in your department, particularly those who have not yet joined the DAP.

## 1) Travel Grants.

To encourage more participation by graduate students we will offer up TEN to travel grants of \$500 each for out of town students and up to FIVE grants of \$100 each for local students for attendance at the main (annual) meeting of the division. To be eligible for these awards, the student should send a short letter of application to the DAP Program Chair (Chuck Dermer, Naval Research Laboratory, Code 7653, Washington, DC 20375-5352). They should include a copy of the abstract of the paper they are submitting for the upcoming meeting (APS April 2001 in Washington DC). They should also ask their supervisor to send a short letter endorsing their proposal. The deadline for these letters will be the same as the deadline for submitting the abstract to the APS (January 14, 2001); the abstract should also be sent directly to the APS via the Web.

## 2) Award for Best Student Talk.

In addition, to the Travel Grants, the DAP will offer an Award of \$500 to the best paper presented by a student at the meeting. The Award will be selected by an Ad Hoc Committee of DAP Executive members attending the meeting who will attend these sessions. The committee to be chaired by the outgoing DAP Chair. To facilitate this selection, the ten student papers will normally be allotted to one session (with diverse topics). The award will be based on the quality of the research described, the clarity of the audio and visual presentation, and the professional manner in which the paper is presented. An additional award of \$500 for the best student poster may be given if there are sufficient student posters submitted.

## 3) Dissertation Papers.

Independent of the above, graduate students who are presenting a paper that is the final summary of their dissertation work may be awarded twice the normal time allotted for a paper (2 x 12 minutes). To determine if the paper falls in this category, it must be verified by an e-mail to the Program Chair (Chuck Dermer) from the student's supervisor. At the discretion of the Program Chair these papers may be scheduled in the normal sessions of submitted DAP papers or in the student session described above. These students will also be eligible for the travel grants and DAP Student Award.

# NASA Announces Small Explorer (SMEX) Selections

Paul Hertz, NASA Headquarters

NASA has made selections in the Explorer Program from the 46 proposals submitted in response to a recent Announcement of Opportunity for Small Explorers (SMEX) and Missions of Opportunity. Seven SMEX proposals and one Mission of Opportunity proposal was selected for concept studies, and one Mission of Opportunity proposal was selected for flight.

## The seven SMEX's selected for study are:

- \* The Heavy Nuclei Explorer (HNX), a space laboratory that would determine the properties of the high-energy atomic particles which are present in interstellar space. PI: Robert Binns of Washington University in St. Louis.

- \* The mission for Spectroscopy and Photometry of the Intergalactic Medium's Diffuse Radiation (SPIDR), a mission that would map the intergalactic "cosmic web" of hot gas which spans the Universe. PI: Supriya Chakrabarti of Boston University.

- \* The Satellite Test of the Equivalence Principle (STEP), a fundamental physics experiment to test the Equivalence Principle at an accuracy which is more than 100,000 times better than that achieved in laboratories on Earth. PI: Francis Everitt of Stanford University.

- \* Joule, an X-ray observatory that would obtain detailed energy spectra from extreme environments in the Universe ranging from the million degree coronae of nearby stars to the supermassive black holes at the cores of distant galaxies. PI: Richard Kelley of NASA's Goddard Space Flight Center.

- \* Aeronomy of Ice in the Mesosphere (AIM), a mission that would determine the causes of the highest altitude clouds in the earth's atmosphere. PI: James Russell III of Hampton University.

- \* The Jupiter Magnetospheric Explorer (JMEX), a mission that would study the magnetosphere of Jupiter by observing Jovian aurorae and the Io torus from Earth orbit. PI: Nicholas Schneider of the University of Colorado at Boulder.

- \* The Primordial Explorer (PRIME), an infrared observatory that would investigate the formation of the first quasars, galaxies, and clusters of galaxies. PI: Wei Zheng of the Johns Hopkins University.

## The Mission of Opportunity selected for study is:

- \* The Spectroscopy of Plasma Evolution from Astrophysical Radiation (SPEAR), an instrument that would trace the energy flow in the gas between stars when flown on the Korean KAISTSAT-4 mission. PI: Jerry Edelman of the University of California at Berkeley.

## The Mission of Opportunity selected for flight is:

- \* The Coupled Ion-Neutral Dynamics Investigations (CINDI), a mission to provide two instruments for the Air Force's Communication/Navigation Outage Forecast System (C/NOFS) satellite that will lead to a better understanding of the dynamics of the Earth's ionosphere. PI: Roderick Heelis of the University of Texas at Dallas.

The eight missions selected for study will begin a six-month concept study in October 2001. After a thorough evaluation of the results of Phase A studies has been completed, NASA expects to select two SMEX missions or launch in 2004 and 2005. NASA may or may not select the Mission of Opportunity for flight. The mission already selected for flight will immediately begin a concept study which, after review, will be followed by definition, a confirmation review, and implementation.



Further information is available at <http://spacescience.nasa.gov/codesr/smex/>

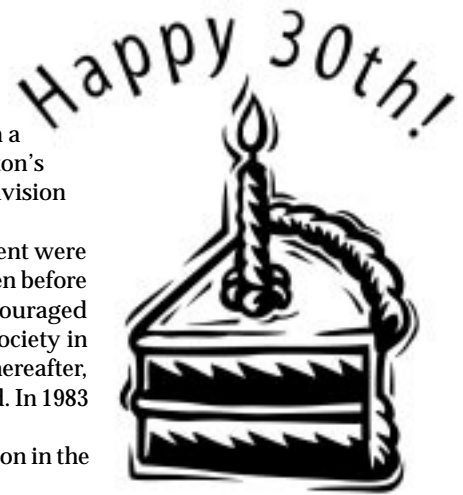
## Celebrating Thirty Years of DAP!

*Maurice M. Shapiro*

This year marks the 30<sup>th</sup> anniversary of the founding to the Division. It started with a breakfast meeting of John Simpson, Frank McDonald and Maurice Shapiro in Washington's Cosmos Club. The first two persuaded Shapiro to undertake the task of organizing a Division of Cosmic Physics (as it was originally called).

A meeting of a "founders group" took place at Shapiro's home. Among those present were Bruno Rossi, John Simpson, Frank McDonald, Bill Kraushar, and Kinsey Anderson. Even before the APS Council acted on their proposal, the Secretary of the Society, Bill Havens, encouraged Shapiro in his plan to organize sessions of invited talks for an April meeting of the Society in Washington. These sessions were among the best attended at that meeting. Soon thereafter, ASP President Luis Alvarez notified Shapiro that the new Division had been authorized. In 1983 the name was changed to Division of Astrophysics.

The founding of DAP stimulated the organization in the organizing of a sister division in the American Astronomical Society, i.e., the High-Energy Astrophysics Division.



## Message from Jim McGuire, GFB Chair-Elect

Some of the invited talks at the Spring APS meeting will be co-sponsored by the Few Body Topical Group and the Division of Astrophysics. Co-sponsorship means more invited talks for DAP. The Few Body Group offered to do this because much of the work done in astrophysics overlaps with few and many body physics. As Chair-Elect of GFP I invite you to join GFB. GFB is small, only a few hundred members.

If our membership from the DAP community increases we will continue to sponsor invited talks in astrophysics. Another advantage of joining GFB is the increased opportunity to communicate with a community whose interests overlap with astrophysics. I hope you will consider joining the Few Body Topical Group.

## "Gamma-Ray Astrophysics 2001": Baltimore, MD, April 4-6, 2001

*Chris Shrader, GSFC*

The Gamma-ray Astrophysics 2001 Symposium is being planned for April 4-6 next year in Baltimore.

The scientific program and format will contain a mixture of invited talks, contributed papers, and poster presentations covering the current status of observational and theoretical gamma ray astrophysics. Results highlighting the 9 years of the CGRO mission, as well as related results from other missions such as RXTE, Chandra, XMM and HESSI will be a major theme. In addition, ground-based VHE gamma-ray and radio observatories, and other ground-based and space missions related to astrophysical sources with emission greater than 10 keV are solicited. Emphasis on forthcoming gamma-ray missions such as GLAST, INTEGRAL, AGILE and Swift is also anticipated. Topics to be covered include all areas of Galactic and Extragalactic Astronomy, as well as Gamma-Ray Bursts, Solar Flares and Instrumentation. A call for papers will be issued via e-mail in the near future. Refer to: <http://coss.gsfc.nasa.gov/symposium/Gamma2001/> for more information.

## American Academy of Arts Honors Donald D. Clayton

On April 15, 2000, the Council of the American Academy of Arts and Sciences elected 154 new Fellows and 15 Foreign Honorary Members. The new members, chosen in recognition of their distinguished contributions to science, scholarship, public affairs, and the arts, represent 89 institutions in 22 states and 11 foreign countries.

Among those honored was Donald D. Clayton Professor at Clemson University, Clemson, South Carolina. A Centennial

Professor of Physics and Astronomy. Professor Clayton is known as a pioneer in the quantitative understanding of the synthesis of the elements in stars. He developed the concept of gamma-ray-line astronomy of radioactive nuclei and applied it with splendid success when Supernova 1987A exploded 18 years later. In addition, his predictions of the isotopic composition of those interstellar dust grains that formed in stars have been confirmed by grains found within meteorites.



# Preliminary Agenda for the Invited Sessions at the Washington, DC, April 2001 APS Meeting

Chuck Dermer, DAP Chair-Elect

An exciting program of invited sessions highlighting the latest astronomical and astrophysical research is planned for next April's APS meeting. The sessions include topics as diverse as the dynamic Sun to the creation of the elements and the birth of black holes. The session on the Sun, shared with the Topical Group on Plasma Astrophysics, will feature TRACE and SOHO/LASCO videos that are a treat to watch — whether or not your interests involve Solar or plasma physics. Two sessions on astrophysical extremes will present the latest research on cosmic rays and the highest energy photons. Another two sessions on the formation of galaxies and the origin of the elements will detail the physics of the building blocks of nature, shedding insight on the processes that lead, ultimately, to our existence. The latest Chandra results will be featured in a plenary talk and in an invited session devoted to research in X-ray and gamma-ray astronomy. Astrophysics at the conference will conclude with a half-session generously provided by the Topical Group on Few-Body Systems and Multiparticle Dynamics that will describe the stellar nurseries in the Orion nebula and the cosmological importance of infrared astronomy.

Make your plans now to attend this conference and present your latest research. Abstract deadline is January 12, 2001. For more information about the conference, visit <http://www.aps.org/meet/APR01/index.html>

Note that the schedule is preliminary and subject to minor changes and additions.

## **COSMIC RAYS: FROM THE KNEE TO THE ANKLE AND BEYOND**

*(Joint DPF and DAP Session)*

*Saturday, April 28th, 10:45am - 1:45pm*

### **The Knee of the Cosmic Ray Spectrum**

Simon Swordy (University of Chicago)

### **Observing Ultra High Energy Cosmic Rays: Experimental Techniques and Results**

Wayne Springer (University of Utah)

### **Cosmic Ray Acceleration: Sites and Mechanisms**

Reinhard Schlickeiser (Bochum University)

### **High Energy Neutrino Astronomy: Current Status and Future Prospects**

Serap Tilav (Oxford)

### **Ultra-high Energy Cosmic Rays - Revolutionary Particle Physics or Revolutionary Astrophysics?**

Glennys Farrar (NYU)

## **BLACK HOLES: BIRTH AND COALESCENCE**

*(Joint GGR and DAP Session)*

*Saturday, April 28th, 2:30pm - 5:00pm*

### **Black Hole Demographics**

David Merritt (Rutgers University)

### **Colliding Black Holes: Status and Prospects**

Luis Lehner (Univ. of British Columbia)

### **Two-Stage Collapse to Black Holes: A Model for Gamma Ray Bursts**

Mario Vietri (Universita di Roma 3)

### **Probing Black Holes with Gravitational Wave Observations**

Scott Hughes (Institute for Theoretical Physics, Santa Barbara)

## **THE ORIGIN OF THE ELEMENTS**

*(Joint DNP and DAP Session)*

*Sunday, April 29th, 10:45am - 1:45pm*

### **CNO and Nova nucleosynthesis**

Michael Wiescher (Notre Dame)

### **Stellar and Galactic Evolution**

Alexander Heger (UCSC)

### **Radioactivity Gamma-rays from Galactic Nucleosynthesis Sites**

Roland Diehl (MPE)

### **Chemical Evolution of Galaxies and the Universe**

Dieter Hartmann (Clemson)

## **HOW GALAXIES FORM AND EVOLVE**

*(Session Organizer: S. Lamb, DAP)*

*Sunday, April 29th, 2:30pm - 5:30pm*

### **Numerical Simulations of Galaxy Formation**

Matthias Steinmetz (University of Arizona)

### **Formation of the Present Day Galaxies**

Chris Mihos (Case Western Reserve)

### **Effects of the Cluster Environment on Galaxy Evolution**

Ben Moore (Durham University, UK)

### **Global Star Formation and Gas Dynamics in Colliding and Merging Galaxies**

Curt Struck (Iowa State University)

## **ENERGETIC PROCESSES IN THE SOLAR ATMOSPHERE**

*(Joint GPAP and DAP Session)*

*Monday, April 30th, 10:45am - 1:45pm*

### **TRACE Observations of the Sun**

Richard Fisher (NASA/GSFC)

### **Solar Energetic Particle Acceleration**

James A. Miller (UAH)

### **New Insights into the Physics of the Solar Corona from SOHO/LASCO**

Russell Howard (NRL)

### **Acceleration of Coronal Mass Ejections**

James Chen (NRL)

*Continued on Next Page*



# APS DPP Division 42<sup>nd</sup> Annual Meeting in Review

Bruce Remington

At the recent 42<sup>nd</sup> Annual Meeting of the APS Division of Plasma Physics Oct. 23-27, 2000, a series of presentations were delivered highlighting the emerging field of "laser astrophysics". Dmitri Ryutov of LLNL (ryutov1@llnl.gov) described theoretical issues behind scaling astrophysics into the laboratory. His talk was wide-ranging, touching on issues such as the hydrodynamics of core-collapse supernovae explosions; young supernova remnants; galactic jets; the formation of fine structures in late supernova remnants by instabilities; and the ablatively driven evolution of molecular clouds illuminated by nearby bright stars. The central question addressed by Ryutov was the extent to which laser experiments, which deal with targets on a spatial scale of  $\sim 0.01$  cm and occur on a time scale of a few nanoseconds, can reproduce phenomena occurring at spatial scales of a million or more kilometers and time scales from hours to many years. Ryutov showed that if dissipative processes, such as viscosity and Joule dissipation, are subdominant in both systems, and if the matter behaves as a polytropic gas, there exists a broad hydrodynamic similarity (the "Euler similarity") that allows a direct scaling of laboratory results to astrophysical phenomena.

This was followed by an experimental talk by Harry Robey of LLNL (robey1@llnl.gov), summarizing the results of 4 experiments being developed to address various issues of core-collapse supernova explosion hydrodynamics. Extensive observational evidence from core-collapse supernovae such as SN 1987A indicates that some form of large-scale hydrodynamic mixing is required to explain the resulting light curves, spectra, and velocities of the heavier elements produced by explosive nucleosynthesis near the core. High-resolution 2D numerical simulations have been unable to reproduce these observations. In the experiments described by Robey, a high intensity laser pulse from the Omega laser is used to drive a strong shock ( $M \gg 1$ ) into the target materials. The issues under

investigation are interface coupling in a 3-layer configuration, planar vs. spherically divergent geometry, 2D vs 3D instability evolution, and multimode vs. single-mode perturbation growth and saturation. Numerical simulations generally were found to provide reasonable agreement with the experiments, which suggests that discrepancies with SN observations may be input related. Alan Calder (calder@flash.uchicago.edu) of University of Chicago also described the first efforts to test a 3D ASCII code with the 3D experiments of Robey.

New experimental work in progress was described by Paul Drake (rpdrake@umich.edu) and Paul Keiter (pkeiter@engin.umich.edu), both from the University of Michigan, in an effort to develop a radiative-shock testbed relevant to supernova remnants (SNR). Strong shocks in low density media lead to a radiative precursor outrunning the shock, and in extreme cases to radiative cooling. Drake and Keiter described their experimental efforts to reproduce these conditions in a laboratory setting on the Omega laser.

Finally, a proposal for a new experiment was presented by Jave Kane of LLNL (kane7@llnl.gov) to look at the dynamics of photoevaporation fronts, such as the Eagle Nebula. The towering 'Pillars of Creation' of the Eagle Nebula are a long-standing astrophysical mystery. In the Rayleigh-Taylor instability model, radiation from nearby stars photoevaporate and accelerate the cloud surface, and the Pillars are falling 'spikes' of dense gas. The model reproduces recently measured fluid velocities in the Pillars, assuming the radiation drive and resulting acceleration decrease with time. In the cometary model, the Pillars consist of gas swept behind dense regions of the cloud impacted by supersonic ionization fronts. Theoretical and numerical evaluations of these models, implications for observations, and possible scaled verification experiments using intense lasers were proposed.

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## Preliminary Agenda Continued

### HIGHEST ENERGY PHOTONS

(Session Organizer: T. Weekes, DAP)

Monday, April 30th, 2:30pm - 5:30pm

#### Galactic Sources of Gamma Rays

Heinz Voelk (MPK)

#### Extragalactic Sources of Gamma Rays

Meg Urry (STScI)

#### Upcoming Gamma-ray Space Missions

Neil Gehrels (GSFC)

#### Next Generation Ground-based Gamma-ray Telescope

Frank Krennrich (ISU)

### THE X/GAMMA CONNECTION

(Session Organizer: C. Dermer, DAP)

Tuesday, May 1st, 8:00am - 11:00am

#### Tribute to Herbert Friedman (12 min)

Herbert Gursky (NRL)

#### BATSE - The Burst and Transient Source Experiment on the Compton Observatory

Gerald Fishman (NASA/MSFC)

#### The World of Compact Objects as Revealed by RXTE's Observations

Jean Swank (NASA/GSFC)

#### Chandra Observations of Supernova Remnants and the Galactic Center

Gordon Garmire (Penn State)

#### Progress towards an Advanced Compton Telescope Mission

James Kurfess (NRL)

### VISTAS IN ASTRONOMY

(GFB and DAP Half-Session)

Tuesday, May 1st, 11:00am - 12:30pm

#### Hubble Space Telescope Observations of the Orion Nebula Stellar Nursery

C. R. O'Dell (Vanderbilt)

#### The Extragalactic Infrared Background Radiation and its Cosmological Implications

M. Harwit (Washington, DC)



# DAP Executive Committee and Officers 2000

Chair ..... Virginia Trimble  
 Chair-Elect ..... Charles Dermer  
 Vice Chair ..... Susan Lamb  
 Past Chair ..... Trevor Weekes  
 Secretary/Treasurer ..... Neil Gehrels  
 Division Councilor ..... Stephen Holt  
 Executive Committee Members (2001) ..... Joel Primack  
 Executive Committee Members (2001) ..... Mel Ulmer  
 Executive Committee Members (2000) ..... Michael Cherry  
 Executive Committee Members (2000) ..... C. Megan Urry

NAME	EMAIL	PHONE	FAX
Patricia Boyd	padi@dragons.gsfc.nasa.gov	(301) 286-2550	(301) 286-1684
Mike Cherry	cherry@phunds.phys.lsu.edu	(225) 388-8591	(301) 388-1222
Chuck Dermer	dermer@osse.nrl.navy.mil	(202) 767-2965	(301) 767-6473
Jerry Fishman	fishman@ssl.msfc.nasa.gov	(205) 544-7691	(205) 544-5800
Neil Gehrels	gehrels@gsfc.nasa.gov	(301) 286-6546	(301) 286-0677
Josh Grindlay	jgrindlay@cfa.harvard.edu	(617) 495-7204	(617) 495-7356
Stephen S. Holt	holt@lheavx.gsfc.nasa.gov	(301) 286-6066	(301) 286-1772
Virginia Trimble	vtrimble@uci.edu	(949) 824-6948	(949) 824-2174
Mel Ulmer	m-ulmer2@northwestern.edu	(847) 491-5633	(847) 491-3135
Meg Urry	cmu@stsci.edu	(410) 338-4593	(410) 338-4767
Trevor Weekes	tweekes@cfa.harvard.edu	(602) 670-5726	(602) 670-5713

