CARNEGIE
INSTITUTION FOR
SCIENCE

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2007-2008 YEAR BOOK

Carnegie Institution
FOR SCIENCE

2007-2008

CARNEGIE INSTITUTION FOR SCIENCE

YEAR BOOK

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Department of Embryology

Geophysical Laboratory

Department of Global Ecology

The Carnegie Observatories

Department of Plant Biology

Department of Terrestrial Magnetism

First Light & Carnegie Academy For Science Education

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2007-2008 YEAR BOOK

The President's Report

July 1, 2007 - June 30, 2008

CARNEGIE INSTITUTION FOR SCIENCE

Former Presidents

Former Trustees

About Carnegie

". . . to encourage, in the broadest and most liberal manner, investigation, research, and discovery, and the application of knowledge to the improvement of mankind . . ."

The Carnegie Institution of Washington was incorporated with these words in 1902 by its founder, Andrew Carnegie. Since then, the institution has remained true to its mission. At six research departments across the country, the scientific staff and a constantly changing roster of students, postdoctoral fellows, and visiting investigators tackle fundamental questions on the frontiers of biology, earth sciences, and astronomy.

Carnegie Institution

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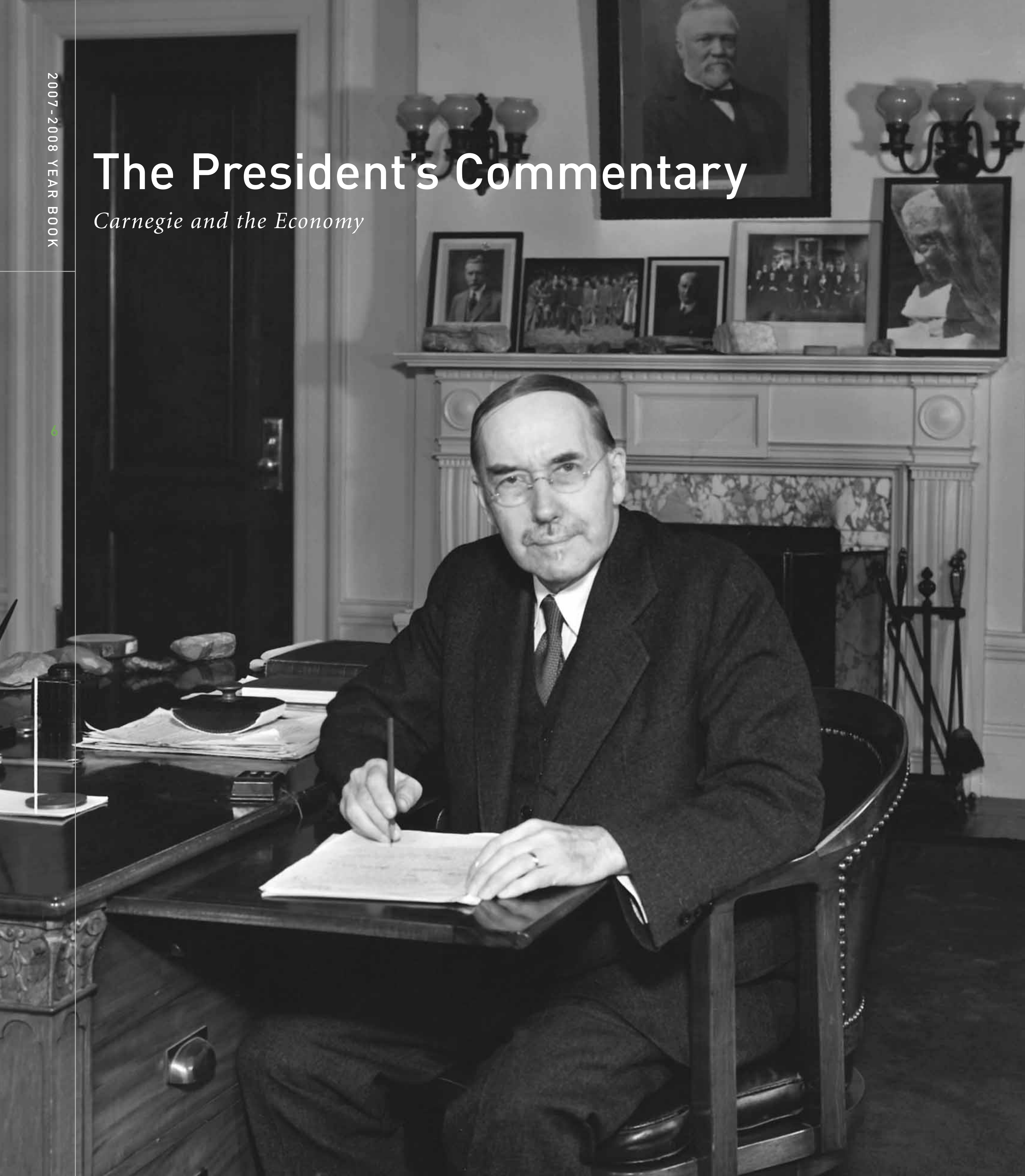
Carnegie and the Economy



Carnegie president
Richard A. Meserve
Image courtesy Jim Johnson

We have all been affected by this period of unprecedented financial turbulence. I am taking this opportunity to discuss how the Carnegie Institution is impacted by these events and how, with your continued support, the institution will confront this challenging financial period.[1]

The Carnegie Institution has been in existence for over 100 years and, as I contemplated what I might write here, I took the opportunity to review the annual reports of a predecessor (John C. Merriam) who was president of the institution during the Great Depression. Merriam's most extended discussion of the subject was in his report for the fiscal year ending in October 1931.[2] He observed that one of the suggestions for responding to the "the imbalance of present day civilization" was to undertake a moratorium on research on the basis that "too much knowledge confuses us" and that "research is responsible for the maladjustment in . . . modern life." While acknowledging that new ideas "may be dangerous to society," Merriam responded that the "safety of humanity does not require a moratorium on increase in honest knowledge." Instead, he argued that "endeavor in search for truth contributes an important element of hope for the future." While acknowledging that research itself may not always by itself provide the means to meet human requirements, he nonetheless saw it as essential: "If necessity is the mother of invention, and invention is in considerable part the creative reorganization or combination of ideas and materials at hand, we must advance those types of fundamental work that produce the data which invention will use." In short, Merriam concluded that the institution's work was more important than ever.

John Merriam, who served as Carnegie's president from 1921 to 1938, had to make hard choices during the Great Depression.

[1] *This Year Book covers the fiscal year ending on June 30, 2008. However, because of the startling economic impacts arising after the close of the fiscal year and their significance for the institution, this overview is not limited to the fiscal year.*

[2] *J. Merriam, "Report of the President, 1931," Year Book 30/31 (Washington, D.C.: Carnegie Institution of Washington, 1931), pp. 2-7.*

Merriam's writings in subsequent years reflect a careful effort by the institution's leadership to control spending while maintaining scientific capabilities, as well as to build up emergency reserves that would provide the capacity to survive an extended period of financial challenge. Salaries were constrained and work was deferred, while always seeking to preserve the foundation for future advance. Suffice it to say, the institution weathered those troubling years successfully.

The public debate surrounding the current economic calamity has not, to my knowledge, been laid at the door of "too much knowledge." Indeed, in the economic sphere, at least, the depths of our ignorance have been revealed. Nonetheless, Merriam's basic argument about the importance of preserving our scientific capabilities has, if anything, been strengthened with the passage of time. Science not only provides the key for long-term economic advance for the reasons articulated by Merriam, but also is an essential ingredient in understanding and responding to many other challenges that demand our attention—responding to climate change, improving health care, developing clean energy sources, protecting the environment, feeding the world's growing population, preserving clean water, and diminishing the threat of terrorism and of weapons of mass destruction, among many other things.

Moreover, the strategy of financial conservatism followed by the institution in the 1930s is a useful template for today. Fortunately, we have the benefit of starting this period of economic turmoil with considerable strength. Perhaps most important, the productivity of our scientists over the last several years has been unparalleled and is recognized as such by our peers. The discussion in the subsequent pages provides a sampling of the exciting science that is under way. Publication of scientific results in the open literature is the coin of the realm in the world of basic science and, as shown by the appendix, our staff has contributed significantly to the inventory of scientific knowledge over the past year.

The following sampling of some recent awards indicates the high esteem in which our scientists are held.

Global Ecology director Chris Field was chosen to be part of the Intergovernmental Panel on Climate Change (IPCC) delegation to receive the 2007 Nobel Peace Prize in Oslo.
Image courtesy Nobel Foundation

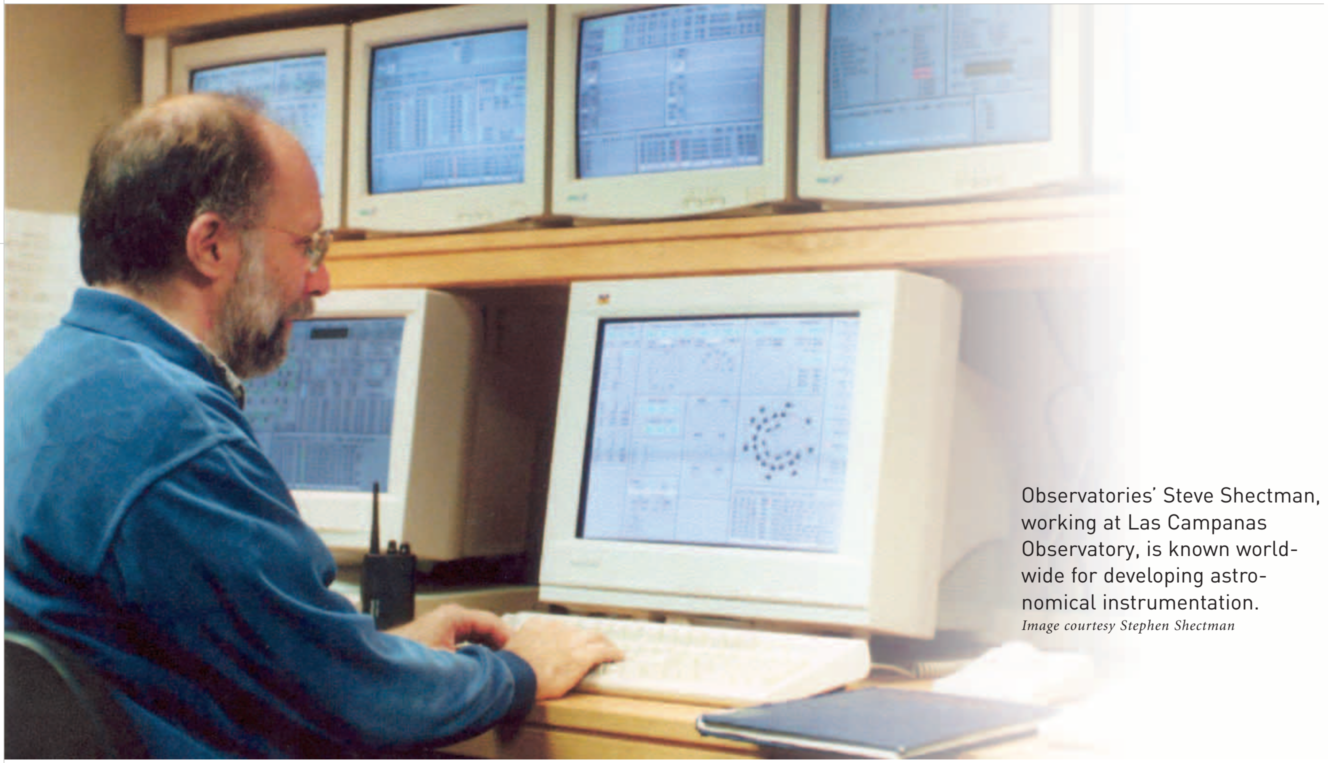
Allan Spradling, the director of the **Department of Embryology**, won the 2008 Genetics Prize from the Peter and Patricia Gruber Foundation in recognition of his contributions to fruit fly genomics and for "fundamental discoveries about the earliest stages of reproduction."

Chris Field, the director of the **Department of Global Ecology**, participated in the work of the Intergovernmental Panel on Climate Change (IPCC) and was invited to represent the United States at the award of the Nobel Peace Prize to the IPCC.

Ho-kwang (Dave) Mao of the **Geophysical Laboratory** was elected a Foreign Member of the Royal Society of London for his "extraordinary creative impact" in high-pressure science and related technology development for over 40 years. He also won the 2007 Inge Lehmann Medal from the American Geophysical Union for his "outstanding contributions to the understanding of the structure, composition, and dynamics of the Earth's mantle and core."

Bjørn Mysen of the **Geophysical Laboratory** was elected a fellow by the Geochemical Society and the European Association for Geochemistry. The title is "bestowed upon outstanding scientists who have, over some years, made a major contribution to the field of geochemistry."

The Geophysical Laboratory's Dave Mao signs the charter book at his induction into the Royal Society of London.
Image courtesy Royal Society of London



Observatories' Steve Shectman, working at Las Campanas Observatory, is known world-wide for developing astronomical instrumentation.
Image courtesy Stephen Shectman

An icon in astronomy, Terrestrial Magnetism's Vera Rubin has received numerous awards over the years for her groundbreaking work and public service.

Stephen Shectman of the **Carnegie Observatories** received the Jackson-Gwilt Medal from the Royal Astronomical Society for his exceptional work in developing astronomical instrumentation and in constructing telescopes.

Vera Rubin of the **Department of Terrestrial Magnetism** received the 2008 Richtmyer Memorial Award from the American Association of Physics Teachers for her "outstanding contributions to physics and effectively communicating those contributions to physics educators," and the Cosmos Club Award, granted to people "of national or international standing in a field of science, literature, the fine arts, the learned professions, or the public service."

Winslow Briggs of the **Department of Plant Biology** won the 2007 Adolph E. Gude, Jr. Award established by the American Society of Plant Biologists for his outstanding service to the science of plant biology.

Ronald Cohen of the **Geophysical Laboratory** received the 2009 Dana Medal of the Mineralogical Society of America. The medal recognizes individuals in the middle of their career for continued outstanding scientific contributions in the mineralogical sciences through original research.

Global Ecology's Greg Asner, shown here in the cockpit of the Carnegie Airborne Observatory, is a pioneer in the remote mapping of rain forest species.
Image courtesy Greg Asner

Greg Asner of the **Department of Global Ecology** was selected by *Popular Science* as one of 2007's "Brilliant Ten" for creating new ways "to map the environment and everything in it."

Russell Hemley, the director of the **Geophysical Laboratory**, was elected to Corresponding Fellowship of the Royal Society of Edinburgh. The society was created in 1783 for "the advancement of learning and useful knowledge." Members are elected by the fellows and come from the sciences, arts, humanities, industry, and commerce.

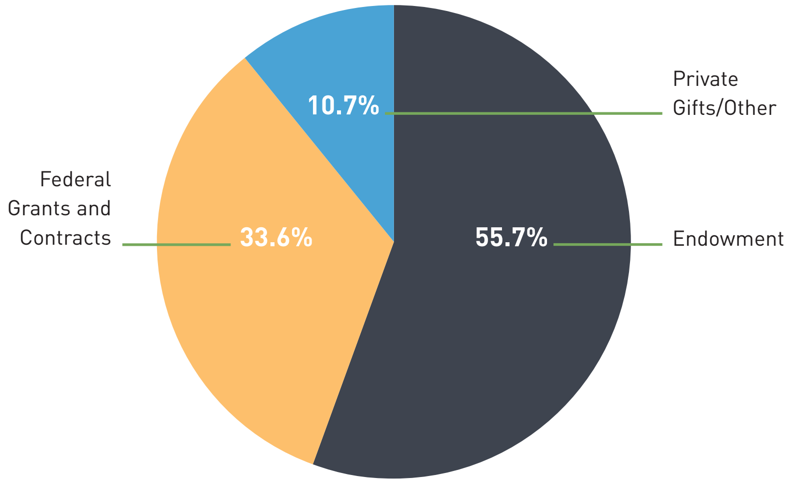
Joseph Gall of the **Department of Embryology** shared the 2007 Louisa Gross Horwitz Prize, awarded by Columbia University. The award honors his work on telomeres—structures that protect the ends of chromosomes during DNA replication.

Mark Phillips of the **Carnegie Observatories** shared the 2007 Cosmology Prize of the Peter and Patricia Gruber Foundation for his role in discovering that the universe is expanding at an accelerating rate.

The Carnegie staff's demonstrated capacity to produce outstanding science provides the foundation that will enable us to weather the current storm.

In addition to his award-winning research on supernovae, Mark Phillips is the associate director of the Las Campanas Observatory.

Figure 1. 2008-2009 Budget by Revenue Source

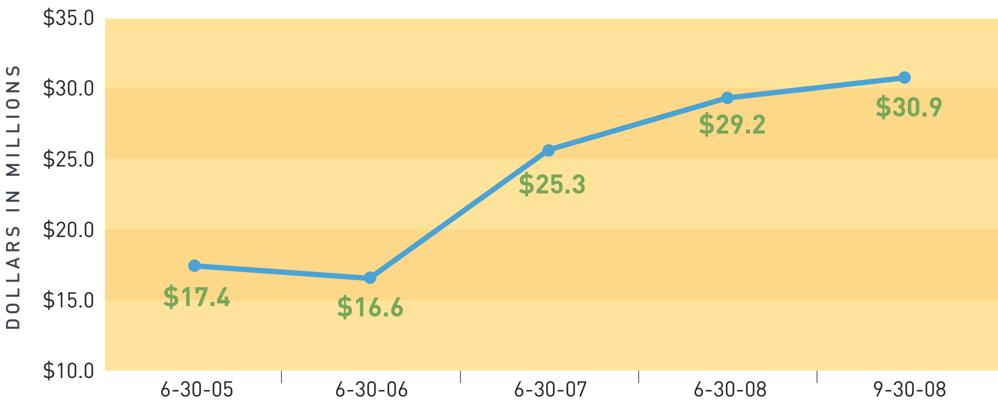


Nonetheless, we will feel adverse effects from the economic meltdown. Our principal sources of revenue are support from the endowment, federal grants and contracts, and private support by foundations and individuals. The percentage contribution of each to our budget is shown in Figure 1. We find that each source of funds is threatened.

As discussed in previous Year Books, Carnegie has greatly benefited from the diligent stewardship of our endowment by our Finance Committee. At the end of fiscal year 2008, our endowment had reached a value of more than \$870 million, an increase of 65% over the previous five years. We achieved this remarkable growth through the disciplined allocation of the endowment to diverse investments and through the careful selection of managers. But the financial downturn has affected investments of all types, with the result that our investment diversity did not protect us from significant deterioration in valuations. At December 31, 2008, our endowment valuation had fallen to approximately \$650 million, a decline of 25 percent. It is little solace that we have not suffered losses to the same extent as many other institutions. The decline in the endowment undercuts our principal source of budgetary support.

Fortunately, our inventory of federal grants and contracts has expanded over the past year. As shown in Figure 2, our inventory of unexpended federal grants and contracts has grown from \$17.4 million at June 30, 2005, to \$30.9 million at September 30, 2008. This increased support is a testament to the recognized skill and capability of our staff.

Figure 2. Unexpended Federal Grants and Contracts



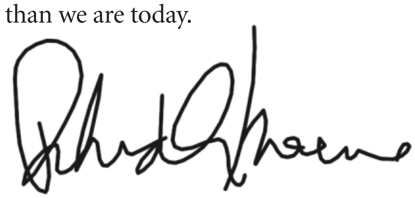
Because these grants typically extend over several years, we do not anticipate that federal revenues will decline significantly over the fiscal year ending in June 2010. But it is clear that the demands on the federal budget are growing at a time of reduced receipts, no doubt creating great pressures on the discretionary parts of the federal budget in the years ahead. The new administration has indicated its intent to increase federal support for science. This is wise because scientific research provides the basis for productivity gains (among many other things), and it would be foolish to sacrifice the long-term economic benefits that science can yield to meet short-term objectives. Nonetheless, it is clear that the government may find it difficult to provide significant new funds for science over the next few years given the country's many other pressing challenges. Hence, Carnegie must prepare for the possibility that federal research support may decline in the coming period.

Our support from private foundations and individuals is also important. Grants have been received from many major foundations that have enabled us to launch important new initiatives. The support for the Carnegie Airborne Observatory (CAO), for example, opens new ways to conduct ecological assessments over wide areas, providing a tool of great importance in measuring the impacts of climate change and the pressures on land use. This fact was recognized early by Carnegie trustee Will Hearst, who provided early support for the CAO, and the project has garnered significant support from the Keck, MacArthur, Mellon, and Moore foundations. Similarly, the sustained and generous support from individuals who understand the value of Carnegie's work is a gratifying and extremely valuable development. But, of course, both foundations and individuals are affected by the economic downturn. We thus recognize that their continuing generosity may be difficult to sustain over the next several years and that we must plan accordingly.

In short, we go into this difficult period with noteworthy scientific and financial strength, but we must anticipate that we may see reductions in all our sources of funding in the next few years. We will benefit in this context from a continuation and expansion of our disciplined approach to the management of our resources. Our ratio of outstanding debt to assets is the envy of many of our peers. We have obtained savings in administrative costs, such as health-care and other insurance, and are increasing revenue from the rental of our P Street headquarters. Our overall administrative efficiency is demonstrated by the fact that Charity Navigator, America's largest evaluator of nonprofits and charities, has awarded Carnegie its highest rating, four stars, for sound fiscal management for eight years running; we are one of only four organizations that have achieved this status out of some 5,300 entities that are monitored. But the great progress that we have made in efficiency will have to be enhanced.

At the same time, we are planning to adjust our endowment spending so as to smooth budgetary impacts. The anticipated decline in endowment returns in this fiscal year will not result in a proportionate reduction of available spending, thereby avoiding a radical disruption of important ongoing projects. But we confront a real need to manage resources carefully during this period, and our budgets for several years will need to be constrained until the economy turns around. I have asked Carnegie's department directors to plan for this reality, and I know that I have their support.

The experts anticipate that resolving the current difficulties in the financial markets will take some time. But, as we look to the future, we will continue to benefit from the expertise and engagement of our board of trustees. We will maintain and will benefit in the long term from our highly diversified portfolio. We remain hopeful that the many individuals and institutions that have assisted us in the past will continue to help in these difficult times. With care in husbanding our funds, I am confident that we will weather this storm as we weathered the 1930s. The Carnegie Institution will continue to do outstanding science, and we will emerge from this period even stronger than we are today.



Richard A. Meserve

Friends, Honors & Transitions

Carnegie Friends

Annual Giving

The Barbara McClintock Society

An icon of Carnegie science, Barbara McClintock was a Carnegie plant biologist from 1943 until her retirement. She was a giant in the field of maize genetics and received the 1983 Nobel Prize in Physiology/Medicine for her work on patterns of genetic inheritance. She was the first woman to win an unshared Nobel Prize in this category. To sustain researchers like McClintock, annual contributions to the Carnegie Institution are essential. The McClintock Society thus recognizes generous individuals who contribute $10,000 or more in a fiscal year, making it possible to pursue the highly original research for which Carnegie is known.

$100,000 to $999,999

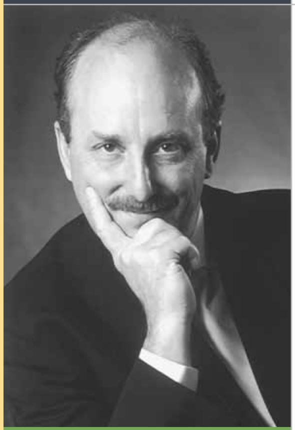
Bruce Ferguson and Heather Sandiford
William and Cynthia Gayden
Michael and Mary Gellert
Robert G. and Alexandra C. Goelet
William T. Golden*
Deborah Rose, Ph.D.

**Deceased*

$10,000 to $99,999

Anonymous
Remi and Lindsay Barbier, Ph.D.
John and Jean Botts
Michael Brin
Gary P. and Suzann A. Brinson
John and Anne Crawford
Michael A. Duffy
Sibyl R. Golden
Robert and Margaret Hazen
Richard E. Heckert
Paul and Carolyn Kokulis
Gilbert and Karen Levin
Lawrence H. Linden
Burton and Deedee McMurtry
Richard A. and Martha R. Meserve
Robert B. Millard
Al and Honey Nashman
Allan R. Sandage
Christopher and Margaret Stone
William and Nancy Turner
Thomas and Mary Urban
Sidney J. Weinberg, Jr.

William R. Hearst III



Carnegie trustee William R. Hearst III always had his eyes on the future. When named editor and publisher of the Pulitzer Prize-winning *San Francisco Examiner* in 1984, he set out to revolutionize a newspaper acquired by his grandfather a century earlier. After leaving his mark on the *Examiner*, Hearst focused on the digital future. He served as director of many high-tech companies, including Sun Microsystems, and joined Silicon Valley's venture capital firm Kleiner Perkins Caufield & Byers.

Hearst has always had a passion for science and math. He graduated from Harvard with a degree in mathematics in 1972 and later became active in the Astronomical Society of the Pacific. There he learned about the Carnegie Institution from Nobel Prize-winning physicist and Carnegie trustee Charles Townes. After his first meeting with Carnegie trustees and scientists, he realized that he could watch science in the making. It was a perfect match. Carnegie's board elected him a trustee in 1992.

Over the years, Hearst has introduced many prominent Californians to Carnegie science by hosting events in his hometown of San Francisco. He organized a trustee dinner and lecture on astronomy at the San Francisco Planetarium in 1993 and a trustee dinner at the San Francisco Exploratorium in 1996. A member of the Edwin Hubble Society, he more recently provided several major gifts to Carnegie, including seed funding for the Carnegie Airborne Observatory at the Department of Global Ecology.

As a trustee of the private foundation established by his grandfather in 1945, Hearst helped to secure the initial funding to endow Carnegie's K-12 science education programs. For over 16 years, Carnegie has benefited from Hearst's enormous generosity and insight. The institution thanks him for his help and for serving as one of its important links between the West and East Coasts.

Other Annual Giving

Individuals

$1,000 to $9,999

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Lloyd Biscomb
William Blanpied
Kurt R. Borski
Randolph Boyle
Robin Brett
Winslow R. Briggs
Peter C. Brockett
Kenneth Brockman
Harold Brodsky and Naomi Brodsky

*Deceased

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Philip S. Brown
Robert and Jennifer Brown
David and Rosemary Buden
Allan B. Burdick
Marjorie Burger
James R. Burke
Gordon Burley
Donald M. Burt
Robert Cadmus
Christopher Cahill
John A. Caldwell
Allan Campbell
Finley A. Campbell
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Timothy J. Carr
Dana Carroll
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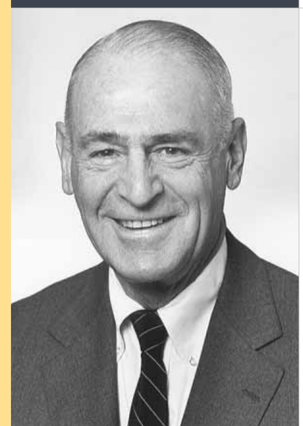
Sidney J. Weinberg, Jr.



As a Goldman Sachs partner beginning in the mid-1960s, Sidney J. Weinberg, Jr., was not just interested in the financial world; he also wanted to advance scientific research and education. In 1965 he became a trustee for the Carnegie Foundation for the Advancement of Teaching. There he met the late Bill Greenough, a Carnegie Institution trustee at the time, who introduced Weinberg to the world of Carnegie science.

Weinberg was inspired by Andrew Carnegie's vision of giving exceptional scientists—individual investigators—the independence to pursue their passions. He became hooked on Carnegie science and was elected to the board in 1983. He served as a member of the Finance Committee before becoming its chairman in 1984, a position he held through the late 1980s. He was a member of the Employee Benefits Committee and became chairman of the Nominating Committee in 1993. In that role he was indispensable in introducing Carnegie to a broader mix of impressive individuals. Weinberg became a senior trustee in 1999, but has continued to participate actively in board meetings. His peers continue to marvel at his ability to listen to a discussion, then directly put his finger on the heart of the matter.

The 1980s was an era of great change at the institution. In late 1984 Weinberg served on the committee that examined the co-location of the Geophysical Laboratory with the Department of Terrestrial Magnetism. Through his work on the Magellan Campaign Committee and the Observatories Visiting Committee, he helped the institution navigate the challenging issues associated with the construction of the Magellan twin 6.5-meter telescopes at the Las Campanas Observatory in Chile.

Weinberg has been exceptionally generous to the institution over the last 25 years, with major gifts to every Carnegie campaign. He is a member of the Edwin Hubble Society. His wisdom, guidance, and commitment to Carnegie's mission have been unparalleled, and the institution is sincerely grateful for his decades of dedication.

Goetz K. Oertel
Michael Ollinger
Gilbert S. Omenn
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R. B. Parry
Arnold Phifer
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Timothy A. Zimmerlin
Wanna Zinsmaster

Foundations and Corporations

Over $1 Million

W. M. Keck Foundation
John D. and Catherine T. MacArthur Foundation
Gordon and Betty Moore Foundation

$100,000 to $999,999

The Gayden Family Foundation
Math for America, Inc.
Andrew W. Mellon Foundation
Ambrose Monell Foundation
Alfred P. Sloan Foundation

$10,000 to $99,999

Anonymous (1)
Michael and Eugenia Brin Philanthropic Fund
The Brinson Foundation
Carnegie Inst. of Canada/Institution Carnegie du Canada
O. P. and W. E. Edwards Foundation
Fannie Mae Foundation
Herman Frasch Foundation for Chemical Research
Golden Family Foundation
Richard W. Higgins Foundation
Hoffberger Foundation
Linden Family Fund
Richard Lounsbery Foundation, Inc.
The McMurtry Family Foundation
The Robert & Bethany Millard Charitable Foundation
The Ralph M. Parsons Foundation
Pearle Vision Foundation
The Rose Hills Foundation
M & C Stone Charitable Trust
The Weathertop Foundation
The Sidney J. Weinberg, Jr. Foundation

$1,000 to $9,999

The Abell Foundation
Agassiz Road Nominee Trust
The Bristol-Myers Squibb Foundation, Inc.
Cavalieri-Look Fund
Damel Investors LLC
The Thomas W. Dower Foundation
Ernst Charities
Michael E. Gellert Trust
Hawthorne Fund
Margaret and William R. Hearst III Gift Fund
The Holaday Foundation
Inman Foundation
Samuel H. Kress Foundation
Laubach Family Fund
Lubin Family Foundation
Lutron Foundation
Robert W. and Gladys S. Meserve Charitable Trust
Millmark Education Corporation
Mulago Foundation
The New York Community Trust
Pfizer Foundation Matching Gifts Program
Roxiticus Fund
Zimmer Gunsul Frasca Architects LLP

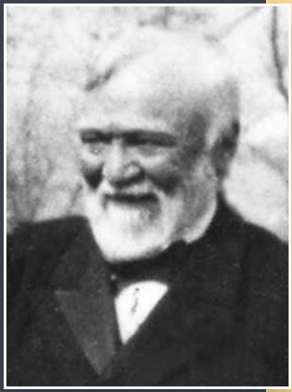
Government

Over $1 Million

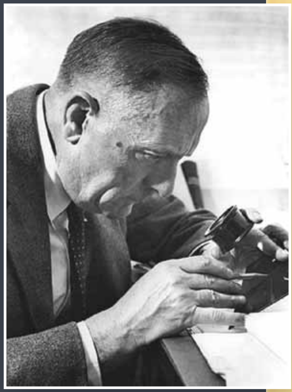
National Aeronautics and Space Administration
National Science Foundation
Space Telescope Science Institute
U.S. Department of Energy
U.S. Public Health Service

$100,000 to $1 Million

USDA Forest Service
U.S. Office of Naval Research



★ *Andrew Carnegie*



★ *Edwin Hubble*

★ *Vannevar Bush*

Lifetime Giving Societies

The Carnegie Founders Society

Andrew Carnegie, the founder of the Carnegie Institution, established it with a gift of $10 million. Although he ultimately gave a total of $22 million to the institution, his initial $10 million gift represents a special level of giving. In acknowledgment of the significance of this initial contribution, individuals who support Carnegie's scientific mission with lifetime contributions of $10 million or more are recognized as members of the Carnegie Founders Society.

Caryl P. Haskins*
William R. Hewlett*

The Edwin Hubble Society

The most famous astronomer of the 20th century, Edwin Hubble, joined the Carnegie Institution in 1919. Hubble's observations shattered our old concept of the universe. He proved that the universe is made of collections of galaxies and is not just limited to our own Milky Way—and that it is expanding. This work redefined the science of cosmology. Science typically requires years of work before major discoveries like these can be made. The Edwin Hubble Society honors those whose lifetime support has enabled the institution to continue fostering such long-term, paradigm-changing research by recognizing those who have contributed between $1,000,000 and $9,999,999.

D. Euan and Angelica Baird
Michael and Mary Gellert
Robert G. and Alexandra C. Goelet
William T. Golden*
William R. Hearst III
Richard E. Heckert
Kazuo and Asako Inamori
Burton and Deedee McMurtry
Jaylee and Gilbert* Mead
Cary Queen
Deborah Rose, Ph.D.
Thomas and Mary Urban
Sidney J. Weinberg, Jr.

The Vannevar Bush Society

Vannevar Bush, the renowned leader of American scientific research of his time, served as Carnegie's president from 1939 to 1955. Bush believed in the power of private organizations and wrote in 1950, "It was Andrew Carnegie's conviction that an institution which sought out the unusual scientist, and rendered it possible for him to create to the utmost, would be worth while [sic] . . ." He further said that "the scientists of the institution . . . seek to extend the horizons of man's knowledge of his environment and of himself, in the conviction that it is good for man to know." The Vannevar Bush Society recognizes individuals who have made lifetime contributions of between $100,000 and $999,999.

Anonymous (3)
Bruce and Betty Alberts
Daniel Belin and Kate Ganz
Didier and Brigitte Berthelemot
Donald and Linda Brown
A. James Clark
Tom and Anne Cori
Jean and Leslie Douglas
Bruce Ferguson and Heather Sandiford
Stephen and Janelle Fodor
William and Cynthia Gayden
Robert and Margaret Hazen
Antonia Ax:son Johnson and Goran Ennerfelt
Gerald and Doris* Laubach
John D. Macomber
Steven L. McKnight
Richard A. and Martha R. Meserve
Al and Honey Nashman
Evelyn Stefansson Nef
Vera and Robert* Rubin
William J. Rutter
Allan Sandage
Christopher and Margaret Stone
William and Nancy Turner

Second Century Society

The Carnegie Institution is now in its second century of supporting scientific research and discovery. The Second Century Society recognizes individuals who have remembered, or intend to remember, the Carnegie Institution in their estate plans and those who have supported the institution through other forms of planned giving.

Bradley F. Bennett
Eleanora Dalton
Nina V. Fedoroff
Marilyn Fogel and Chris Swarth
Kirsten H. Gildersleeve
William T. Golden*
Robert and Margaret Hazen
Paul and Carolyn Kokulis
Gilbert and Karen Levin
Evelyn Stefansson Nef
Allan Sandage
Leonard Searle
Maxine and Daniel Singer
Hatim A. Tyabji

**Deceased*

Members were qualified with gift records we believe to be accurate. If there are any questions, please call Mira Thompson at 202.939.1122.

Honors & Transitions

Honors

Administration

Senior trustee **David Swensen**, chief investment officer at Yale University, was elected to the American Academy of Arts and Sciences in spring 2008.

Embryology

Staff member **Joseph Gall** delivered the opening lecture and received the 2007 Wilhelm Bernhard Medal at the 20th Wilhelm Bernhard Workshop: International Conference on the Cell Nucleus, in St. Andrews, Scotland, in August 2007, and he shared the 2007 Horwitz Prize.

Director **Allan Spradling** was awarded the 2008 Gruber Genetics Prize in recognition of his contributions to fruit fly genomics and for "fundamental discoveries about the earliest stages of reproduction."

Geophysical Laboratory

The Geological Society of America announced in October 2007 that **Ronald Cohen** would receive the 2009 Dana Medal of the Mineralogical Society of America. The Dana Medal "is intended to recognize continued outstanding scientific contributions through original research in the mineralogical sciences by an individual in the midst of their career."

Electronics engineer **Christos Hadidiacos** was selected as the first recipient of the Carnegie Institution's new Service to Science Award. This award was created in 2007 to recognize outstanding and/or unique contributions to science by employees who work in administrative, support, and technical positions. Hadidiacos has made invaluable contributions over a 42-year career, beginning with the arrival of the first electron microprobe at the Geophysical Lab.

In March 2008 Director **Russell Hemley** was elected to Corresponding Fellowship of the Royal Society of Edinburgh—Scotland's national academy of science and letters.

In May 2008 **Ho-kwang (Dave) Mao** was elected a Foreign Member of the Royal Society of London, the national academy of science of the United Kingdom, for his "extraordinary creative impact" in high-pressure science and related technology development for over 40 years.

Senior scientist **Bjørn Mysen** was named a Geochemical Fellow for 2008 by the Geochemical Society and the European Association for Geochemistry.

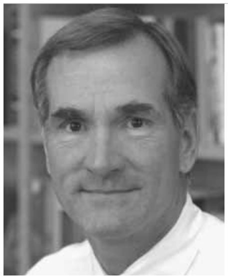
Global Ecology

Staff scientist **Greg Asner** was picked by *Popular Science* magazine as one of the 10 most brilliant young scientists in the country in 2007.

Staff scientist **Ken Caldeira** and director **Chris Field** were key contributors in the UN panel awarded the 2007 Nobel Peace Prize in October for work on global climate change. The Intergovernmental Panel on Climate Change shares the prize with former vice president Al Gore for his role in communicating the issue to the public. Field was one of 25 researchers chosen to attend the Nobel Peace Prize ceremony and banquet in December in Oslo, Norway.

Observatories

The Royal Astronomical Society awarded **Stephen Shectman** the 2008 Jackson-Gwilt Medal for his exceptional work in developing astronomical instrumentation and in constructing telescopes. **Mark Phillips** shared the 2007 Cosmology Prize of the Peter and Patricia Gruber Foundation.


★ *David Swensen*


★ *Joseph Gall*


★ *Allan Spradling*


★ *Ronald Cohen*


★ *Christos Hadidiacos*


★ *Russell Hemley*


★ *Ho-kwang (Dave) Mao*


★ *Bjørn Mysen*


★ *Greg Asner*


★ *Ken Caldeira*


★ *Chris Field*


★ *Stephen Shectman*


★ *Mark Phillips*


★ *Chris Somerville*


★ *Winslow Briggs*


★ *Vera Rubin*


★ *William T. Golden*


★ *Robert C. Seamans, Jr.*


★ *Wolf Frommer*


★ *Christine Smith*


★ *Alex Schreiber*


★ *Scott Sheppard*

Plant Biology

Former department director **Chris Somerville** was awarded an honorary doctorate by the University of Guelph and was named a fellow of the American Society of Plant Biologists. In October 2007 Somerville, with Jay Keasling, received BayBio's Visionary Award for bringing bioenergy research institutes to the region. **Winslow Briggs** received the 2007 Adolph E. Gude, Jr. award from the American Society of Plant Biologists.

Terrestrial Magnetism

Astrophysicist **Vera Rubin** received the 2008 Richtmyer Memorial from the American Association of Physics Teachers at their 2008 winter meeting in Baltimore. In March she received the 2008 Cosmos Club Award in Washington, D.C.

Transitions

Senior trustee **William T. Golden** died on October 7, 2007, at the age of 97.

Trustee emeritus **Robert C. Seamans, Jr.**, died on June 28, 2008, at the age of 89.

On December 1, 2007, **Chris Somerville**, director of Plant Biology since 1994, became the first director of the Energy Biosciences Institute (EBI)—a new research and development organization with an interdisciplinary approach to solving global energy needs and reducing fossil-fuel emissions that contribute to global warming. Staff member **Wolf Frommer,** at Carnegie since 2003, became the acting director of the department.

Chief Advancement Officer **Christine Smith** left Carnegie May 23 to become associate vice president for advancement at Lehigh University in Bethlehem, Pennsylvania.

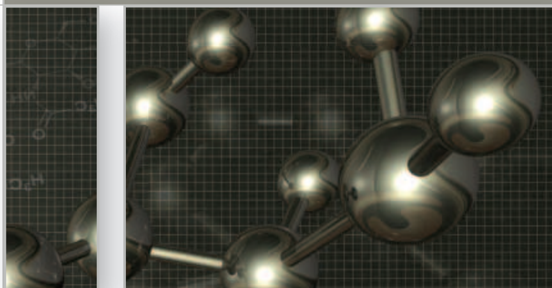
Embryology staff associate **Alex Schreiber** took a position at the College of Notre Dame of Maryland.

Former Hubble Fellow at Terrestrial Magnetism **Scott Sheppard** joined the research staff in July 2007.

Research Highlights

Embryology

Deciphering the Complexity of Cellular, Developmental, and Genetic Biology



What Controls the Genetic Shuffle?

Ever wonder why your niece looks more like you than either of her parents? It's because nature shuffles genes to ensure a diverse population. This genetic scrambling, called recombination, is vitally important, but little is known about what controls it. Using the nematode *C. elegans,* Judith Yanowitz has found that the organization of chromatin, the complex of material that includes DNA, RNA, and protein and makes up chromosomes, is fundamental to regulating recombination. She is also investigating how environmental factors and age alter recombination.

Recombination occurs during a two-part cell division process known as meiosis that forms egg and sperm. During meiosis the chromosomes pair up inside the cells, "cross over" each other, and swap similar genes. When egg and sperm later merge during fertilization, the embryo is made up of a unique blend of some genes from the father and some from the mother.

To see how chromatin affects meiotic crossovers, Yanowitz and colleagues screened a number of chromatin-related genes. They found that without the gene *xnd-1* (*X nondisjunction*), the X chromosome was defective in crossover formation—probably because of a defective first step in which double-stranded DNA is supposed to break apart and start the crossover process. This finding was surprising: How can the gene target just the X chromosome and have no effect on the rest of the chromosomes, particularly given the fact that the process of crossing over appears to be similar for all chromosomes? Although the *xnd-1* gene primarily affects the X chromosome, it is found on the non-sex chromosomes (called autosomes) and could be working from a distance. The gene may be part of a mechanism to make the autosomes look different from the sex chromosome so that the factors required for starting crossover can better find the X chromosome.

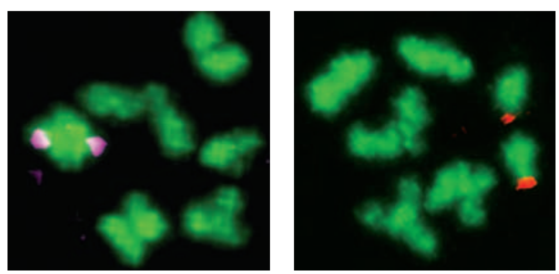
Yanowitz also found that sex, age, and temperature affect the placement of crossovers along the chromosomes, pointing to chromatin architecture as an important regulator of genetic mixing.

Reining In Jumping Genes

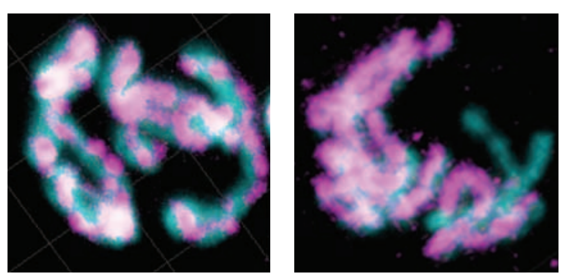
Unlike regular genes, which don't move around the genome, genetic elements called transposons can jump around chromosomes and cause mutations. This behavior can be particularly threatening in cells that give rise to egg and sperm. Fortunately, nature developed a mechanism that employs small RNA molecules known as piRNAs to rein in these jumping genes. But how piRNAs carry out this important function has remained a puzzle. Recent studies by Alex Bortvin and colleagues discovered a protein that may cooperate with piRNAs to restrain jumping genes in mouse sperm. They also found that the protein is crucial to sperm formation and that jumping

(Above Right) Judith Yanowitz (foreground) and research scientist Cynthia Wagner examining the nematode *C. elegans* at their microscopes.

(Left) Undergraduate research assistant Frazer Heinis prepares samples for typing genes.



Chromosomes are held together at the site of the exchange of DNA so that each chromosome pair can be counted prior to cell division. At left, there are six chromosome pairs of the nematode. The pink spots are the X chromosomes held together. At right, the X chromosomes (red) have not exchanged material and are separate. The five larger spots correspond to the non-sex chromosomes.



When chromosome pairs come together to recombine, a "glue" called the synaptonemal complex holds them together. At left, this glue (Syp-1 protein, pink) is seen between all the DNA pairs (blue). At right, in the *xnd-1* mutant the X chromosome glue has come off and the X chromosomes start to splay apart.

Images courtesy Judith Yanowitz

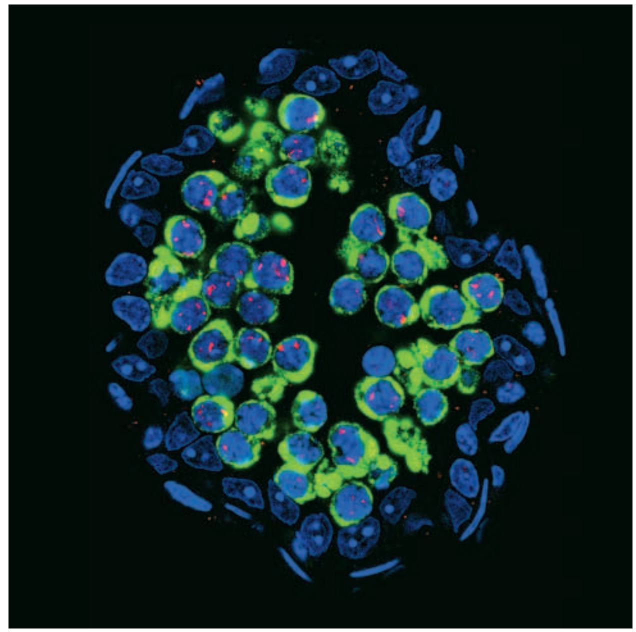
Embryology, *Continued*

genes may be fundamental to sperm development.

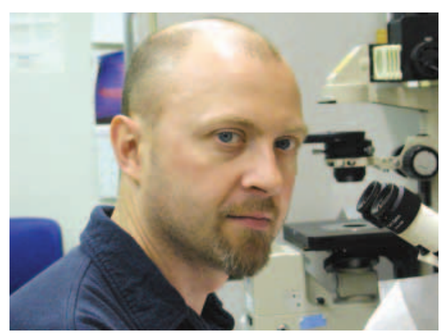
Bortvin and team built on previous studies of the fruit fly by researchers including former Carnegie scientist Toshie Kai, who studied the role of a cell component called nuage in repressing transposons in the female fruit fly. Nuage is exclusive to cells that produce egg and sperm (called germ cells). It was found to be involved in silencing transposons during egg development in fruit flies. To test if the mouse nuage played a similar role in mammals, the Bortvin team focused on the mouse protein Maelstrom—a distant relative to the relevant fruit fly protein.

The scientists first marked Maelstrom with a fluorescent antibody and found that, like the counterpart protein in the fruit fly, it becomes active at the nuage. Then they created mutant mice without the gene that makes the protein and discovered that germ cell division, meiosis, went terribly awry. Transposons were uncontrollably expressed and flooded the cytoplasm and nuclei of the germ cells, killing them. The more transposons there were in the nucleus, the more the chromosomes failed to locate each other during meiosis. Since studies in fruit flies and mice point to nuage, it likely plays a central role across species in silencing jumping genes during egg and sperm development.

The scientists were taken aback to find that the silencing does not occur one time only in the male cells during fetal development. Instead, the jumping genes are activated each time a germ cell divides, but then are quickly silenced, over the course of a mouse's life. This result suggests that germ cells may harness transposons in some fundamental way in male germ cell division. It is the first clue that jumping genes could have a pivotal role in sperm development. □



(Above) In the absence of the protein Maelstrom to keep them at bay, jumping genes, called transposons (green), flood germ cells (DNA-blue)—the precursor cells of sperm in the male mouse. (Below) Alex Bortvin. *Images courtesy Alex Bortvin*



Geophysical Laboratory

Probing Planet Interiors, Origins, and Extreme States of Matter

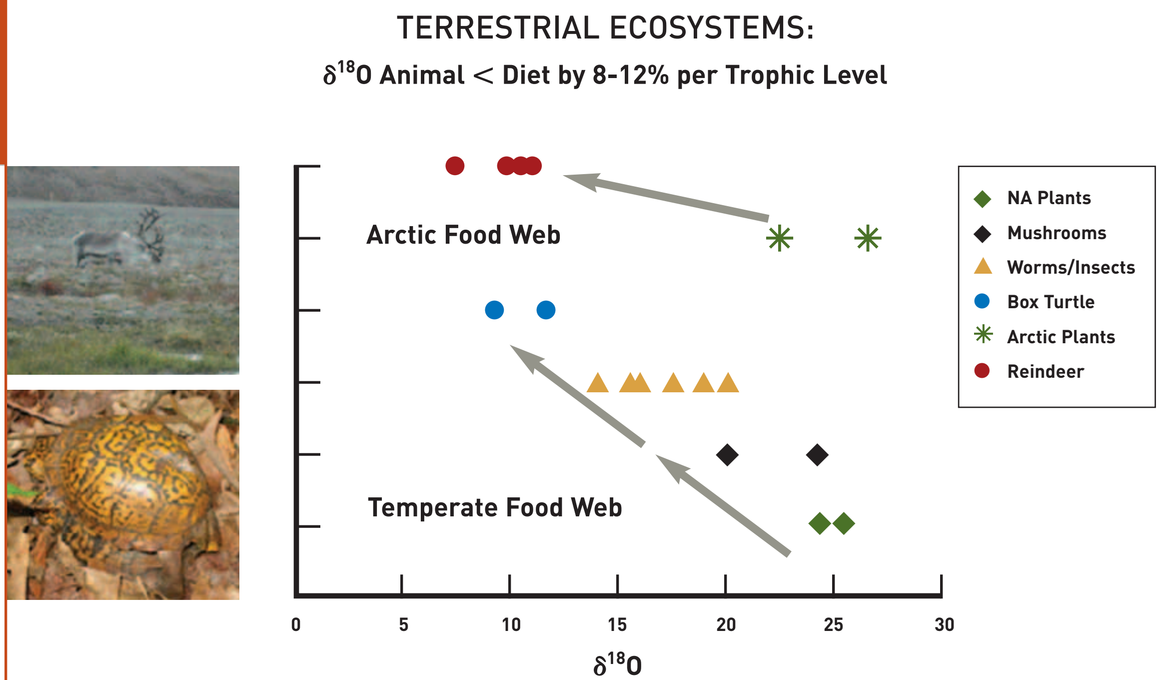
Untangling the Food Web

Creatures really are what they eat. Their diet is frozen into their bones and tissue, leaving a trail that tells what their environment is like and how they interact with their ecosystem. The clues come from concentrations of certain isotopes—atoms with the same number of protons but a different number of neutrons. Oxygen, hydrogen, carbon, nitrogen, and sulfur isotopes are particularly key; their concentrations change depending on chemical processing or temperature. Recently, Marilyn Fogel began to tackle a particularly vexing problem: how oxygen-18 (^{18}O) from tissue can be used to link food webs and hydrology—important information for pinpointing environmental changes and for advancing food-web research.

Although very little is known about how oxygen isotopes are incorporated into biological tissues, scientists have used them for some time to determine latitude, altitude, water cycling, and precipitation, thereby deepening our understanding of ecosystems. With postdoctoral fellow Seth Newsome, Fogel is establishing a new way that ^{18}O, the heaviest oxygen isotope, in tissue can be used to trace food webs. Scientists have believed that the oxygen isotopic composition of an animal is determined by its water consumption. But oxygen in tissues comes not only from drinking water, but also from respiration and food. Fogel and Newsome are determining which types of aquatic and land plants and animals at different levels in the food chain are best for analysis and how seasons, water, metabolism, transpiration, and respiration affect the ratios of ^{18}O in tissue. In studying *E. coli*, a simple bacterium, they are also looking at how the isotope flows from outside to inside cells.

It turns out that ^{18}O becomes progressively depleted at higher levels in the food chain, which the scientists believe results from the separation of lighter from heavier isotopes during the breathing process. They also found major differences among animal groups. Initially, they saw a difference between terrestrial and marine organisms, then among different aquatic organisms. By looking at the

Geophysical Laboratory staff scientist Marilyn Fogel (left) and postdoctoral fellow Seth Newsome (right). *Image courtesy Marilyn Fogel*



Fogel and Newsome found that the relative abundance of the heaviest oxygen isotope, ^{18}O, in terrestrial ecosystems varies by latitude, species, and the feeding level the animals occupy in the food chain. *Image courtesy Marilyn Fogel*

isotopic level, the researchers have established for the first time, in a wide variety of organisms, a means for deciphering how the isotope wends its way into tissue. They also believe that developing multiple tracers of diet will help resolve particularly complex food webs, and that oxygen isotopes may be more important than hydrogen isotopes to understanding aquatic ecosystems.

Not Too Hot to Handle

In Jules Verne's science fiction novel, scientists traveled to the center of the Earth. But in real life they have to devise methods to imitate the extreme temperatures and pressures there to understand the internal dynamics that drive the Earth's evolution and that create phenomena we observe much nearer to the surface, such as earthquakes and volcanoes. Until recently, researchers did not have the capability to measure how heat moves through the deep interior. Alexander Goncharov and colleagues broke this barrier by developing a new procedure to observe how heat is transferred through mantle minerals. They found that the concentration of iron in silicate perovskite and ferropericlase—the two major mantle minerals—is key to moving heat.

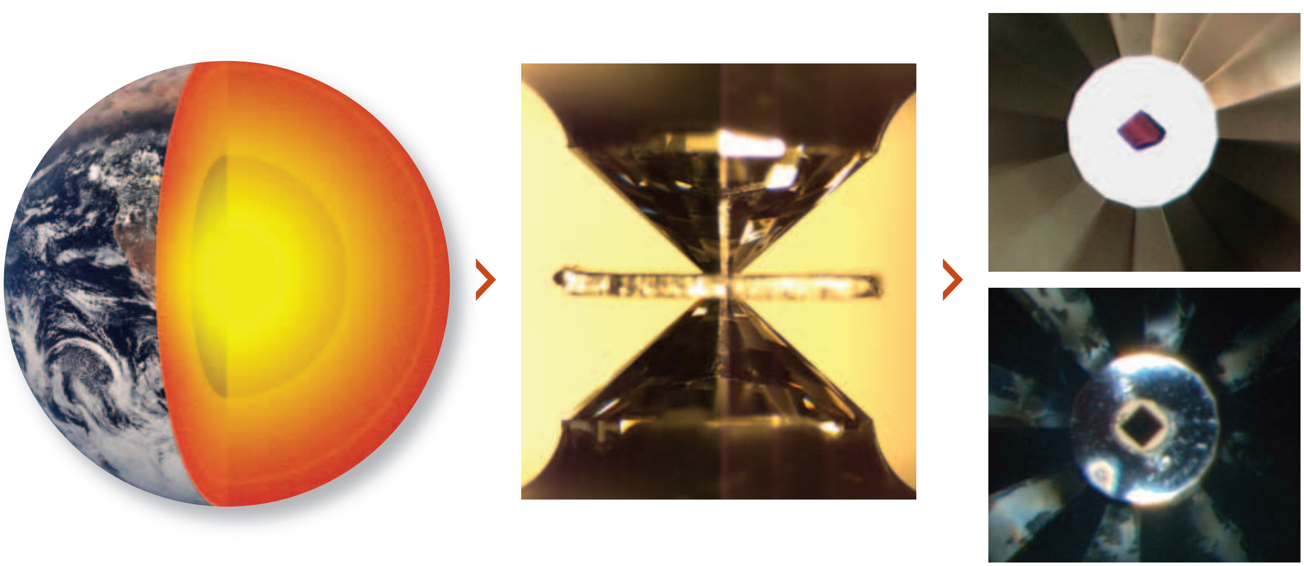
The lower mantle sits on top of the core and is about 400 to 1,800 miles (660 to 2,900 kilometers) deep. Pressures range from 23 gigapascals, which is about 230,000 times the pressure at sea level (atmospheres), to 1.3 million atmospheres. Temperatures are brutal—ranging from about 2,800 to 6,700 degrees Fahrenheit. Silicate perovskite is believed to constitute about 80% of

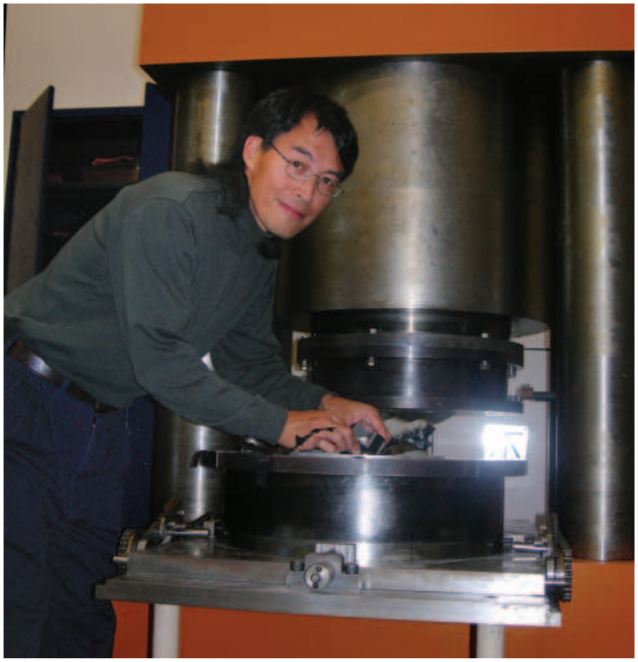
the mantle, while ferropericlase makes up the rest. Both minerals contain between 10% and 20% iron, and its presence strongly influences properties such as density, sound velocity, heat diffusion, and conductivity. Under these extreme conditions, the atoms and electrons of iron are squeezed so close that spinning electrons are forced to pair up. When this spin state changes from unpaired electrons—a high-spin state—to paired electrons—a low-spin state—other properties also change.

Goncharov and team—Ben Haugen, Viktor Struzhkin, Pierre Beck, and Steve Jacobsen—developed a new optical spectroscopy system to measure optical spectra, from infrared through ultraviolet wavelengths, and the energy dissipation rate through radiometry. They subjected the minerals to pressures up to 1.3 million atmospheres at room temperature and subjected ferropericlase to 640,000 atmospheres at temperatures to 980°F.

The scientists found that heat absorption is governed by the concentration of ferrous ($Fe^{2}+$) iron in ferropericlase and ferric ($Fe^{3}+$) iron in silicate perovskite. They also noted changes in absorption related to the spin-state transition, but the effects were smaller. The results suggest that the radiative thermal conductivity is smaller than previously thought, which is important for understanding mantle dynamics, including the generation and stability of thermochemical plumes.

To study the Earth's interior (left), scientists replicate the extreme pressure conditions there by squeezing samples of interior minerals between two diamond tips (middle image). They then measure the changes each sample undergoes (right image). *Images courtesy Steve Jacobsen*





Yingwei Fei loads a sample for analysis in the Geophysical Laboratory's multianvil lab.

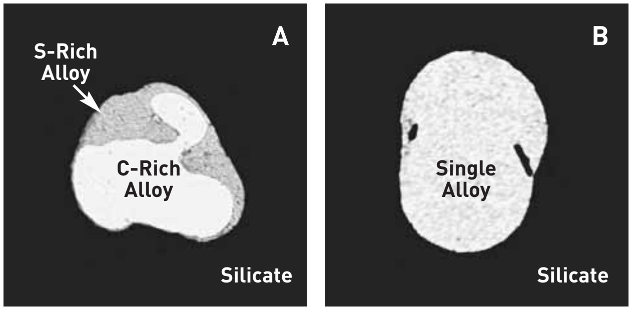
Image courtesy Yingwei Fei

Lightening Up the Earth's Core

Since its discovery in 1906 from seismic data, the Earth's core has intrigued geoscientists. Formed chiefly of iron, it is extremely dense, accounting for nearly a third of the planet's mass despite occupying only an eighth of its volume. Yet the core also exhibits what researchers such as Yingwei Fei call a density deficit. That is, neither the liquid outer core nor the solid inner core is as dense as would be expected if the core were pure iron. This suggests that lighter elements must also be present.

But which elements? Sulfur, carbon, silicon, oxygen, and hydrogen are possible candidates. Fei and colleagues have been systematically investigating how these lighter elements form alloys with iron at high pressure and temperature, with particular attention to the iron-sulfur-carbon system. Sulfur can dramatically lower iron's melting temperature, suggesting that molten iron-sulfur mixtures present during the Earth's hot early days would have been relatively quick to percolate downward to create the primordial core. On the other hand, carbon is extremely abundant in the Solar System and binds readily to iron, so it may also have been part of the mix.

Fei and his collaborators melted mixtures of pure iron, iron sulfide, and carbon in differing proportions while subjecting them to pressures up to 250,000 atmospheres. They found that at pressures below and above 50,000 atmospheres the mixtures melt differently. Below 50,000 atmospheres the melt tended to separate into two immiscible liquids, one sulfur rich and the other carbon rich, in a manner analogous to oil and vinegar in salad dressing. Above 50,000 atmospheres this tendency disappeared, however. The researchers also found that when the melts solidify, the carbon becomes concentrated in the solids, while the sulfur tends to remain in the liquid. These results imply that within the Earth's core sulfur is primarily concentrated in the liquid outer core, with carbon concentrated in the solid inner core. The presence of carbon in the core, even as a minor constituent, would make it the largest carbon reservoir on Earth. □



Electron microscope images show experimental samples at low and high pressure. At pressures below about 50,000 times the atmospheric pressure at sea level, sulfur-rich and carbon-rich molten alloys of iron exist as separate fluids in a silicate matrix (A). But at pressures above this level (B), there is complete miscibility and a single alloy is present. Scale bars are 25 microns (0.025 mm).

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Global Ecology

Linking Ecosystem Processes with Large-scale Impacts

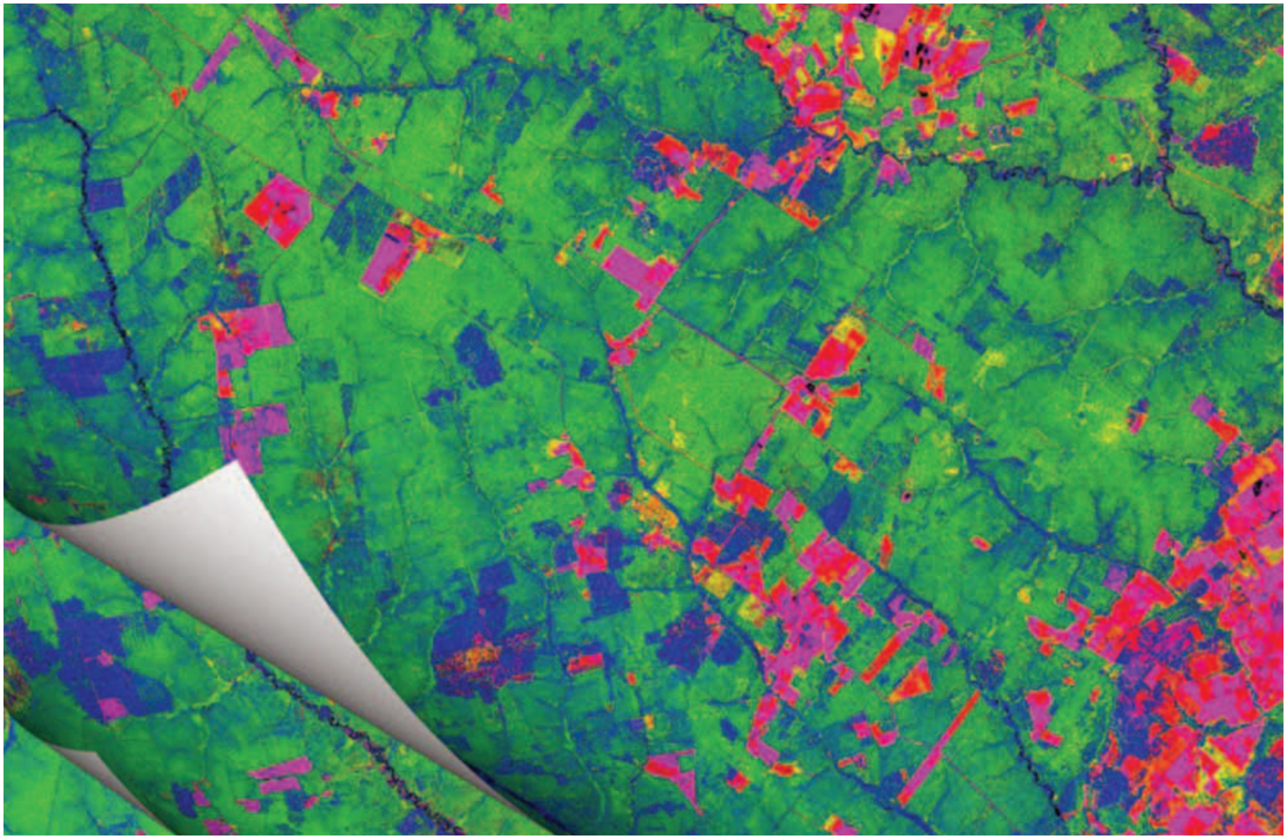
CLAS Goes Lite and Wide

A slew of satellites look down on our planet, making cell phones, weather prediction, global positioning, and other everyday conveniences possible. Greg Asner and team have developed new technology to work with one of the oldest satellite systems—Landsat. Their tool grew out of his team's Carnegie Landsat Analysis System (CLAS) and allows researchers in tropical nations to monitor rain forest disturbances from their desktops. Dubbed CLASLite, the new technology is very user friendly, promising to revolutionize deforestation mapping and help rain forest nations better understand their carbon budgets.

The first remote sensing Landsat satellite was launched in the early 1970s, but analysis techniques could not penetrate the upper layers of forest leaves. Beginning in 1999, Asner started analyzing satellite imagery of Brazilian rain forests using advanced computational methods that he developed with programmer Dave Knapp. CLAS's image analysis and pattern-recognition algorithms can penetrate the canopy all the way to the soil at a scale of about 100 square feet. The intricate computations were run on the lab's large cluster of computers to detect minute differences in vegetation patterns and produce detailed vegetation maps. This enabled detection of clandestine logging activities—the removal of a few valuable trees—that previously had escaped notice. Over four years, Asner and team found that Brazilian rain forest destruction had been underestimated by half—critical information for the Brazilian government and nongovernmental organizations (NGOs) concerned about deforestation.

Although the Asner group spent years improving CLAS in Brazil, they were able to complete a study in Peru in just one year with their advanced software. They found that rain forest protection measures are working well in that Amazon nation. Shortly thereafter they took CLAS to Borneo.

Over the past year, Asner and Knapp retooled CLAS to be more user friendly and to work on desktop computers so that even the smallest government agency or NGO can observe what is happening to the rain forests. During 2008, they trained 35 Peruvians on the CLASLite system. They now plan to extend the training and technology transfer to other countries around the globe, beginning with Ecuador, Colombia, and Bolivia. With support from the Gordon and Betty Moore Foundation, Asner is working to certify CLASLite as a standard forest-monitoring tool for the proposed United Nations program to reduce carbon dioxide emissions from deforestation and forest degradation.



This output from CLASLite shows deforestation (bare soil) in pink and forest disturbance from logging in blue in the Brazilian Amazon. The map depicts changes through time with each successive overlay.
Image courtesy the Asner lab

Putting Biofuels on the Map

Location, location, location: it's a key to success in real estate. Could it also be a key to the successful development of biofuels? Much of the media attention on biofuels has focused on the pros and cons of specific bioenergy crops and the technologies for converting them to fuel. But for biofuels to be a realistic and environmentally friendly solution to the world's energy woes, location clearly matters. Converting forestlands to cornfields or other bioenergy croplands could worsen the problem of global warming by emitting the carbon stored in forest trees and soils. And converting croplands currently used to grow food threatens the global food supply.

Global Ecology's Biofuel Project, led by department director Chris Field, is investigating the potential for developing bioenergy agriculture on currently abandoned or degraded agricultural lands. Field's team estimated the global extent of abandoned crop- and pastureland, calculating their potential for sustainable bioenergy production from historical land-use data, satellite imaging, and ecosystem models. Agricultural areas that have been converted to urban areas or that have reverted to forests were not included in the assessment.

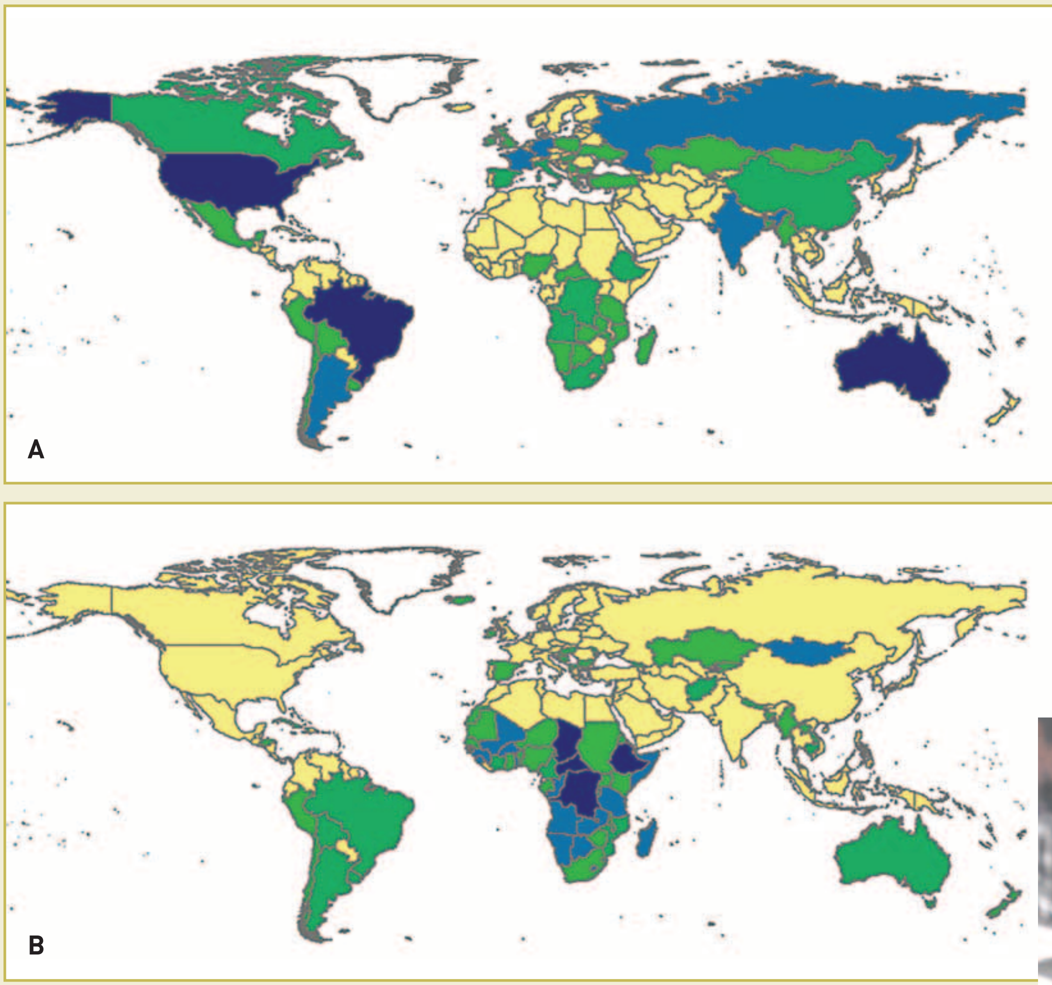
According to the study, up to 4.7 million square kilometers (approximately 1.8 million square miles)

of abandoned lands could be made available for growing energy crops. The potential yield of these lands, equivalent to nearly half the land area of the United States (including Alaska), depends on local soils and climate as well as on the specific energy crops and cultivation methods in each region. But the researchers estimate that the worldwide harvestable dry biomass could amount to as much as 2.1 billion tons, with a total energy content of about 41 exajoules (one exajoule is a billion billion joules, equivalent to about 170 million barrels of oil).

This sustainable bioenergy, grown on the available lands within the borders of each country, would likely satisfy 10% or less of the total energy demand in the energy-intensive economies of North America, Europe, and Asia. But for some developing countries, notably in sub-Saharan Africa, it could potentially supply many times their current energy needs without compromising the food supply or destroying forests. □

(Left) Sometimes old-fashioned tools are needed in a high-tech project. Greg Asner works in the field.
(Right) David Knapp operates sophisticated instrumentation in many remote regions. *Image courtesy Asner lab*

Global Ecology, *Continued*



Potential biofuel production on previously abandoned agricultural land is highest in the United States, Brazil, and Australia (A), but local production is most likely to meet domestic needs in developing countries where energy demand is low, such as in sub-Saharan Africa (B). Energy production is measured in exajoules per year (one exajoule is equivalent to approximately 170 million barrels of oil).

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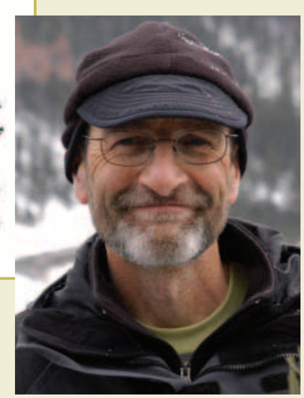


Carnegie's Chris Field

Observatories

Investigating the Birth, Structure, and Fate of the Universe

New MagE Spectrograph a "Hit"

In science, as in baseball, you don't always have to swing for the fences to get results. Sometimes you are better off going for base hits. That's how Stephen Shectman describes the philosophy behind the latest generation of instruments built for the Magellan telescopes. The original set of instruments built for the 6.5-meter telescopes at the Las Campanas Observatory in Chile were ambitious, general-purpose analytical tools. The new instruments being built for the telescopes are simpler, less expensive, and geared to address more specialized questions.

For example, the newly commissioned Magellan Echellette, or MagE, spectrograph is optimized to analyze light from faint ultraviolet targets. Built collaboratively with MIT, MagE was installed on the Magellan Clay telescope in late 2007. At its heart is an echellette grating, a specialized type of diffraction grating consisting of closely spaced angular grooves on a mirror. Using the diffraction effect (the same optical phenomenon that creates the play of colors on the surface of a compact disk) to split starlight into its constituent wavelengths, diffraction gratings typically produce higher-resolution spectra than prisms. But unlike prisms, they produce multiple overlapping spectra, called orders, from a single beam of light. The grooves of echellette gratings are cut or "blazed" at a specific angle to enhance particular diffraction orders and wavelengths. The problem of overlapping orders is solved by orienting prisms to deflect light at right angles to the spectra, stacking the orders neatly one above the other. As a result of this optical legerdemain, the MagE spectrograph can efficiently analyze 15 orders at once over a broad sampling of wavelengths, including the ultraviolet realm.

With Ian Thompson, Hsiao-Wen Chen, Scott Burles, and Jennifer Marshall, Shectman has already begun to put MagE through its paces, hunting for metal-poor stars in the galactic bulge and studying the absorption spectra of light passing through gas clouds in the halos of nearby galaxies. MagE's heightened response at ultraviolet wavelengths is key to both efforts.

Other specialized instruments are on deck for the Clay telescope, including the new Planet Finder Spectrograph (PFS), optimized for discovering extrasolar planets. Developed by Shectman with Jeffrey Crane and Terrestrial Magnetism's Paul Butler, the PFS should go into operation in mid-2009.

Star Birth at the Edge

Massive, high-luminosity stars live fast, die young, and never make it far from their place of birth. This makes them useful beacons for delineating regions of currently active star formation within galaxies. Unfortunately, these newborn stars emit most of their light at ultraviolet wavelengths, which are largely blocked by the Earth's atmosphere. To rise above the problem, NASA launched the *Galaxy Evolution Explorer* spacecraft, or GALEX, in

(Above) Carnegie's Ian Thompson (left) and Scott Burles (right) of MIT prepare to mount MagE's electronics package for the CCD detector on the instrument in the lab in Pasadena before it is shipped to Chile.

(Left) Mechanic Felix Quiroz (left) and instrument specialist Mauricio Navarrete (right) look on as the instrument is hoisted into position on the Magellan Clay telescope on November 20, 2007.

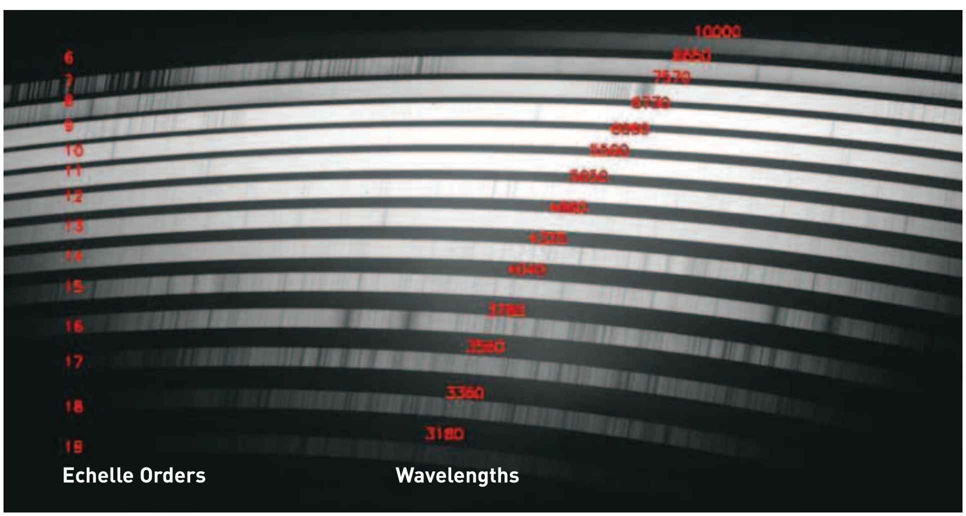
Images courtesy Stephen Shectman

2003. With detectors sensitive to both near and far ultraviolet wavelengths, GALEX has given astronomers, such as the Observatories' Barry Madore, a new set of eyes on the universe.

Perhaps the most significant of GALEX's findings has been the discovery of extended ultraviolet disks around many nearby galaxies. These bright ultraviolet-emitting regions of star formation can extend up to four times the diameter of the galactic disks observable in visible light. Of the galaxies described by Madore and colleagues in the recently published GALEX Ultraviolet Atlas of Nearby Galaxies, 30% of the spiral galaxies show extended UV disks, suggesting active star formation in these regions.

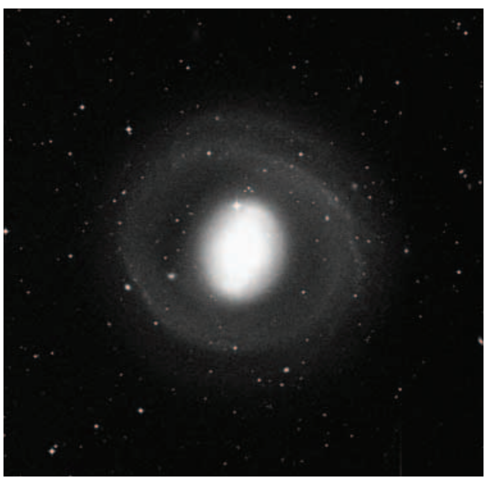
The outer reaches of galactic disks were believed to be unlikely regions for star formation because it was expected that the gas and dust out of which stars might condense would be spread too thinly. Below a certain threshold no stars could form—or so it was thought. But the presence of these extended UV disks shows that stars are in fact actively forming and that there is no lower threshold of gas density for producing stars. Star formation tails off as the disks thin, but it is not abruptly truncated.

It has long been known that there are untapped reservoirs of gas at large radii in many galaxies. How this gas accumulates and what acts as the trigger for star formation is still an active topic of research with implications for galaxy formation and evolution. Interactions among galaxies undoubtedly play a role in the formation of extended UV disks, but the GALEX observations suggest that even isolated galaxies know how to store fuel and trigger star formation far from their centers. □



The image shows a solar spectrum taken by the MagE spectrograph, with diffraction orders numbered 6 through 19. Central wavelengths of the orders range from 3180 to 10,000 angstroms; the spectrum covers the entire range of optical wavelengths transmitted by the atmosphere. MagE's ability to simultaneously analyze optical spectra in up to 15 orders will be a boon to researchers. *Image courtesy Stephen Shectman*

Observatories, *Continued*

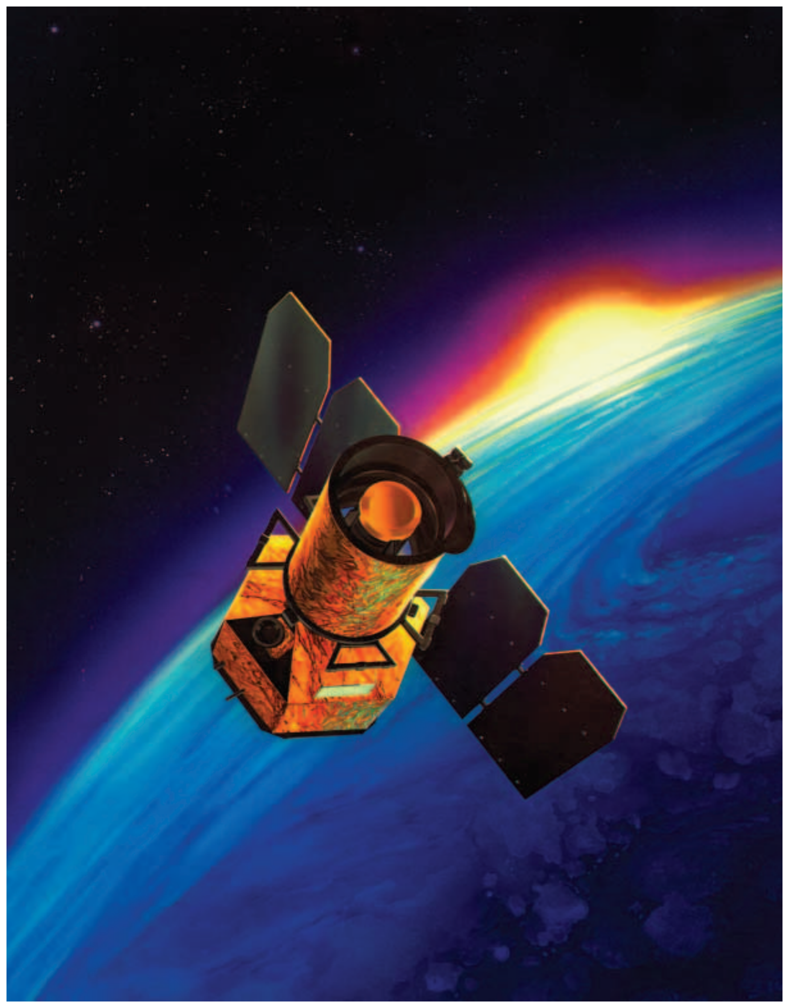


This pair of images shows the galaxy NGC 1291 in ultraviolet (top) and visible light (bottom). The ultraviolet image, taken by NASA's *Galaxy Evolution Explorer*, reveals bright regions of young stars in the galaxy's outer disk. It was previously thought that star-forming materials were too sparse in these outer zones for new stars to form. NGC 1291 is located about 33 million light-years away in the constellation Eridanus.

Images courtesy NASA/JPL-Caltech/SSC and the Palomar

The *Galaxy Evolution Explorer* (GALEX) was launched on April 28, 2003. Its mission is to study the shape, brightness, size, and distance of galaxies across 10 billion years of cosmic history by making observations at ultraviolet wavelengths.

Image courtesy NASA/JPL-Caltech



Plant Biology

Characterizing the Genes of Plant Growth and Development

LITTLE ZIPPER Keeps Leaves Right Side Up

Leaves are the factories that turn sunlight and atmospheric carbon dioxide into carbohydrates and oxygen. Through evolution, they have developed into highly efficient, organized structures: cells specializing in light capture are packed tightly in the upper half of the leaf, while cells responsible for gas exchange are typically on the bottom. This asymmetry is genetically controlled early during the emergence of the leaf primordium from the meristem—the growing point of the plant.

Kathryn Barton's lab has examined how the upper and lower regions of the leaf become distinct during early leaf development. Using the reference plant *Arabidopsis*, her lab studies the regulatory network that controls leaf asymmetry. This year the researchers discovered a new family of *LITTLE ZIPPER* genes responsible for giving the leaf its unique organization.

A protein named REVOLUTA was already known to be a powerful promoter of upper leaf development by activating genes required to give the upper leaf half its unique characteristics. However, until now, the "target" genes that REVOLUTA affects had not been identified.

The key to discovering the *LITTLE ZIPPER* genes was to engineer the REVOLUTA protein to control the genes' activity. John Emery attached a section to the REVOLUTA protein that renders it inactive unless the steroid dexamethasone is added. This engineered protein was introduced into *Arabidopsis*, where, when activated, it started the "program" that drives upper leaf development. Stephan Wenkel found that within 30 minutes of activating the REVOLUTA protein, four previously undescribed *LITTLE ZIPPER* genes were turned on. This remarkable family has the ability to "zipper" with and then inactivate the REVOLUTA protein through a feedback loop, which happens through compatible "leucine zipper" domains.*

When a plant is engineered to make too much of the ZIPPER3 protein, the stem cells in the meristem—the tip of the shoot—are used up in making a single terminal leaf. This leaf lacks the correct machinery for establishing the normal top/bottom polarity in the leaf, which develops as the spike-like structure in the middle. *Image courtesy Kathryn Barton*

*Leucine zipper domains were first described by Carnegie trustee Steven McKnight when he was a staff member at Carnegie's Department of Embryology.

Plant Biology, *Continued*

The *LITTLE ZIPPERS* complete the feedback loop, keeping the REVOLUTA protein in check in cells where it needs to remain dormant. Wenkel also found that the *LITTLE ZIPPER* proteins—products of the genes—limit the growth of stem cell populations in the plant, another indication of how important the *LITTLE ZIPPERS* are to plant growth and development.

Now the team will explore a new series of questions: What breaks the feedback loop in cells where the REVOLUTA protein must be active? What do the dozens of REVOLUTA target genes do?

New Twist on Life's Power Source

Photosynthesis is arguably the most important biological process on Earth. Through photosynthesis, plants, algae, and some bacteria support nearly all living things by producing food from sunlight. In the process, they alter the atmosphere by releasing oxygen and absorbing carbon dioxide. But research by Plant Biology's Arthur Grossman and Shaun Bailey, with colleagues, suggests that certain marine microorganisms have evolved a way to break the rules—they get a significant proportion of their energy from the Sun without a net release of oxygen or uptake of carbon dioxide. This discovery not only impacts scientists' basic understanding of photosynthesis, but importantly, it may also impact our measurements of primary productivity in the ways that microorganisms in the oceans might influence rising levels of atmospheric carbon dioxide.

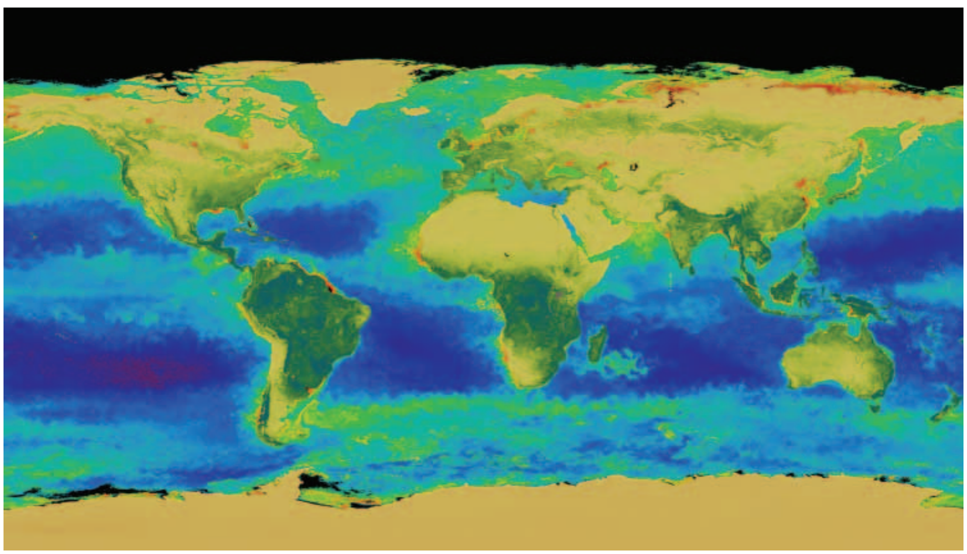
Grossman's team investigated photosynthesis in a marine *Synechococcus,* a genus of cyanobacteria (formerly called blue-green algae). *Synechococcus* dominates phytoplankton populations over much of the world's oceans and is an important contributor to global primary productivity. Grossman and his colleagues wanted to understand how *Synechococcus* could thrive in the iron-poor waters that make up large areas of the ocean, since certain activities of normal photosynthesis require high levels of iron.

It turns out that *Synechococcus* solves the iron problem by short-circuiting the standard photosynthetic process, reducing the levels and activities of those stages in photosynthesis that require the most iron. These are also the stages in which carbon dioxide is taken from the atmosphere. Grossman and Bailey have tentatively identified the enzyme involved in this process as plastoquinol terminal oxidase, or PTOX.

This prominent phenomenon in oligotrophic ocean picophytoplankton studied in the laboratory was also shown to occur in nature by Stanford University graduate student Kate Mackey, who made direct measurements of photosynthesis in field samples from the Atlantic and Pacific oceans. This may mean that primary productivity of the oceans is lower than expected from pigment levels. As a result, it may be important to consider this aspect of photosynthesis when predicting CO_2 removal from the atmosphere by open-ocean photosynthetic organisms. These findings, together with corroborating evidence reported by other groups, especially Cardol, Finazzi, and Wollman in France, will add depth to and a mechanistic foundation for the modeling of primary productivity in the ocean.

Plant Biology's Kathryn Barton

Image courtesy Joel Grimes



This satellite image shows the amount of chlorophyll present globally. Low levels of chlorophyll in oligotrophic (nutrient-poor) regions of the oceans appear purple and blue. *Synechococcus* dominates the phytoplankton assemblage in these areas.

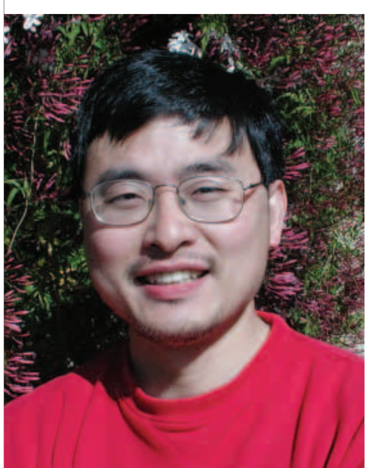
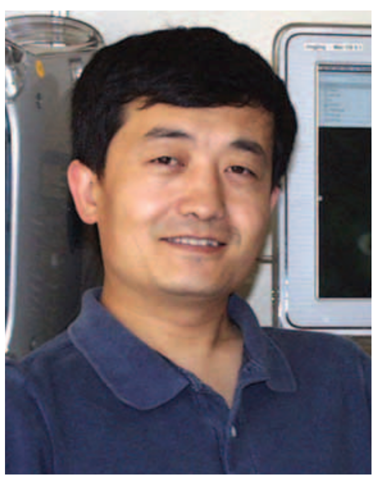
Image courtesy the SeaWiFS Project and the NASA Goddard Scientific Visualization Studio

Finding the Missing Links

Steroids bulk up plants just as they do human athletes, but in plant cells the molecular machinery through which steroids regulate the genes to boost growth and development is far more elaborate than in human cells. Animal cells respond to steroids via receptor molecules within the cell nucleus, whereas plants respond to the steroid hormone brassinosteroid (BR) through receptors on the outside of the cell membranes. A challenge for researchers has been to piece together the steps by which the hormonal signal is transmitted from the cell surface receptor to genes in the nucleus. Although several proteins that relay the BR signal have been identified,

Plant Biology, *Continued*

Brassinosteroids (BRs) are important growth hormones throughout the plant kingdom. BR-deficient mutants, such as *det2* (right), show dramatic developmental defects such as dwarfism, as seen in the photo, as well as male sterility and other deficiencies.
Image courtesy Zhi-Yong Wang

Wenqiang Tang (left), a postdoctoral associate working with Zhi-Yong Wang (right), was lead author for the *Science* paper on the brassinosteroid signaling pathway. *Image courtesy Zhi-Yong Wang*

the pathway has remained incomplete. Understanding this signaling cascade may help engineering efforts to alter plant architecture and to produce higher plant yield, important features of future food and bioenergy crops.

To identify missing links in the plant's steroid signal transduction chain, Zhi-Yong Wang, with postdoc Wenqiang Tang, used a technique called comparative proteomics to identify changes in the protein pattern specifically induced by exposure of plants to the hormone. Since the signal originates from receptors at the cell membrane, the researchers focused their analysis on fractions enriched in the cell membrane. Two new proteins that were named brassinosteroid-signaling kinases (BSK1 and BSK2) altered their running behavior on two-dimensional gel separations in response to brassinosteroid addition. Follow-up analyses confirmed that BSKs function as the immediate targets of the brassinosteroid receptor BRI1 in the membrane, bridging between the receptor on the membrane and the soluble regulator proteins inside the cell.

Brassinosteroids are key growth hormones throughout the plant kingdom, regulating many aspects of growth and development. Understanding how BRs activate genes could lead to enhanced harvests. Finding BSKs not only fills a major gap in the BR signaling pathway but also may have broader implications for cell signaling. Plant cells contain hundreds of receptor kinases and a number of proteins similar to BSKs, so it is tempting to speculate that these represent missing connections in other signaling cascades. □

Terrestrial Magnetism

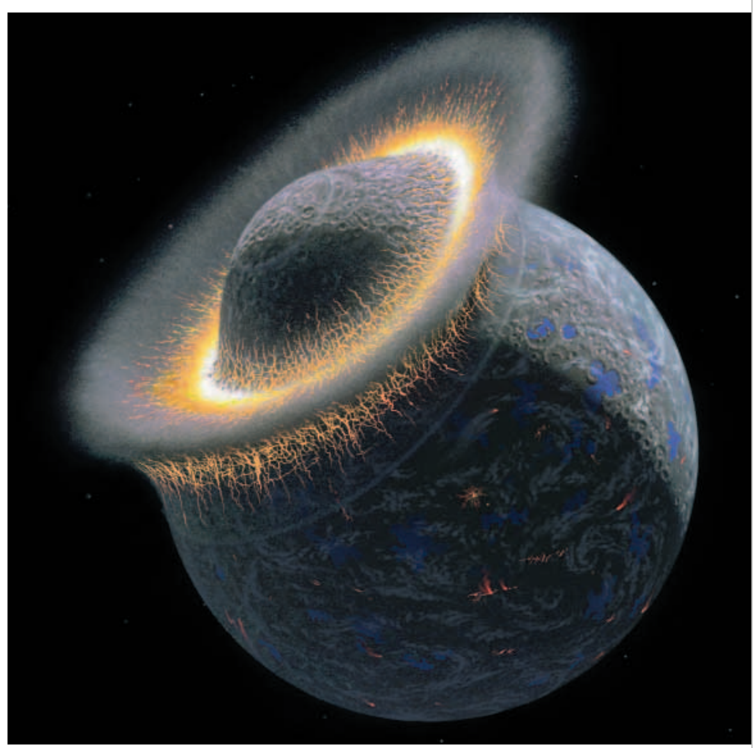
Understanding Earth, Other Planets, and Their Place in the Cosmos

Water on the Moon!

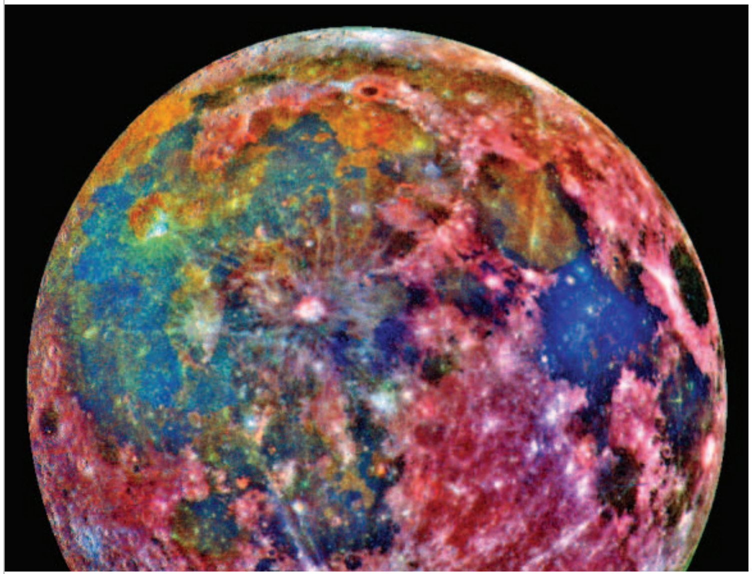
From analyses of material collected by the *Apollo* missions, scientists concluded decades ago that the Moon was dry. But new techniques developed by Terrestrial Magnetism's Erik Hauri have confounded this notion and challenged the long-standing "giant impact" theory of the Moon's formation.

For over 40 years scientists have tried to determine the content and origin of volatiles on the Moon—these volatiles, particularly water, are elements or compounds that evaporate easily. Previously, the limit for detecting volatile water in lunar rocks was about 50 parts per million (ppm). By refining the technology of secondary ion mass spectrometry, Hauri can detect as little as 5 ppm of water. He and his team (including visiting investigator Alberto Saal and former Carnegie Fellow James Van Orman) found considerably more water—up to 46 ppm—in tiny beads of volcanic glass from two Apollo sites. The finding means that H_2O was not entirely lost when the Moon formed and suggests that the water emerged from the lunar interior via volcanic eruptions over 3 billion years ago.

The long-standing belief is that the Moon was formed when a Mars-sized body collided with Earth about 4.5 billion years ago. The collision very likely melted both



The artwork at right depicts what could have occurred under the "giant impact" theory, which proposes that a Mars-sized body collided with Earth about 4.5 billion years ago. The collision melted both objects and sent molten debris and vaporized material into orbit around the Earth, some of which formed the Moon. It had earlier been thought that volatiles were lost from this debris before the Moon coalesced. The new study calls into question how much of the volatiles ended up inside the Moon as it formed and cooled. *Image courtesy © Don Davis*



(Above) This 1992 false-color photograph of the Moon shows differences in soil composition. Blue and orange are ancient lava flows, while red indicates highlands. The recent analysis of volcanic soil from two *Apollo* missions points to the probability that the Moon may have once had water. *Image courtesy NASA/JPL*

(Below) Erik Hauri developed the techniques to detect extremely minute quantities of water in volcanic glasses and minerals using a technology called secondary ion mass spectrometry (SIMS).

objects and sent molten debris into orbit around the Earth, some of which formed the Moon. The heat from the giant impact would have vaporized water and other elements of similar volatility.

The researchers found that one volcanic glass bead exhibited a decrease in volatiles from the tiny sphere's core to its rim. James Van Orman wrote the numerical model that matched the profiles for all the volatiles, including the water. It showed that a droplet cooling from 3°F to 6°F per second over 2 to 5 minutes between eruption and "freezing" lost 95% of the water.

The scientists estimated that the magma at eruption time had about 750 ppm of water, implying that the Moon's interior might have had as much water as the Earth's modern upper mantle. But where did all that erupted water go? Hauri believes that since the Moon's gravity is so weak, some of it was forced into space, but some may have drifted toward the cold lunar poles, where ice may still be present in permanently shadowed craters. Two upcoming NASA missions will address this intriguing question.

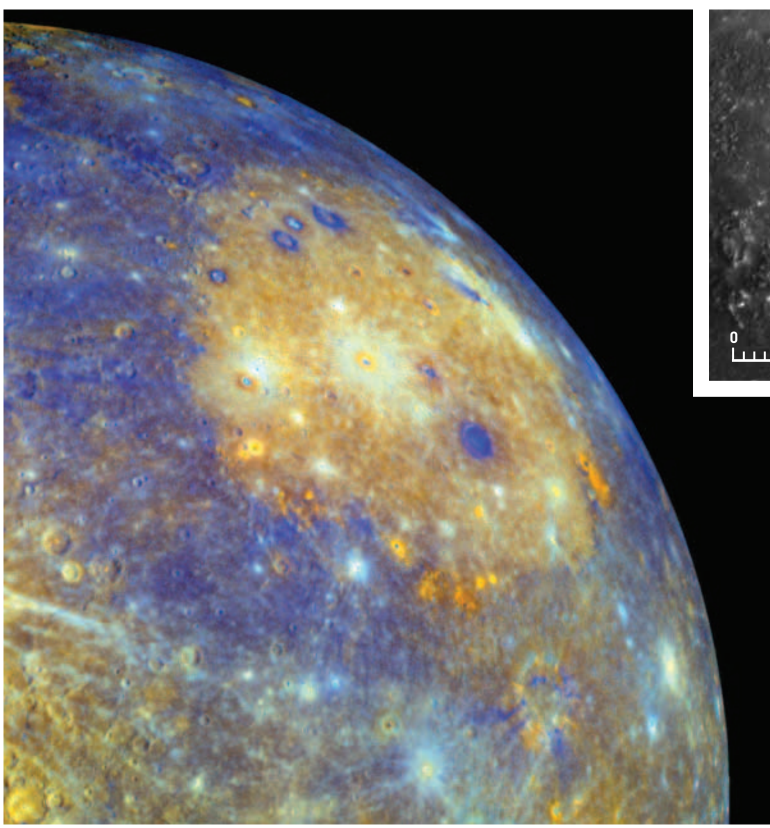
Reuniting with Mercury after 33 Years

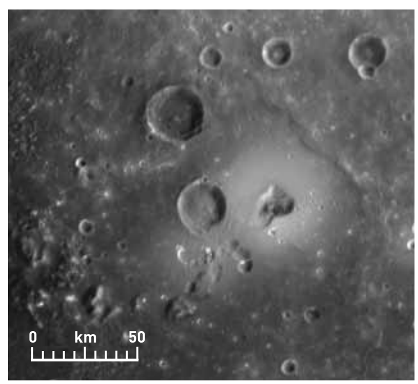
On January 14, 2008, the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) craft flew 125 miles (200 kilometers) above Mercury's surface and made history: it viewed part of the planet never seen by a spacecraft before. Sean Solomon, director of Terrestrial Magnetism, leads the mission as its principal investigator. With over 1,200 images and other data, the brief flyby settled a 30-year debate about the origins of Mercury's smooth plains; it shed light on the source of its magnetic field; and it produced myriad surprises.

In 1972, the *Apollo 16* Moon mission suggested that some lunar plains originated from material ejected from impacts, which formed smooth "ponds." In 1975, *Mariner 10* saw similar features on Mercury. Some scientists believed that the same processes were at work; others thought that Mercury's plains came from erupted lavas. But the absence of volcanic features in *Mariner 10* images left the question hanging. MESSENGER's flyby confirmed that once-active volcanoes helped form the plains.

Of the terrestrial planets, only Earth and Mercury have magnetic fields. A hot, churning, liquid-iron core produces Earth's. But Mercury's has puzzled scientists because its iron core should have cooled, turning off the dynamo that produces a magnetic field. Some believe the magnetism is frozen in the outer crust. MESSENGER did not find evidence of this, but it did demonstrate that Mercury's field is dominantly dipolar, with north and south magnetic poles, which suggests that the core generates magnetism. The full answer awaits orbit in 2011.

MESSENGER found that huge cliffs, called lobate scarps, dominate the planet's tectonic landforms. The scarps formed over great faults created as the core cooled and the planet contracted. The mission discovered that the global contraction is at least one-third greater than previously thought.





(Above) This smooth dome is characteristic of a volcano. The center kidney-shaped dimple is surrounded by a bright halo, which the scientists believe was deposited by an explosive eruption on Mercury.

Image courtesy Science *magazine/AAAS*

(Left) This false-color image shows the Caloris Basin (orange circle) and adjacent areas. The orange spots inside the basin indicate the location of the kidney-shaped depression and related features. The different-colored craters indicate excavated material of different composition. Some were modified by post-impact volcanic activity.

Image courtesy Science *magazine/AAAS*

Sean Solomon, principal investigator of the MESSENGER mission and director of the Department of Terrestrial Magnetism, responds to a question about the flyby during the press briefing at NASA Headquarters.

The flyby also made the first-ever observations of ions—charged particles—including water ions in Mercury's unique exosphere, an ultrathin atmosphere. Ions heavier than hydrogen and helium come from the planet's surface. MESSENGER confirmed that there is strong variation in the exosphere over time, caused by the planet's highly elliptical orbit, slow rotation, and interactions between the solar wind and Mercury's bubble-like magnetosphere, generated by the planet's magnetic field. MESSENGER was additionally the first spacecraft to observe Mercury's 1.5-milion-mile-long (2.5 million kilometers) sodium tail, formed by the escape of exospheric atoms accelerated by solar radiation pressure. Perhaps the biggest surprise is how much interaction there is among the planet's interior, surface, exosphere, and magnetosphere.

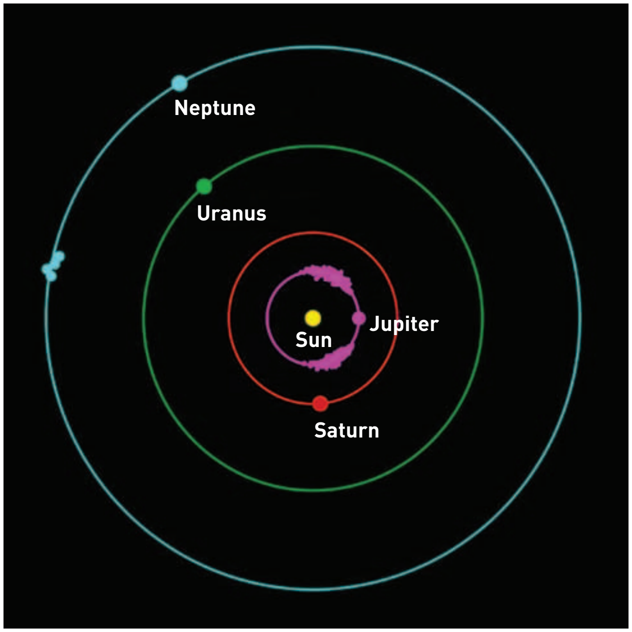
Missing Trojans: The Little Ones That Got Away

Besides the familiar planets and comets visible with a good pair of binoculars, the Solar System contains a host of small bodies that modern telescopes are revealing in increasing abundance. Trojans are asteroids that share a planet's orbit but cluster around points 60° ahead and behind the planet's path, where the pull of gravity from the planet and the Sun are in balance. The swarm of Trojans in Jupiter's orbit is the best-known group; the first was discovered in 1906. The Trojans in Neptune's orbit, being farther away from the Sun, are fainter and harder to observe. The first was not discovered until 2001, but Scott Sheppard and his colleagues believe they will turn out to be even more numerous than the Jupiter Trojans.

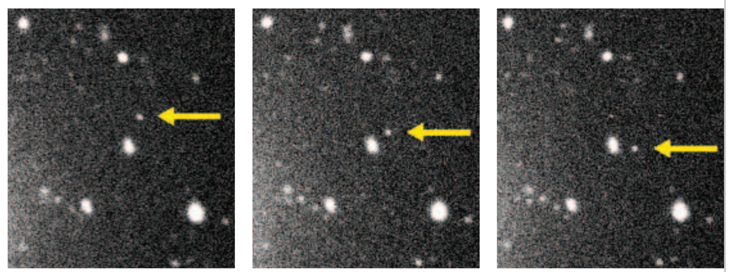
Deciphering the history of these primitive bodies can give clues to the evolution of the Solar System. Sheppard studies the coloration, orbital parameters, and size distribution of the Trojans. No Neptune Trojan is likely to have a diameter bigger than 125 miles (200 kilometers). Most are much smaller, though Sheppard has found that objects less than a few tens of miles across are relatively scarce. Jupiter Trojans and objects in the Kuiper Belt beyond Neptune's orbit show a similar pattern.

Why so few small Trojans? Sheppard hypothesizes that they were originally present, but over the Solar System's lifetime have been selectively destroyed or dispersed by collisions. Large bodies are less likely to break up during collisions because, being more massive, they have stronger gravitational fields to hold them together and attract new matter. But bodies with diameters less than about 30 miles (50 kilometers) are less likely to muster enough gravity to survive an impact, and are more likely to be scattered and lost. So, in a kind of "rich get richer, poor get poorer" dynamic, over time the large objects grow while small ones erode.

The hard-knocks life of the Neptune Trojans has broader implications, too. It can help researchers understand how primordial objects coagulated to form planetesimals—the building blocks of planets—not only in our Solar System but in those surrounding distant stars as well. □



This diagram of the Solar System shows Trojans in Jupiter's orbit (pink) clustered 60° ahead of and behind the planet. Farther out, newly discovered Neptune Trojans (blue) are also displaced 60° from the planet's position. *Image courtesy Scott Sheppard*

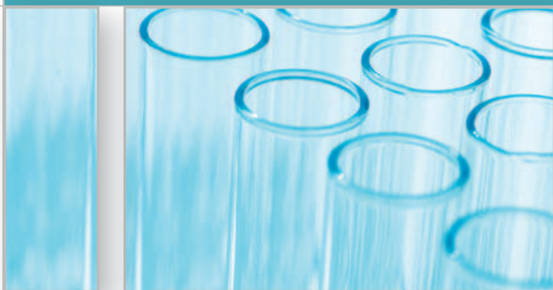


Trojans are discovered optically by their movement against a fixed background of stars. These photos of Neptune 2005 TN53 were taken over a two-hour interval with Carnegie's Magellan 6.5-meter telescope in Chile. Yellow arrows indicate the Trojan.
Image courtesy Scott Sheppard

Scott Sheppard poses at the Magellan Baade telescope at Carnegie's Las Campanas Observatory in Chile, where he scans the skies for Trojans and other small bodies in the Solar System.
Image courtesy Chad Trujillo

First Light & The Carnegie Academy

Teaching the Art of Teaching Science



First Light Turns 20!

Juna Wallace, an alumna of First Light, Carnegie's imaginative Saturday science school, returned as an intern this year—the 20th anniversary of the program. She attended First Light in the early 1990s when Julie Edmonds, codirector of the Carnegie Academy for Science Education (CASE), had just come on board as a volunteer. Like many other First Light graduates, Wallace extended the science skills nurtured by First Light; she's a Xavier University graduate who will enter medical school in the fall of 2009.

For the last three years the First Light curriculum has been based on the interdisciplinary field of astrobiology, which looks at the origins and distribution of life in the universe. Scientists at Carnegie's Broad Branch Road campus are involved in the NASA Astrobiology Institute and provide a real-world link to the students. About 20 middle schoolers participate in three six-week sessions that blend laboratory experimentation with fieldwork. In one expedition, the children learned about navigation, water analysis, and comets in an overnight session that included a boat trip on the *Half Shell* with the Living Classrooms program.

In another interdisciplinary effort, CASE is lead partner for DC Biotech: Improving Opportunities for Urban Minority Students. Partners are area schools, industry, and academic institutions. The program trains high school students for jobs in biotechnology and teaches teachers about this career path. This summer the program supported 15 interns working at Howard University, Catholic University, the J. Craig Venter Institute, the Pepper Hamilton law firm, and Carnegie headquarters. Teams of students produced four videos about work in a biotechnology laboratory. Those with communications skills learned about biology and information technology and those with a science background learned how to better communicate their research. The videos will be posted at dcbiotech.org. As another part of the effort, coordinator Marlena Jones led a biotech workplace experience at McKinley Technology High School. The 24 students were paid by the D.C. Department of Employment Services.

DC Biotech has made a big impact. This year, 39 of the 45 Biotech graduates from McKinley were accepted to college. Out of the top 10 students, seven were Biotech participants, and both the valedictorian, Obinna Ukwuani, and the salutatorian, Jennifer Guy, were graduates of the program. □

(Top left, next page) Biotechnology Workplace Program at McKinley Technology High School interns pose for a picture. From left to right, first row: Stephanie Navarrete, Keisha Blackmoore, Lanisha Dorsey, and Victor Akosile; second row: DeMarcus Clark, Kelechi Ukaegbu, Safiya Howard, and Rhia Hardman. *Image courtesy Marlena Jones*

for Science Education

(Left Center) Juna Wallace, First Light alumna from the 1990s, returned to Carnegie this year as an intern after graduating from Xavier University. She will attend medical school in 2009. *Image courtesy Toby Horn*

(Left Bottom) First Light students take their programmed robot through its paces. *Image courtesy Julie Edmonds*

(Top Right) First Light students examine macroscopic life from the Potomac River. *Image courtesy Julie Edmonds*

Financial Profile

for the year ending June 30, 2008 (unaudited)

Reader's Note: ***In this section, we present summary financial information that is unaudited. Each year the Carnegie Institution, through the Audit Committee of its Board of Trustees, engages an independent auditor to express an opinion about the financial statements and the financial position of the institution. The complete audited financial statements are made available on the institution's website at www.ciw.edu.***

The Carnegie Institution of Washington completed fiscal year 2008 in sound financial condition due to the positive returns of the diversified investments within its endowment; a disciplined spending policy that balances today's needs with the long-term requirements of the institution and the interests of future scientists; and the continued support of organizations and individuals who recognize the value of nurturing basic science.

The primary source of support for the institution's activities continues to be its endowment. This reliance on institutional funding provides an important degree of independence in the research activities of the institution's scientists.

As of June 30, 2008, the endowment was valued at $870 million and had a total annual return, net of management fees, of 5.5%. Over the last five fiscal years, the endowment has grown from $526 million to more than $870 million, an increase of 65%. Carnegie's endowment has returned an annualized 14.6% over the trailing five years for the period ending June 30, 2008.

As of December 31, 2008, the date of the writing of this profile, the value of Carnegie's investments has declined by more than 20% from the June 30, 2008, valuation. This decline is consistent with the general trend in the financial markets during this period, and is also consistent with the experience of other endowments at institutions of higher education and nonprofit organizations. During this period, Carnegie has held sufficient cash and bond funds to meet all ongoing operational requirements, debt obligations, and investment obligations, thereby avoiding the need for any liquidation of equity and alternative investments at otherwise unfavorable terms. Carnegie anticipates being able to meet requirements in 2009 in a similar manner and to make financial adjustments, including limiting spending, that are necessitated by the decline in endowment value.

For a number of years, under the direction of the Finance committee of the board, Carnegie's endowment has been allocated among a broad spectrum of asset classes including: fixed-income instruments (bonds), equities (stocks), absolute return investments; real estate partnerships; private equity; and natural resources partnerships. The goal of this diversified approach is to generate attractive overall performance and minimize the volatility that would exist in a less diversified portfolio.

The Finance committee of the board regularly examines the asset allocation of the endowment and readjusts the allocation, as appropriate. The institution relies upon external managers and partnerships to conduct the investment activities, and it employs a commercial bank to maintain custody.

The following chart shows the allocation of the institution's endowment among the asset classes it uses as of June 30, 2008.

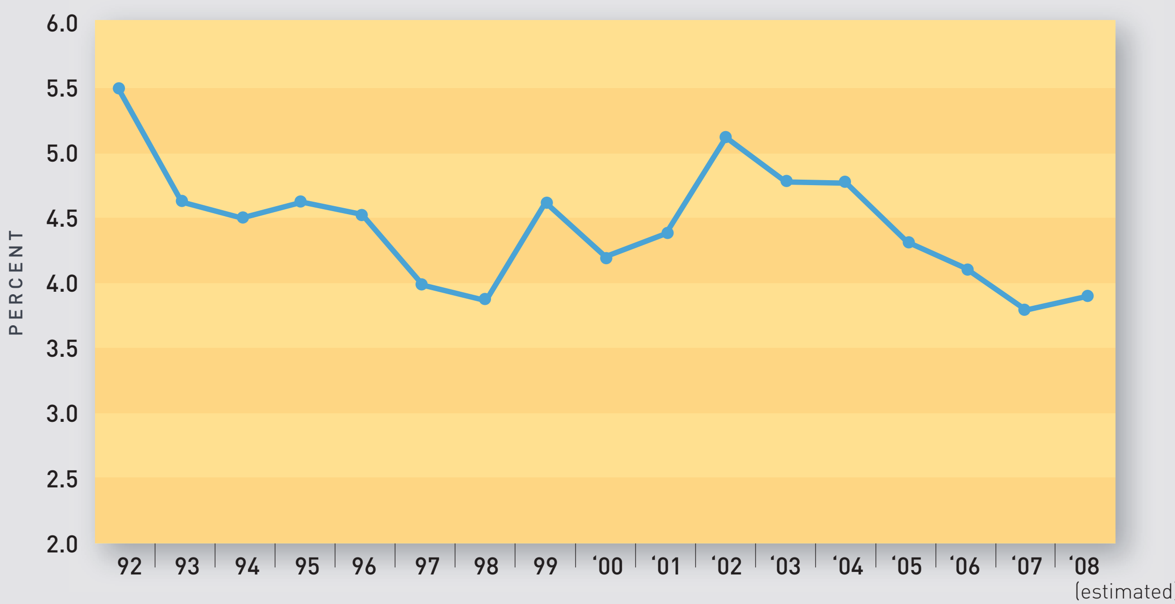
Asset Class	Target	Actual
Common Stock	35.0%	32.9%
Alternative Assets	55.0%	60.3%
Fixed Income and Cash	10.0%	6.8%

Carnegie's investment goals are to provide high levels of current support to the institution and to maintain the long-term spending power of its endowment.

Carnegie has also pursued a long-term policy of controlling its spending rate, bringing the budgeted rate down in a gradual fashion from 6+ percent in 1992 to 5.00% for 2008. Beginning with fiscal year 2008, Carnegie has revised its spending method from calculating the five percent against a simple three-year average of year-ending endowment values to a 70/30 rule, which factors in the previous year's spending. That is, the amounts available from the endowment under the 70/30 rule is made up of 70% of the previous year's budget, adjusted for inflation, and 30% of the most recently completed year-end endowment value, multiplied by the spending rate of 5.0% and adjusted for inflation and for debt. This method reduces volatility from year-to-year. The following figure depicts actual spending as a percentage of ending market value for the last 17 years.

In addition to investment performance and spending restraint, Carnegie benefits from external support. Within Carnegie's endowment, there are a number of "funds" that provide support either in a general way or targeted to a specific purpose. The largest of these is the Andrew Carnegie Fund, begun with the original gift of $10 million. Mr. Carnegie later made additional gifts totaling another $12 million during his lifetime. This tradition of generous support for Carnegie's scientific mission has continued throughout our history, and a list of donors in fiscal year 2008 appears in an earlier section of this year book. In addition, Carnegie receives important federal and private grants for specific research purposes, including support from the Howard Hughes Medical Institute for researchers at the Department of Embryology.

Endowment Spending as a Percent of Ending Value*



*Includes debt financing expenses

Statements of Financial Position (unaudited)

June 30, 2008 and 2007

	2008	2007
Assets		
Current assets:		
Cash and cash equivalents	957,861	1,896,601
Accrued investment income	138,050	265,104
Contributions receivable	6,885,460	4,928,969
Accounts receivable and other assets	6,474,614	12,685,334
Bond proceeds held by trustee	121,904	122,106
Total current assets	$ 14,577,889	$ 19,898,114
Noncurrent assets:		
Investments	895,939,989	838,384,075
Property and equipment, net	162,108,756	164,296,421
Total noncurrent assets	$1,058,048,745	$1,002,680,496
Total assets	$1,072,626,634	$1,022,578,610
Liabilities and Net Assets		
Accounts payable and accrued expenses	27,217,376	10,308,534
Deferred revenues	36,539,753	34,987,592
Bonds payable	65,303,339	65,248,695
Accrued postretirement benefits	14,486,199	14,327,973
Total liabilities	$ 143,546,667	$ 124,872,794
Net assets:		
Unrestricted	264,490,808	814,958,725
Temporarily restricted	609,844,386	27,990,125
Permanently restricted	54,744,773	54,756,966
Total net assets	$ 929,079,967	$ 897,705,816
Total liabilities and net assets	$1,072,626,634	$1,022,578,610

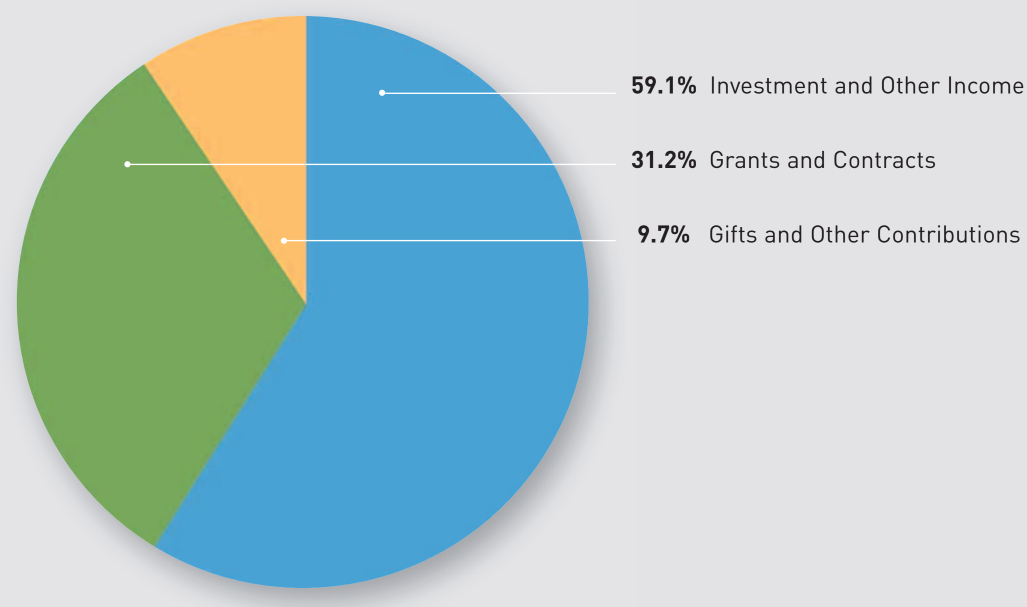
Statements of Activities[1] (unaudited)

Periods ended June 30, 2008 and 2007

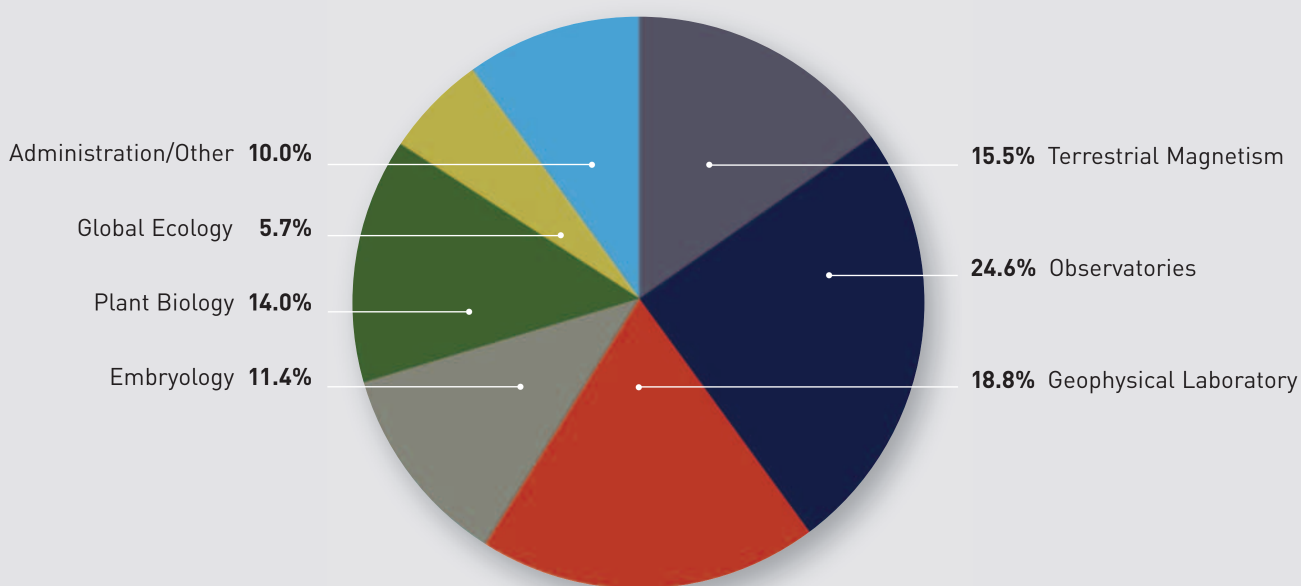
	2008	2007
Revenue and support:		
Grants and contracts	$ 33,051,740	$ 31,280,089
Contributions, gifts	10,227,204	4,296,626
Net gain or (loss) on property disposal	(49,772)	(22,822)
Other income	(18,624,082)	7,075,827
Net external revenue	$ 24,605,090	$ 42,629,720
Investment income, net	81,245,420	140,942,874
Total revenues, gains, other support	$105,850,510	$183,572,594
Program and supporting services:		
Terrestrial Magnetism	11,635,917	11,083,178
Observatories	18,455,315	17,816,485
Geophysical Laboratory	14,125,190	13,096,369
Embryology	8,593,858	8,635,996
Plant Biology	10,518,171	9,928,992
Global Ecology	4,263,800	3,936,862
Other programs	661,776	609,667
Administration and general expenses	6,853,537	7,967,307
Total expenses	$ 75,107,564	$ 73,074,856
Adoption of FASB Statement No. 158	—	(771,001)
Pension Related Changes	631	—
Increase (decrease) in net assets	31,374,151	109,736,737
Net assets at the beginning of the period	897,705,816	787,979,079
Net assets at the end of the period	$929,079,967	$897,705,816

[1]Includes restricted, temporarily restricted, and permanently restricted revenues, gains, and other support.

2008 Revenues and Gains ($106 million)



2008 Expenses by Department ($75.1 million)



Personnel

July 1, 2007-June 30, 2008

Carnegie Administration

Benjamin Barbin, *Manager of Advancement Activities*
Sharon Bassin, *Assistant to the President/Assistant Secretary to the Board*
Shaun Beavan, *Systems Administrator*
Gloria R. Brienza, *Budget and Management Analysis Manager*
Don Brooks, *Building Maintenance Specialist*
Marjorie Burger, *Financial Manager*
Cady Canapp, *Human Resources and Insurance Manager*
Alan Cutler, *Science Writer* [1]
Stephanie DeVos, *Advancement Intern* [2]
Robert Ellis, *Web Developer* [3]
Shawn Frazier, *Accounting Technician* [4]
Dina Freydin, *Senior Grants Accountant*
Susanne Garvey, *Director of External Affairs*
Jason Gebhardt, *Research Assistant for Advancement*
Patricia Harrigan, *Financial Accountant* [5]
Darla Keefer, *Special Assistant for Administration and Building Operations*
Caitlyn Kennedy, *Advancement Intern* [6]
Mulyono Kertajaya, *Business Data Analyst/Developer* [7]
Ann Keyes, *Payroll Coordinator*
Yang Kim, *Deputy Financial Manager*
Lisa Klow, *Secretary to the President*
George Gary Kowalczyk, *Director of Administration and Finance*
Tina McDowell, *Editor and Publications Officer*
Richard Meserve, *President*
June Napoco-Soriente, *Financial Accountant*
Mikhail Pimenov, *Endowment Manager*
Arnold J. Pryor, *Facilities Coordinator*
Gotthard Sághi-Szabó, *Chief Information Officer*
Vinutha Saunshimath, *Computer Systems Associate* [8]
Ashit Sheth, *Computer Systems Associate* [9]
Harminder Singh, *Financial Systems Accountant* [10]
Christine Smith, *Chief Advancement Officer* [11]
John Strom, *Web Manager*
Mira Thompson, *Manager of Advancement Operations*
Kenneth Tossell, *Computer Systems Associate*
Vickie Lee Tucker, *Administrative Coordinator* [12]
Yulonda White, *Human Resources and Insurance Records Coordinator*
Jacqueline Williams, *Assistant to Human Resources and Insurance Manager*
Matthew Wright, *Science Writer* [13]

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[1] From October 1, 2007
[2] To August 23, 2007
[3] From January 22, 2008
[4] From October 1, 2007
[5] To October 9, 2007
[6] From May 27, 2007
[7] From March 24, 2008
[8] From March 2, 2008
[9] From May 14, 2008
[10] From November 5, 2007
[11] To May 23, 2008
[12] To September 7, 2007
[13] To August 8, 2008

Carnegie Academy for Science Education

Brenton Bassin, *Intern* [1]
Sarah Bax, *Mentor Teacher* [1,2]
Guy Brandenburg, *First Light Instructor, Mentor Teacher* [1,2]
John Buchanan, *Mentor Teacher* [2]
Derek Butts, *First Light Assistant* [3]
Shaina Byrnes, *Summer Forensics Instructor,* [2] *CASE Coordinator* [4]
Alexander Cole, *Intern* [1,2]
Asonja Dorsey, *Mentor Teacher* [1,2]
Nia Doweary, *Intern* [2]
VanNessa Duckett, *Mentor Teacher* [1,2]
Audrey Edmonds, *CASE Coordinator,* [5] *Intern* [2]
Julie Edmonds, *Codirector*
Jessica Franklin, *Mentor Teacher* [2]
Ricky Garibay, *First Light Assistant, Intern* [1,2]
Joseph Geglia, *Intern* [2]
Tashima Hawkins, *Mentor Teacher* [1,2]
Anne Hemphill, *Mentor Teacher* [1,2]
Gayan Hettipola, *Intern* [1,2]
Toby Horn, *Codirector*
Marlena Jones, *DC Biotech Coordinator* [6]
Loretta Kelly, *Mentor Teacher* [1,2]
Yeelan Ku, *DC Biotech Assistant* [7]
Becky Lippy, *Intern* [2]
Robert Lucas, *Intern* [2]
Fran McCrackin, *Mentor Teacher* [2]
Thomas Nassif, *Mentor Teacher* [1,2]
Maxine Singer, *Senior Scientific Advisor*
Henry Spencer, *Intern* [1]
John Tatum, *Mentor Teacher* [1]
Annie Thompson, *Mentor Teacher* [2]
Juna Wallace, *First Light Assistant* [7], *DC Biotech Assistant* [7]

DC Biotech Summer Teacher Fellows

Joseph Isaac [2]
Monique Petersen [2]

DC Biotech Interns

Victor Akosile [1,2]
Monica Artis [1,2]
Vanessa Banks [2]
Keisha Blackmoore [1]
DeMarcus Clark [1,2]
Ngonda Dibango [2]
Lanisha Dorsey [1]
Joseph Green [1]
Rhia Hardman [1,2]
Nolan Harris [2]
Safiya Howard [1]
Cassie Lewis [2]
Elishauntae` Lindsay [1]
Kaya Lowery [1]
Michael McCreary [1]
Stephanie Navarrete [1]
Tuan Nguyen [2]
Marciel Rojas-Rosario [1]
Jimmika Smallwood [2]
Kelechi Ukaegbu [1]
Obinna Ukwuani [2]
Isaiah West [1]

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[1] Summer 2008
[2] Summer 2007
[3] To May 30, 2007
[4] August 1 to November 30, 2007
[5] From January 30 to June 15, 2007
[6] From December 1, 2007
[7] From October 1, 2007

Embryology

Research Staff Members

Alexsky Bortvin
Donald D. Brown, *Director Emeritus*
Chen-Ming Fan
Steven Farber
Joseph G. Gall
Marnie Halpern
Douglas E. Koshland
Allan C. Spradling, *Director*
Yixian Zheng

Staff Associates

Jeffrey Han
David MacPherson
Alex Schreiber [1]
Judith Yanowitz

Postdoctoral Fellows and Associates

Sandrine Biau, *Carnegie Fellow*
Michael Buszczak, *American Cancer Society Fellowship; Carnegie Fellow* [2]
Liquan Cai, *NIH Grant (Brown)* [3]
Rachel Cox, *Howard Hughes Medical Institute Research Specialist*
Svetlana Deryusheva, *Visiting Scientist* [4]
Lucilla Facchin, *Eppley Foundation Grant (Halpern)*
Donald Fox, *Jane Coffin Childs Fellowship*
Rebecca Frederick, *Howard Hughes Medical Institute Research Associate* [5]
Hongjuan Gao, *Carnegie Fellow* [6]
Julie Gleason, *Carnegie Fellow* [7]
Mary Goll, *Damon Runyon Cancer Research Fellowship*
Daniel Gorelick, *Carnegie Fellow*
Vinny Guacci, *Howard Hughes Medical Institute Research Specialist*
Kotaro Hama, *Japan Foundation Fellowship*
Youngjo Kim, *Howard Hughes Medical Institute Research Associate* [8]
Yung-Shu Kuan, *Carnegie Fellow*
Robert Levis, *Special Investigator, NIH Grant (Spradling with Baylor College of Medicine, subcontract)*
Ji-Long Liu, *Carnegie Fellow* [9]
Zhonghua Liu, *Howard Hughes Medical Institute Research Associate*
Safia Malki, *Carnegie Fellow*
Lucy Morris, *Howard Hughes Medical Institute Research Associate*
Sandeep Mukhi, *NIH Grant (Brown)*
Todd Nystul, *Life Sciences Research Foundation Fellow*
Ben Ohlstein, *Howard Hughes Medical Institute Research Associate* [10]
Itay Onn, *Howard Hughes Medical Institute Research Associate*
Kiran Santhakumar, *NIH Grant (Halpern)* [11]
Tina Tootle, *Ruth Kirschstein (NRSA) Fellowship*
Godfried Van der Heijden, *Carnegie Fellow*
Queenie Vong, *Howard Hughes Medical Institute Research Associate*
Cynthia Wagner, *Special Investigator, Carnegie Fellow*
James Walters, *American Cancer Society Fellow*
Shusheng Wang, *Research Associate, NIH Grant (Zheng)*
Zheng-an Wu, *Special Investigator, NIH Grant (Gall) and Carnegie Fellow*
Cheng Xu, *NIH Grant (Fan) and Carnegie Fellow*

Predoctoral Fellows and Associates

Courtney Akitake, *The Johns Hopkins University*
Anna Allen (formerly Krueger), *The Johns Hopkins University* [12]
Dean Calahan, *The Johns Hopkins University*
Juliana Carten, *The Johns Hopkins University* [13]
Julio Castaneda, *The Johns Hopkins University*
Daniel Ducat, *The Johns Hopkins University*
Ben Goodman, *The Johns Hopkins University*
Robyn Goodman, *The Johns Hopkins University* [14]
Jill Heidinger, *The Johns Hopkins University*
Margaret Hoang, *The Johns Hopkins University*
Christoph Lepper, *The Johns Hopkins University*
Kate Lannon, *The Johns Hopkins University* [15]
Katherine Lewis, *The Johns Hopkins University*
Daniel Lighthouse, *The Johns Hopkins University*
Peter Lopez, *The Johns Hopkins University*
David Martinelli, *The Johns Hopkins University*
Vanessa Matos-Cruz, *The Johns Hopkins University* [16]
Katie McDole, *The Johns Hopkins University* [17]
Tim Mulligan, *The Johns Hopkins University*
Zehra Nizami, *The Johns Hopkins University*
Lori Orosco, *The Johns Hopkins University*
Andrew Skora, *The Johns Hopkins University*
Sara Soper (formerly Clatterbuck), *The Johns Hopkins University* [18]
Elçin Ünal, *The Johns Hopkins University* [19]
Lamia Wahba, *The Johns Hopkins University*
Aaron Welch, *The Johns Hopkins University* [20]

Supporting Staff

Jen Anderson, *Research Technician*
Molly Broache, *Research Undergraduate* [21]
James Bronson, *Research Undergraduate* [22]
Ellen Cammon, *Howard Hughes Medical Institute Research Technician I*
Patricia Cammon, *Howard Hughes Medical Institute Laboratory Helper*
Melinda Campbell, *Animal Technician* [23]
Richard Chen, *Research Undergraduate* [24]
Rong Chen, *Howard Hughes Medical Institute Research Technician I*
Dolly Chin, *Administrative Assistant*
Katie Cole, *Student Assistant* [25]
Karina Conkrite, *Research Technician*
Vanessa Damm, *Howard Hughes Medical Institute Lab Assistant* [26]
Carol Davenport, *Howard Hughes Medical Institute Research Technician III*
Bianca Dennis, *Student Assistant* [27]
Neha Deshpande, *Research Undergraduate* [28]
Eugenia Dikovskaia, *Animal Facility Manager*
Chun Dong, *Research Scientist*
Jesse Dong, *Student Assistant* [29]
Adem Eifert, *Animal Technician* [30]
Andrew Eifert, *Assistant Facility Manager*
Zehra Eifert, *Animal Technician*
Michael Fletcher, *Student Assistant, Ingenuity Program* [31]
Ariela Friedman, *Student Assistant*
Lea Fortuno, *Animal Care Technician*
Nicole Gabriel, *Animal Care Technician*
Jeremy Gao, *Student Assistant* [32]
Tara Hardiman, *Research Technician* [33]
Fraser Heinis, *Student Assistant* [34]
Steven Heitzer, *Animal Technician* [35]
Brian Hollenback, *Animal Technician*
Colin Huck, *Animal Technician* [36]
Ella Jackson, *Howard Hughes Medical Institute Laboratory Helper*
Fred Jackson, *P/T Animal Care Technician*
Connie Jewell, *Systems Administrator*
Glenese Johnson, *Laboratory Helper*
Rejeanne Juste, *Research Technician*
Susan Kern, *Business Manager*
Amy Kowalski, *Research Technician*
Anastasia Krasnoperova, *Laboratory Assistant* [37]
Bill Kupiec, *Information Systems Manager*
Megan Kutzer, *Technician*
David Lai, *Student Assistant, Ingenuity Program*
Jaclyn Lim, *Student Assistant*
Jonathan Liu, *Student Volunteer* [38]
Michelle Macurak, *Research Technician*
Sneha Mani, *Research Undergraduate* [39]
Ona Martin, *Howard Hughes Medical Institute Research Technician III*
Tom McDonaugh, *Facilities Manager*

Khadijah McGhee-Bey, *Student Assistant* [40]
Wendy McKoy, *Administrative Assistant*
Stephanie Owen, *Research Technician* [41]
Shelley Paterno, *Howard Hughes Medical Institute Research Technician II*
Allison Pinder, *Howard Hughes Medical Institute Research Technician III*
Earl Potts, *Animal Technician*
Christine Pratt, *Howard Hughes Medical Institute Administrative Assistant II*
Joan Pulupa, *Student Assistant* [42]
Tosa Puvapiromquan, *Fly Food Technician* [43]
Megan Reid, *Student Assistant, Ingenuity Program* [44]
Michael Sepanski, *Electron Microscopy Technician*
Mahmud Siddiqi, *Research Specialist*
Alison Singer, *Research Technician* [45]
Keeyana Singleton, *Howard Hughes Medical Institute Research Technician I* [46]
C. Evan Siple, *Research Technician*
Ina Soh, *Research Undergraduate* [47]
Jessica Steele, *Carnegie Outreach Coordinator* [48]
Loretta Steffy, *Accounting Assistant*
Allen Strause, *Machinist*
Maggie Sundby, *Research Technician* [49]
Yan Tan, *Research Technician* [50]
Rafael Villagaray, *Computer Technician*
Xin Wang, *P/T Laboratory Helper* [51]
Dianne Williams, *Howard Hughes Medical Institute Research Technician III*

Visiting Investigators and Collaborators

Joel Bader, *Department of Biomedical Engineering, The Johns Hopkins University*
Robert Baker, *Department of Physiology and Neuroscience, New York University School of Medicine*
James Beck, *Department of Physiology and Neuroscience, New York University School of Medicine*
Hugo Bellen, *Baylor College of Medicine*
Ian Blair, *Department of Chemistry, University of Pennsylvania*
Dana Carroll, *Department of Biochemistry, University of Utah*
Rosalind Coleman, *Department of Nutrition, University of North Carolina*
Michael Dean, *Laboratory of Genomic Diversity, NCI-Frederick*
Maitreya Dunham, *Carl Icahn Laboratory, Princeton University*
Steven Ekker, *Department of Genetics, Cell Biology and Development, University of Minnesota Medical School*
Michael Granato, *Department of Cell and Developmental Biology, University of Pennsylvania School of Medicine*
Matthias Hammerschmidt, *Max Planck Institute for Immunobiology, Germany*
Roger Hoskins, *Lawrence Berkeley National Laboratory*
Yiannis Ioannou, *Department of Genetics and Genomic Sciences, Department of Gene and Cell Medicine, Mount Sinai School of Medicine*
Henry Krause, *Donnelly Centre for Cellular and Biomolecular Research, University of Toronto, Canada*
Peter Kwiterovich, *Department of Pediatrics, The Johns Hopkins University*
Steven Leach, *Department of Surgery, Division of Surgical Oncology, The Johns Hopkins University School of Medicine*
Li Ma, *Laboratory of Molecular Cell Biology and Center of Cell Signaling, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences*
Cecilia Moens, *Fred Hutchinson Cancer Research Center*
Mari Moren, *National Institute of Nutrition and Seafood Research, Norway*
Karen Oogema, *European Molecular Biology Laboratory, Germany*
Michael Parsons, *Departments of Surgery and Oncology, The Johns Hopkins University School of Medicine*
Erez Raz, *Department of Germ Cell Development, Max Planck Institute for Biophysical Chemistry, Germany*
Gerald M. Rubin, *University of California, Berkeley*
Bernard Thisse, *Institut de Génétique et de Biologie Moléculaire et Cellulaire, CNRS/INSERM/ULP, France*
Christine Thisse, *Institut de Génétique et de Biologie Moléculaire et Cellulaire, CNRS/INSERM/ULP, France*
Milena Vuica, *Department of Pathology, The Johns Hopkins University School of Medicine*

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[1] To August 21, 2007
[2] To August 9, 2007
[3] To July 31, 2007
[4] From April 7, 2008
[5] From September 17, 2007
[6] To August 13, 2007
[7] From February 11, 2008
[8] From January 2, 2008
[9] To August 17, 2007
[10] To September 30, 2007
[11] To September 30, 2007
[12] To February 8, 2008
[13] From June 2, 2008
[14] To July 4, 2007
[15] From June 2, 2008
[16] From January 21, 2007
[17] From June 2, 2008
[18] To December 31, 2007
[19] To December 31, 2007
[20] From June 2, 2008
[21] From August 31, 2007
[22] From September 20, 2007
[23] To July 13, 2007
[24] From October 5, 2007
[25] From June 2, 2008
[26] From May 17, 2007 (omitted from previous year book)
[27] From June 16, 2008
[28] From September 6, 2007
[29] From June 16, 2008
[30] To January 31, 2008
[31] To October 27, 2007
[32] To December 31, 2007
[33] To June 13, 2008
[34] From May 19, 2008
[35] From September 17, 2007
[36] From February 23, 2008
[37] To January 31, 2008
[38] From September 17, 2007
[39] From September 17, 2007
[40] From June 16, 2008
[41] To July 5, 2007
[42] From May 19, 2008
[43] From February 19, 2008
[44] From June 11, 2008
[45] From August 10, 2007
[46] To September 14, 2007
[47] From January 2, 2008
[48] From September 17, 2007
[49] From September 24, 2007
[50] To August 17, 2007
[51] To August 21, 2007

Geophysical Laboratory

Research Staff Members

George D. Cody
Ronald E. Cohen
Yingwei Fei
Marilyn L. Fogel
Alexander F. Goncharov
Robert M. Hazen
Russell J. Hemley, *Director* [1]
Wesley T. Huntress, Jr., *Director Emeritus*
T. Neil Irvine, *Emeritus*
Ho-kwang Mao
Bjørn O. Mysen
Douglas Rumble III
Andrew Steele
Viktor V. Struzhkin

Staff Associate

Burkhard Militzer [2]

Senior Research Fellows

Dudley R. Herschbach, *Harvard University*
Dimitri A. Sverjensky, *The Johns Hopkins University*
Takamitsu Yamanaka, *Osaka University, Japan*

Research Scientists

Muhetaer Aihaiti, *ONR* [3]
Nabil Z. Boctor, *NASA, NASA Astrobiology Institute (NAI)*
Marc Fries, *NASA* [4]
Qi Liang, *CVD Diamond*
Giles Maule, *NASA* [5]
Anurag Sharma, *Shell Oil* [6]
Maddury Somayazulu, *CDAC*
Chih Shiue Yan, *CDAC, NSF, Carnegie*
Chang-Sheng Zha, *CDAC*

Summer Education Coordinator and Research Scientist

Stephen A. Gramsch, *CDAC Laboratory Manager*

High Pressure Collaborative Access Team (HPCAT), High Pressure Synergetic Center (HPSynC) at the Advanced Photon Source (APS), Argonne National Laboratory, Chicago, IL; and National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory, Upton, NY

Melike Abliz, *Postdoctoral Researcher, HPSynC* [7]
Arunkumar S. Bommannavar, *Beamline Control Scientist, HPCAT*
Paul Chow, *Beamline Scientist, HPCAT*
Yang Ding, *Beamline Scientist, HPSynC*
Cindy Doran, *Administrative Assistant, HPSynC* [8]
Daijo Ikuta, *Predoctoral Research Associate, HPCAT* [9]
Michael Lerche, *Beamline Scientist, HPSynC*
Hanns-Peter Liermann, *Beamline Scientist, HPCAT*
Haozhe Liu, *Postdoctoral Research Associate* [10]
Jing Liu, *Visiting Scientist, HPCAT* [11]
Ho-kwang Mao, *Director, HPCAT and HPSynC*
Qiang Mei, *Postdoctoral Research Associate, HPCAT* [12]
Yue Meng, *Beamline Scientist, HPCAT*
Veronica O'Connor, *Office Manager, HPCAT*
Fang Peng, *Visiting Scholar, HPSynC* [13]
Eric Rod, *Beamline Technician, HPCAT*
Olga Shebanova, *Postdoctoral Research Associate, HPCAT* [14]
Guoyin Shen, *Project Manager, HPCAT and HPSynC*
Jinfu Shu, *Research Technician, HPCAT*
Stanislav Sinogeikin, *Beamline Scientist, HPCAT*
Lin Wang, *Balzan Fellow, Postdoctoral Researcher, HPCAT and HPSynC*
Yuming Xiao, *Postdoctoral Research Associate, HPCAT* [15]
Wenge Yang, *Beamline Scientist, HPCAT*
Qiaoshi Charles Zeng, *Predoctoral Research Associate, HPSynC* [16]

Postdoctoral Fellows and Postdoctoral Research Associates

Pierre Beck, *Carnegie Fellow* [17]
Andrey Bekker, *Carnegie Fellow, NAI* [18]
Raja Chellappa, *Postdoctoral Associate, DOE-CDAC, DOE-BES*
Xiao-Jia Chen, *Postdoctoral Associate, DOE*
Henderson James Cleaves II, *Senior Research Associate, NAI*
Kenneth P. Esler, *Postdoctoral Associate, NSF*
Dionysis I. Foustoukos, *Carnegie Fellow*
Panchapakesan Ganesh, *Postdoctoral Associate* [19]
Mihaela Glamoclija, *Carnegie Fellow* [20]
Pierre-Eymeric Janolin, *Postdoctoral Associate, DOE/ONR* [21]
Timothy Jenkins, *Postdoctoral Associate, DOE* [22]
Saad Antoun Khairallah, *Postdoctoral Associate* [23]
Svetlana Kharlamova, *Postdoctoral Associate* [24]
Adrienne Kish, *Postdoctoral Associate, NASA and Keck Foundation* [25]
Tetsuya Komabayashi, *JSPS Fellow, Japan*
Takahiro Kuribayashi, *JSPS Fellow, Japan*
Amy Lazicki, *Carnegie Fellow* [26]
Konstantin Litasov, *Postdoctoral Associate, NSF* [27]
Xuan Luo, *Postdoctoral Associate, NSF* [28]
Yufei Meng, *Postdoctoral Associate*
Javier Antonio Montoya Martinez, *Carnegie Fellow* [29]
Subramanian Natarajan, *Postdoctoral Associate, DOE* [30]
Seth D. Newsome, *Postdoctoral Associate, NSF*
Dominic Papineau, *Carnegie Fellow, NSF*
Simon Nicholas Platts, *Postdoctoral Associate, Santa Fe Institute Grant FIBR33* [31]
Angèle Ricolleau, *Carnegie Fellow, NSF*
Matthew Schrenk, *Carnegie Fellow* [32]
Xianwei Sha, *Postdoctoral Associate, DOE, ASC, NSF* [33]
Anurag Sharma, *Postdoctoral Associate, Shell Oil* [34]
Alexander Smirnov, *Postdoctoral Associate* [35]
Ravindran Thoguluva, *Postdoctoral Associate, DOE* [36]
Hikaru Yabuta, *Carnegie Fellow* [37]
Chih-Shiue Yan, *Postdoctoral Associate, NSF*
Lin Wang, *Postdoctoral Associate, Balzan Foundation Fund* [38]
Michelle B. Weinberger, *Postdoctoral Associate, DOE* [39]
Li Zhang, *Postdoctoral Associate, NASA* [40]

Predoctoral Fellows and Predoctoral Research Associates

Liwei Deng, *NSF* [41]
Patrick L. Griffin, *NAI, Balzan Foundation Fund, Prewitt-Hazen Gift Fund* [42]
Verena Starke, *NASA Marshall Space Flight Center*
Hong Yang, *NSF* [43]
Shidan Yu, *Predoctoral Research Associate* [44]
Yong Yu, *Predoctoral Research Associate* [45]

Research Interns

Namhey Lee, *The Johns Hopkins University* [46]
Gillian Robbins, *Rutgers University* [47]
Celine Silver, *Emory University, Smithsonian funding*
Emily Snyder, *American University, DTM NAI funding*
William Wurzel, *Research Assistant, UMD* [48]

Summer Scholar Interns (Summer 2008)

Violeta Castro, *Bucknell University*
Kim Cone, *George Mason University*
Ellen Crapster-Pregont, *Colby College*
Charlene Estrada, *University of Arizona*
Caitlin Farnsworth, *University of California, Davis*
Emily Heying, *Wartburg College*
Emme Johnston, *Mount Holyoke College*
Rohan Kundargi, *University of California, Los Angeles*
Aric Mine, *Rensselaer Polytechnic Institute*

GEOPHYSICAL LABORATORY **First row (left to right):** Marilyn Fogel, Ho-kwang Mao, George Cody, Robert Hazen, Ronald Cohen, Douglas Rumble, Russell Hemley, Alexander Goncharov, Andrew Steele, Yingwei Fei, Wesley Huntress, Viktor Struzhkin, Seth Newsome, Patrick Griffin. **Second row (left to right):** Shohei Ohara, Danielle Appleby, Weifu Guo, Verena Starke, Adrienne Kish, Chang-Sheng Zha, Takamitsu Yamanaka, Caroline Jonsson, Jinfu Shu, Susana Mysen, Agnes Mao, Xuan Luo, Ravindran Thoguluva, Dominic Papineau, John Armstrong, Javier Montoya, Maceo Bacote, Karen Orellana, Shaun Hardy, Subramanian Natarajan, John Janik. **Third row (left to right):** Gary Bors, Trong Nguyen, William Key, Garret Huntress, visitor, Luke Schulenburger, Jeff Lightfield, Anurag Sharma, Christopher Jonsson, Stephen Gramsch, Christos Hadidiacos, Gefei Qian, James Cleaves, Dionysi Foustoukos, Raja Chellappa, Pierre-Eymeric Janolin, Timothy Strobel, Stephen Hodge, Angele Ricolleau, Xiao-Jia Chen, Yao Wu, Merri Wolf, Mihaela Glamoclija, Svetlana Kharmalova. **Back row (left to right):** Marilyn Venzon, Twanna Washington, Yufei Meng, Joseph Lai, Qi Liang, Chih-Shiue Yan, Muhetaer Aihaiti, Panchapakesan Ganesh, Amy Lazicki, Michelle Weinberger, Anat Shahar, Morgan Phillips, Li Zhang, Steve Coley, Zhenxian Liu, Hong Yang. **Not in photo:** Nabil Boctor, Bobbie Brown, Jennifer Ciezak, Roy Dingus, Pablo Esparza, Neil Irvine, Lauren Kerr, Felix Krasnicki, Konstantin Litasov, Bjørn Mysen, Pedro Roa, Haiyun Shu, Maddury Somayazulu, Dimitri Sverjensky, Thomas Yu.

Jack Moriarty, *Colby College*
Greg Pelkey, *College of Charleston*
Erin Wirth, *New York University*

High School Students

Tara Covarella, *Prince George High School*
Thomas Gramsch, *Lake Braddock High School*
Maura James, *Convent of the Sacred Heart*
Andrew Kung, *Montgomery Blair High School, Balzan Fellow*
Maneeshika Madduri, *Thomas Jefferson High School for Science and Technology*
Jackie Rivera, *Cesar Chavez High School*
Benjamin Shih, *Montgomery Blair High School*

Supporting Staff

Danielle J.-H. Appleby, *Assistant to the Director, Departmental and Institutional Matters*[49]
Maceo T. Bacote, *Building Engineer*[50]
Shaun Beavan, *Systems Administrator*
Gary A. Bors, *Building Engineer*[51]
Bobbie L. Brown, *Instrument Maker*
Stephen D. Coley, Sr., *Instrument Shop Supervisor*
Roy R. Dingus, *Facility Manager*[52]
Pablo D. Esparza, *Maintenance Technician*[53]
Christos G. Hadidiacos, *Electronics Engineer*[54]
Shaun J. Hardy, *Librarian*[55]
Stephen Hodge, *Instrument Maker*
Garret Huntress, *Systems Administrator, Systems Developer*
Marjorie E. Imlay, *Assistant to the Director*[56]
Lauren Kerr, *Research Technician, Charles River Grant*
William E. Key, *Building Engineer*[57]
Szczesny (Felix) Krasnicki, *CVD Diamond Senior Engineer*
Joseph Lai, *Laboratory Scientist/Engineer*
Jeff Lightfield, *Controller*
Fabian Moscoso, *Building Engineer Apprentice*[58]
Susana Mysen, *Technical Assistant*
Trong T. Nguyen, *Assistant Controller*
Morgan D. Phillips, *Assistant to the Director, Science and CDAC*
Pedro J. Roa, *Maintenance Technician*[59]
Haiyun (Kevin) Shu, *CVD Diamond Technician*
Helen Venzon, *Accounts Payable Specialist*
Twanna D. Washington, *Administrative Assistant*[60]
Merri Wolf, *Library Technical Assistant*[61]
Thomas Yu, *CVD Diamond Technician*
Eugene Zhao, *Electronics Engineer*[62]

Visiting Investigators (Washington, DC)

Melike Abliz, *Argonne National Laboratory*
Marina Baldini, *Stanford University*
Andrey Bekker, *University of Manitoba*
Yan Bi, *Institute of Fluid Physics, Chinese Academy of Engineering Physics*
Sven Bilke, *NCI*
Robert Botto, *ACS PRF*

Abel Brieva, *Newcastle University, United Kingdom*
Bin Chen, *University of Illinois, Urbana-Champaign*
Jennifer Ciezak, *US Army Research Laboratory, Aberdeen Proving Grounds*
Elizabeth Cottrell, *Smithsonian Institution*
Katherine Crispin, *Case Western Reserve University*
Dale Cruikshank, *NASA Ames*[63]
Jianjun Dong, *Auburn University*
Kevin Driver, *Ohio State University*
Heather Franz, *University of Maryland/GSFC*
Bevan M. French, *Smithsonian Institution*
Marc Fries, *NASA JPL*
Loise Gaillou, *Smithsonian Institution*
Alexander Gavriliuk, *Institute for High Pressure Physics*
Reto Giere, *University of Freiburg, Germany*
Eugene Gregoryanz, *University of Edinburgh*
Axel Hofmann, *University of KwaZulu-Natal, South Africa*
John Hoslins, *York University*
Christopher Howard, *University College London*
Yolin Huang, *Army Research Laboratory (ARL)*
Caroline Jonsson, *The Johns Hopkins University*
Christopher Jonsson, *The Johns Hopkins University*
Svetlana Kharlamova, *Argonne National Laboratory*
Michel Klopt, *Thomas Jefferson National Accelerator Facility*
Anton Kolesnikov, *Moscow State Academy*
Tetsuya Kombayashi, *Tokyo Institute of Technology*
Srinivas Kulkarni, *Florida International University*
Takahiro Kuribayashi, *Tokyo Institute of Technology*
Dominik Kurzydlowski, *University of Warsaw, Poland*
Kai Landskron, *Lehigh University*
Peter Lazor, *Uppsala University, Sweden*
Jie Li, *University of Illinois–Urbana-Champaign*
Yu Lin, *Stanford University*
Haozhe Liu, *HPCAT, Harbin Institute of Technology, China*
Jing Liu, *Chinese Academy of Sciences*
Zhiguo Liu, *Harbin Institute of Technology, China*
Matthew S. Lucas, *California Institute of Technology*
Wendy Mao, *Stanford University*
Carlos Martinez del Rio, *University of Wyoming*
Kelton McMahon, *Woods Hole Oceanographic Institution*
Kristen Miller, *University of Maryland*
Michelle E. Minitti, *Arizona State University*
David Mittlefehlt, *NASA-ISC*
Penny Morril, *McMaster University, Canada*
Natalie Monacci, *University of Alaska Fairbanks*
Christian Ostertag-Henning, *Federal Institute for Geosciences, Germany*
Nishad Phatak, *Florida International University*
Luciana Ricciadelli, *Centro Austral de Investigationes Cientificas, Argentina*
Steve Richardson, *University of Cape Town*
Gillian Robbins, *Rutgers University*
Anat Shahar, *UCLA*
Keren Smit, *University of Cape Town, South Africa*
Mikhail Strzhemechny, *B. Verkin Institute for Low Temperature Physics and Engineering, National Academy of Sciences of Ukraine, Kharkov*
Liling Sun, *Institute of Sciences, Beijing*
Lingyun Tang, *Chinese Academy of Sciences*
Allan Treiman, *Lunar and Planetary Institute*
David Wacey, *Oxford University*
Andrew Walters, *University College London*
Luhong Wang, *HPCAT*
Shibing Wang, *Stanford University*
Gwyn Williams, *Thomas Jefferson National Accelerator Facility*
Wansheng Xiao, *Institute of Geochemistry, Chinese Academy of Sciences*
Jian Xu, *Institute of Fluid Physics, Chinese Academy of Engineering Physics*
Hexiang Yang, *University of Arizona*
Ed Young, *UCLA*
Yong Yu, *Institute of Sciences, Beijing*
Qiaoshi Zeng, *Zhejiong University, China*

Visiting Investigators (Geophysical Laboratory Synchrotron Facilities)

Kimberly Adams, *Northwestern University, HPCAT, NSLS*
George Amulele, *Stanford University, HPCAT*
Chantel Aracne, *Lawrence Livermore National Laboratory, HPCAT*
Bruce Baer, *Lawrence Livermore National Laboratory, HPCAT*
Jason Baker, *University of Nevada, Las Vegas, HPCAT*
Aaron Bell, *University of Nevada, Las Vegas, HPCAT*
Lauren Borkowski, *University of Nevada, Las Vegas, HPCAT*
Abel Brieva, *Newcastle University, United Kingdom, HPCAT*
Bin Chen, *University of Illinois, HPCAT*
J. Chen, *SUNY, Stony Brook, NSLS*
Gary Chesnut, *Los Alamos National Laboratory, HPCAT*
Samantha Combs, *University of Nevada, Las Vegas, HPCAT*
Hyunchae Cynn, *Lawrence Livermore National Laboratory, HPCAT*
Dana Dattlebaum, *Los Alamos National Laboratory, HPCAT*
Przemyslav Dera, *GSECARS/Advanced Photon Source, HPCAT*
T. Detrie, *Virginia Polytechnic and State University, NSLS*
Dan Dolan, *Sandia National Laboratory, NSLS*
Z. Dong, *University of Western Ontario, NSLS*
Susana Dorfman, *Princeton University, HPCAT*
Robert Downs, *University of Arizona, HPCAT*
Vadim Drozd, *Florida International University, HPCAT*
Thomas Duffy, *Princeton University, HPCAT*
Carl Ebeling, *Northwestern University, HPCAT*
Juan Fallas, *University of Nevada, Reno, HPCAT*
L. Gao, *University of Illinois, HPCAT*
P. Gao, *New Jersey Institute of Technology, NSLS*
Y. Gao, *GE Global Research Center, HPCAT*
Lyci George, *Florida International University, HPCAT*
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R. Greene, *University of Maryland, HPCAT*
Eugene Gregoryanz, *University of Edinburgh, HPCAT*
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Timothy Jenkins, *National Institute of Standards and Technology, HPCAT*
Fuming Jiang, *Princeton University, HPCAT*
Patricia Kalita, *University of Nevada, Las Vegas, HPCAT*
Yahya Al Katabeh, *New Mexico State University, HPCAT*
Jae-Hyun Park Klepeis, *Lawrence Livermore National Laboratory, HPCAT*
M. Klepeis, *Lawrence Livermore National Laboratory, HPCAT*
Rahvi Kumar, *University of Nevada, Las Vegas, HPCAT*
D. Kurzydlovski, *Warsaw University, Poland, HPCAT*
Mark Lang, *University of Michigan, HPCAT*
Barbara Lavina, *University of Nevada, Las Vegas, HPCAT*
Peter Lazor, *Uppsala University, Sweden, HPCAT*
Kanani Lee, *Yale University, HPCAT*
Jie Li, *University of Illinois, HPCAT*
Jung-Fu Lin, *Lawrence Livermore National Laboratory, HPCAT*
Zhijun Lin, *Los Alamos National Laboratory, HPCAT*
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Magnus Lipp, *Lawrence Livermore National Laboratory, HPCAT*
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Haozhe Liu, *Harbin Institute of Technology, China, HPCAT, NSLS*
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Matthew Lucas, *California Institute of Technology, HPCAT*
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Steve Maglio, *University of Nevada, Las Vegas, HPCAT*
Lisa Maguer, *California Institute of Technology, HPCAT*
K. F. Mak, *Columbia University, NSLS*
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Zhu Mao, *Princeton University, HPCAT*
Emily Martin, *Northwestern University, HPCAT*
J. McClure, *University of Nevada, Las Vegas, HPCAT*
Li Chung Ming, *University of Hawaii, HPCAT*
Lowell Miyagi, *University of California, Berkeley, HPCAT*
Jorge Munoz, *California Institute of Technology, HPCAT*
Zhihua Nie, *Northern Illinois University, HPCAT*
K. Otsuka, *Yale University, NSLS*
Wendy Panero, *Ohio State University, NSLS*
Michael Pravica, *University of Nevada, Las Vegas, HPCAT*
Walter Pravica, *University of Nevada, Las Vegas, HPCAT*
John Proctor, *University of Edinburgh, HPCAT*
Zeng Qiaoshi, *Zhejiang University, China, HPCAT*
Z. Qin, *New Jersey Institute of Technology, NSLS*
Jordan Raney, *California Institute of Technology, HPCAT*
D. Reaman, *Ohio State University, NSLS*
Kelly Robertson, *University of Nevada, Las Vegas, HPCAT*
D. Robins, *Los Alamos National Laboratory, HPCAT*
M. Roderick, *Sandia National Laboratory, NSLS*
Edward Romano, *University of Nevada, Las Vegas, HPCAT, NSLS*
Nancy Ross, *Virginia Polytechnic and State University, NSLS*
Costel Rotundu, *University of Maryland, HPCAT*
A. Saal, *Brown University, NSLS*
D. Sauter, *University of Nevada, Las Vegas, HPCAT*
Allison Savage, *University of Iowa, HPCAT*
W. Robert Scheidt, *University of Notre Dame, HPCAT*
Chris Seagle, *University of Chicago, NSLS*
Emre Selvi, *Texas Tech University, HPCAT*
M. Sfeir, *Brookhaven National Laboratory, NSLS*
D. Shakhvorostov, *University of Western Ontario, NSLS*
Sean Sheih, *University of Western Ontario, HPCAT*
Adam Simon, *University of Nevada, Las Vegas, HPCAT*
J. Smedley, *Brookhaven National Laboratory, NSLS*
Emmanuel Soignard, *Arizona State University, HPCAT*
Yang Song, *University of Western Ontario, NSLS*
Narcizo Souza Neto, *Advanced Photon Source, HPCAT*
Lewis Stevens, *Los Alamos National Laboratory, HPCAT*
Liling Sun, *Institute of Physics, Chinese Academy of Science, HPCAT*
Kimberly Tait, *Royal Ontario Museum, HPCAT*
Hongjin Tan, *California Institute of Technology, HPCAT*
Elizabeth Tanis, *University of Nevada, Las Vegas, HPCAT*
Cathy Tarabrella, *SUNY, Stony Brook, NSLS*
S. M. Thomas, *Northwestern University, NSLS*
Sergey Tkachev, *University of Nevada, Las Vegas, HPCAT, NSLS*
Oliver Tschauner, *University of Nevada, Las Vegas, HPCAT, NSLS*
Yuan-Chieh Tseng, *Northwestern University, HPCAT*
T. Tyson, *New Jersey Institute of Technology, NSLS*
Nenad Velisavljevic, *Lawrence Livermore National Laboratory, HPCAT*
K. Visbek, *Lawrence Livermore National Laboratory, HPCAT*
Luhong Wang, *Harbin Institute of Technology, HPCAT*
Yuejian Wang, *Los Alamos National Laboratory, HPCAT*
Michael Winterrose, *California Institute of Technology, HPCAT*
Yuming Xiao, *University of Illinois, HPCAT*
Lisha Xie, *Princeton University, HPCAT*
S. Xie, *University of Western Ontario, NSLS*
H. Yang, *University of Arizona, HPCAT*
S. Yu, *Jilin University, China, NSLS*
T. Yu, *SUNY, Stony Brook, NSLS*
Brian Yulga, *University of Nevada, Las Vegas, HPCAT, NSLS*
J. Zhang, *Los Alamos National Laboratory, HPCAT*
W. Zhang, *University of Chicago, NSLS*
Tao Zhou, *New Jersey Institute of Technology, NSLS*
Pavel Zinin, *University of Hawaii, HPCAT*

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[1] From July 1, 2007
[2] To October 12, 2007
[3] From April 1, 2008
[4] To November 3, 2007
[5] To April 30, 2008
[6] From September 1, 2007
[7] From August 1, 2007
[8] From August 27, 2007
[9] From July 1, 2007
[10] To September 1, 2007
[11] To December 7, 2007
[12] From March 1, 2008
[13] From August 1, 2007, to July 31, 2008
[14] From September 1, 2007
[15] From September 9, 2007
[16] From September 1, 2007
[17] To August 1, 2007
[18] To August 31, 2007
[19] From August 1, 2007
[20] From September 1, 2007
[21] From November 1, 2007
[22] To July 6, 2007
[23] From September 4, 2007
[24] From May 1, 2008
[25] From January 9, 2008
[26] From September 1, 2007
[27] From October 1, 2007
[28] From August 1, 2007
[29] From January 1, 2008
[30] From February 1, 2008
[31] To May 31, 2008
[32] To February 20, 2008
[33] To July 27, 2007
[34] From September 4, 2007
[35] To February 3, 2008
[36] From December 3, 2007
[37] To April 28, 2008
[38] From January 1, 2007
[39] From March 5, 2007
[40] From January 9, 2007
[41] To August 30, 2007
[42] From March 16, 2007
[43] From February 15, 2008
[44] From January 1, 2008
[45] From March 1, 2008
[46] From June 2, 2008
[47] From June 23, 2008
[48] From October 1, 2007, to March 1, 2008
[49] From November 27, 2007
[50] Joint appointment with DTM
[51] Joint appointment with DTM
[52] Joint appointment with DTM
[53] Joint appointment with DTM
[54] Retired on May 1, 2008
[55] Joint appointment with DTM
[56] Retired on December 3, 2007
[57] Joint appointment with DTM
[58] Joint appointment with DTM
[59] Joint appointment with DTM
[60] From May 11, 2007, to October 31, 2007
[61] Joint appointment with DTM
[62] From February 20, 2008
[63] From September 17, 2007

GLOBAL ECOLOGY **First row (left to right):** Robin Martin, Turkan Eke, Jan Brown, Linda Longoria, Kyla Dahlin, Kirkill Caldeira, Ken Caldeira, Adam Wolf, Kim Nicholas-Cahill, Paul Sterbentz. **Second row:** Mona Houcheime, Naoia Williams, Kathi Bump, Claire Lunch, David Knapp, Evana Lee, Marion O'Leary, Alex Nees, Chris Field, Steve Davis. **Third row:** James Jacobson, Melinda Belisle, Ruth Emerson, Yuka Estrada, KT Mertes, Jennifer Johnson, Todd Tobeck. Fourth row: Long Cao, Parker Weiss, Matt Colgan, Chris Doughty, Jack Silverman, George Ban-Weiss, Joe Berry, Greg Asner, Shaun Levick, Ty Kennedy-Bowdoin, Christian Andreassi, Roland Pieruschka.

Global Ecology

Research Staff Members

Gregory Asner
Joseph A. Berry
Kenneth Caldeira
Christopher B. Field, *Director*

Postdoctoral Fellows and Associates

Cristina Archer, *Stanford University*
Long Cao, *University of Illinois*
Noel Gurwick, *Cornell University*
Cho-ying Huang, *University of Arizona*
Maoyi Huang, *University of California, Berkeley*[1]
James Kellner, *University of Georgia*[2]
Scott Loarie, *Duke University*[3]
Robin Martin, *University of Colorado*
Halton Peters, *Stanford University*[4]
Roland Pieruschka, *Forschungszentrum Jülich, Germany*

Predoctoral Fellows and Associates

Eben Broadbent, *Stanford University*
Kim Nicholas Cahill, *Stanford University*
Kyla Dahlin, *Stanford University*[5]
Jason Funk, *Stanford University*
Claire Lunch, *Stanford University*
Carolyn Snyder, *Stanford University*
Adam Wolf, *Stanford University*

Supporting Staff

Christian Andreassi, *Laboratory Technician*[6]
Matthew Colgan, *Laboratory Assistant*[7]
Ruth Emerson, *Laboratory Technician*[8]
Yuka Estrada, *Laboratory Technician*
Lawrence Giles, *Senior Laboratory Technician*
James Jacobson, *Laboratory Technician*[9]
Matthew Jones, *Laboratory Technician*[10]
Ty Kennedy-Bowdoin, *Laboratory Technician*
David Knapp, *Senior Laboratory Technician*
Linda Longoria, *Administrative Assistant*
Paulo Oliveira, *Laboratory Technician*[11]
Todd Tobeck, *Laboratory Coordinator*
Angela Torney, *Laboratory Assistant*[12]
Mitsuhiko Tsukimoto, *Laboratory Technician*[13]
Tim Varga, *Laboratory Technician*[14]

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[1] To March 15, 2008
[2] From June 2, 2008
[3] From May 19, 2008
[4] To April 1, 2008
[5] From September 24, 2007
[6] From April 16, 2007, to September 30, 2007
[7] From April 16, 2007, to September 30, 2007
[8] From January 22, 2008
[9] From February 19, 2008
[10] To August 31, 2007
[11] To March 31, 2008
[12] From January 9, 2008
[13] To August 31, 2007
[14] To May 31, 2008

The Observatories

Research Staff Members

Alan Dressler
Wendy Freedman, *Director*
Luis Ho
Patrick McCarthy
Andrew McWilliam
John Mulchaey
Augustus Oemler, Jr., *Director Emeritus*[1]
Eric Persson
George Preston, *Director Emeritus*
Michael Rauch
Allan Sandage, *Staff Member Emeritus*
François Schweizer
Leonard Searle, *Director Emeritus*
Stephen Shectman
Ian Thompson
Ray Weymann, *Director Emeritus*

Research Associates

Dan Kelson, *Staff Associate*
Barry Madore, *Senior Research Associate*

Technical Staff Members

Matt Johns, *Associate Director of the Observatories*
Alan Uomoto, *Magellan Technical Manager*

Postdoctoral Fellows and Associates

George Becker, *Postdoctoral Associate*
Edo Berger, *Carnegie-Princeton Hubble Fellow*[2]
Christopher Burns, *Postdoctoral Associate*
Rupali Chandar, *Postdoctoral Research Associate*[3]
Jeffrey Crane, *Postdoctoral Associate*
Inese Ivans, *Carnegie-Princeton Fellow*
Tesla Jeltema, *Postdoctoral Associate*[4]
Daisuke Kawata, *Postdoctoral Associate*
Andreas Koch, *P/T Research Associate*
Juna Kollmeier, *Carnegie-Princeton Hubble Fellow*
Ivo Labbé, *Hubble Fellow*[5]
Janice Lee, *Hubble Fellow*[6]
Jennifer Marshall, *Carnegie Fellow*
Masami Ouchi, *Carnegie Fellow*[7]
Jesper Rasmussen, *Chandra Fellow*[8]
Jane Rigby, *Spitzer Fellow*
Mark Seibert, *Postdoctoral Associate*
Laura Sturch, *Research Assistant*[9]
Violet Taylor, *Postdoctoral Associate*
Haojing Yan, *Physical Scientist Associate*

Las Campanas Research Staff

Mark Phillips, *Associate Director, Las Campanas Observatory and Magellan Telescopes*
Miguel Roth, *Director, Las Campanas Observatory*

Las Campanas Fellows and Associates

Ricardo Covarrubias, *Magellan Fellow*
David Floyd, *Magellan Fellow*
Gaston Folatelli, *Postdoctoral Fellow*
Maximilian Stritzinger, *Postdoctoral Fellow*[10]

Las Campanas Visiting Investigator

Nidia Morrell, *Visiting Scientist*

Support Scientist

David Murphy, *Instrument Scientist*

External Affairs, Pasadena

Arnold Phifer, *Regional Director of Advancement*

Supporting Staff, Pasadena

Alan Bagish, *Las Campanas Observatory Engineer*
Christoph Birk, *Data Acquisition Programmer*
Jerson Castillo, *Instrument Maker*
Ken Clardy, *Programmer*
Paul Collison, *Computer Systems Manager*
Jorge Estrada, *Electronics Technician*
John Grula, *Head Librarian, Information Services/Publications Manager*
Tyson Hare, *Mechanical Engineer*
Earl Harris, *Shipping and Receiving Clerk*
Charles Hull, *Magellan Project Mechanical Engineer*
Silvia Hutchison, *Assistant to the Director*
Sharon Kelly, *Buyer*
Minjin Kim, *Research Assistant*
Vincent Kowal, *Machine Shop Foreperson/Instrument Maker*
Becky Lynn, *Secretary*
Luis Ochoa Ramirez, *Accounts Payable Specialist*
Greg Ortiz, *Assistant, Buildings and Grounds*
Robert Pitts, *Assistant, Buildings and Grounds*
Vgee Ramiah, *Business Manager*[10]
Judith Rosenau, *Special Projects Coordinator*[11,12]
Scott Rubel, *Associate Facilities Manager*
Eli Slawson, *GMT Assistant*
Jeanette Stone, *Purchasing Manager*
Robert Storts, *Instrument Maker*
Gregory Walth, *Data Analyst*
Steven K. Wilson, *Facilities Manager*

Supporting Staff, Las Campanas

Miriel Abarca, *Janitor*[13]
Carolina Alcayaga, *Purchasing Officer*
Ricardo Alcayaga, *Mechanic*
Juan Alfaro, *Magellan Site Maintenance Support*
Hernán Ángel, *Driver/Purchaser*
Jorge Araya, *Magellan Telescope Operator*
Hector Balbontín, *Chef*
Luis Boldt, *Research Assistant*
Jorge Bravo, *Magellan Instrument Specialist*
Pedro Carrizo, *Plumber*
Jilberto Carvajal, *El Pino Guard*
Jorge Castillo, *Paramedic*
Emilio Cerda, *Magellan Electronics Engineer*
Johnny Chavez, *Chef Assistant*[14]
Carlos Contreras, *Science Support*
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Henry Cortés, *Electrician*
José Cortés, *Janitor*
Jorge Cuadra, *Mechanic Assistant*
Oscar Duhalde, *Mechanical Technician*
Julio Egaña, *Painter*
Juan Espoz, *Mechanic*
Glenn Eychaner, *Telescope Systems Programmer*
Carlos Flanega, *Janitor*
Javier Fuentes, *Night Assistant*
Jaime Gómez, *Accounting Assistant*
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Luis González, *Janitor*
Sergio González, *Science Support*
Javier Gutiérrez, *Mechanical Technician Assistant*
Luis Gutiérrez, *Mechanic*[16]
Nelson Ibacache, *Mechanical Assistant*
Marco Jara, *Chef*[14]
Patricio Jones, *Magellan Electronics Engineer*
Oscar Juica, *Plumber*[17]

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Alejandro Leyton, *Electrician*[18]
Leonel Lillo, *Carpenter*
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Mauricio Martinez, *Magellan Telescope Operator*
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Honorio Rojas, *Water Pump Operator*
Jorge Rojas, *Janitor*
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Geraldo Vallardes, *Magellan Telescope Operator*
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Harold Francke, *Universidad de Chile*
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Bunyou Hatsukade, *Iwate University, Japan*
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Kamil Zloczewski, *Copernicus Foundation*

[1]To October 31, 2007
[2]To July 31, 2007
[3]To July 2, 2007
[4]To August 31, 2007
[5]From October 1, 2007, formerly Carnegie Fellow
[6]From September 15, 2007
[7]From July 20, 2007
[8]From August 1, 2007
[9]From June 1, 2008
[10]From November 1, 2007
[11]From January 1, 2008, formerly Collison
[12]From April 16, 2008, formerly Magellan Project Admin. Asst./Asst. Business Manager
[13]From February 6, 2008
[14]To August 19, 2007
[15]From December 10, 2007
[16]To April 16, 2008
[17]From January 9, 2008
[18]From January 2, 2008
[19]To February 12, 2008
[20]From February 26, 2008
[21]To August 29, 2007
[22]To August 27, 2007
[23]From August 28, 2007
[24]To April 13, 2008

Plant Biology

July 1, 2007 – June 30, 2008

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David Ehrhardt
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Seung Y. Rhee
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Farzad Haerizadeh, *DOE Research Associate* [22]
In-Seob Han, *NSF Research Associate* [23]
Kun He, *NSF Research Associate* [24]
Kian Hematy, *NSF Research Associate* [6]
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Thomas Walk, *NSF Research Associate* [33]
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Shuqing Zhao, *NIH Research Associate* [40]
Shengwei Zhu, *NIH Research Associate* [41]

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Michele Davison, *Stanford University* [43]
Michelle Facette, *Stanford University* [42]
Joshua Gendron, *Stanford University* [44]
Ryan Gutierrez, *Stanford University*
Blaise Hamel, *Stanford University*
Katherine Mackey, *Stanford University*
Wirulda Pootakham, *Stanford University*
Ruiju Wang, *Nankai University, China* [45]

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Athikkatuvalasu Karthikeyan, *Curator* [49]
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Rashmi Sanbhadti, *Intern*
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Todd Yecies, *Intern*[26]
Joy Zhang, *Intern*[26]
Peifen Zhang, *Curator*

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[1] Acting director from December 1, 2007
[2] Leave of absence from November 30, 2007
[3] Leave of absence from January 1, 2008
[4] To December 31, 2007
[5] From January 18, 2008
[6] To February 29, 2008
[7] From February 1, 2008, to May 31, 2008
[8] From September 13, 2007
[9] To October 1, 2007
[10] To November 1, 2007
[11] To September 22, 2007
[12] To April 13, 2008
[13] From October 15, 2007
[14] To April 30, 2008
[15] From May 1, 2008
[16] From November 16, 2007, to April 30, 2008
[17] To June 8, 2008
[18] To December 14, 2007
[19] To August 24, 2007
[20] From October 1, 2007
[21] To March 16, 2008
[22] To March 28, 2008
[23] To July 31, 2007
[24] From September 5, 2007
[25] To May 31, 2008
[26] To August 31, 2007
[27] From February 22, 2008
[28] From September 1, 2007
[29] From September 1, 2007, to March 16, 2008
[30] To March 31, 2008
[31] To January 7, 2008
[32] From February 1, 2008
[33] To September 28, 2007
[34] From August 15, 2007, to March 19, 2008
[35] From July 1, 2007
[36] To May 22, 2008
[37] To April 1, 2008
[38] To October 31, 2007
[39] From March 17, 2008
[40] From March 3, 2008
[41] From April 29, 2008
[42] To June 30, 2008
[43] From April 17, 2008
[44] To February 8, 2008
[45] From September 1, 2007
[46] From April 14, 2008
[47] From March 16, 2008
[48] To August 22, 2007
[49] From January 7, 2008
[50] From November 1, 2007
[51] From November 12, 2007, to February 15, 2008
[52] From July 9, 2007, to October 18, 2007
[53] From August 27, 2007
[54] From October 11, 2007

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[1]From July 1, 2007
[2]From May 1, 2008
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[9]From October 12, 2007
[10]To October 31, 2007
[11]From January 7, 2008
[12]To August 9, 2007
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[16]Deceased April 12, 2008

Bibliography

July 1, 2007 - June 30, 2008

EMBRYOLOGY

Allen, A. K., and A. C. Spradling, The Sf1-related nuclear hormone receptor Hr39 regulates *Drosophila* female reproductive tract development and function, *Development 135*, 311-321, 2008.

Channels, W. E., F. J. Nédélec, Y. Zheng, and P. A. Iglesias, Spatial regulation improves antiparallel microtubule overlap during mitotic spindle assembly, *Biophys J. 94*, 2598-2609, 2008.

Ducat, D., S. Kawaguchi, H. Liu, J. R. Yates 3rd, and Y. Zheng, Regulation of microtubule assembly and organization in mitosis by the AAA+ ATPase pontin, *Mol. Biol. Cell 19*, 3097-3110, 2008.

Friedman, E. R., and C. M. Fan, Separate necdin domains bind ARNT2 and HIF1alpha and repress transcription, *Biochem. Biophys. Res. Comm. 363*, 113-118, 2007.

Halpern, M. E., J. Rhee, M. G. Goll, C. M. Akitake, M. Parsons, and S. D. Leach, Gal4/UAS transgenic tools and their application to zebrafish, *Zebrafish 5*, 97-110, 2008.

Hochheiser, H., and J. Yanowitz, If I only had a brain: exploring mouse brain images in the Allen Brain Atlas, *Biol. Cell 99*, 403-409, 2007.

Kuan, Y. S., J. T. Gamse, A. M. Schreiber, and M. E. Halpern, Selective asymmetry in a conserved forebrain to midbrain projection, *J. Exp. Zoolog. B. Mol. Dev. Evol. 308*, 669-678, 2007.

Li, H. Y., W. P. Ng, C. H. Wong, P. A. Iglesias, and Y. Zheng, Coordination of chromosome alignment and mitotic progression by the chromosome-based Ran signal, *Cell Cycle 6*, 1886-1895, 2007.

Lighthouse, D. V., M. Buszczak, and A. C. Spradling, New components of the *Drosophila* fusome suggest it plays novel roles in signaling and transport, *Dev. Biol. 317*, 59-71, 2008.

Liu, J. L., and J. G. Gall, U bodies are cytoplasmic structures that contain uridine-rich small nuclear ribonucleoproteins and associate with P bodies, *Proc. Natl. Acad. Sci. USA 104*, 11655-11659, 2007.

Macpherson, D., Insights from mouse models into human retinoblastoma. *Cell Div. 3*, 9, 2008.

MacPherson, D., and M. A. Dyer, Retinoblastoma: from the two-hit hypothesis to targeted chemotherapy, *Cancer Res. 67*, 7547-7550, 2007.

Martinelli, D. C., and C. M. Fan, The role of *Gas1* in embryonic development and its implications for human disease, *Cell Cycle 6*, 2650-2655, 2007.

Mukhi, S., J. Mao, and D. D. Brown, Remodeling the exocrine pancreas at metamorphosis in *Xenopus laevis*, *Proc. Natl. Acad. Sci. USA 105*, 8962-8967, 2008.

Nystul, T., and A. Spradling, An epithelial niche in the *Drosophila* ovary undergoes long-range stem cell replacement, *Cell Stem Cell 1*, 277-285, 2007.

Onn, I., J. M. Heidinger-Pauli, V. Guacci, E. Ünal, and D. E. Koshland, Sister chromatid cohesion: a simple concept with a complex reality, *Annu. Rev. Cell Dev. Biol. Jul 10*, 2008. [Epub ahead of print]

Ouyang, M., A. T. Garnett, T. M. Han, K. Hama, A. Lee, Y. Deng, N. Lee, H. Y. Liu, S. L. Amacher, S. A. Farber, and S. Y. Ho, A web based resource characterizing the zebrafish developmental profile of over 16,000 transcripts, *Gene Expr. Patterns 8*, 171-180, 2008.

Tootle, T. L., and A. C. Spradling, *Drosophila* Pxt: a cyclooxygenase-like facilitator of follicle maturation, *Development 135*, 839-847, 2008.

Ünal, E., J. M. Heidinger-Pauli, and D. Koshland, DNA double-strand breaks trigger genome-wide sister-chromatid cohesion through Eco1 (Ctf7), *Science 317*, 245-248, 2007. Erratum in: *Science 318*, 1722, 2007.

Ward, J. D., L. J. Barber, M. I. Petalcorin, J. Yanowitz, and S. J. Boulton, Replication blocking lesions present a unique substrate for homologous recombination, *EMBO J. 26*, 3384-3396, 2007.

Xu, C., and C. M. Fan, Expression of Robo/Slit and Semaphorin/Plexin/Neuropilin family members in the developing hypothalamic paraventricular and supraoptic nuclei, *Gene Expr. Patterns, June 21*, 2008. [Epub ahead of print].

Yanowitz, J. L., Genome integrity is regulated by the *C. elegans* Rad51D homolog *rfs-1*, *Genetics 179*, 249-262, 2008.

Zheng, Y., and K. Oegema, Cell structure and dynamics—Editorial overview, *Curr. Opin. Cell Biol. 20*, 1–3, 2008.

GEOPHYSICAL LABORATORY

Here updated through September 30, 2008. The list is regularly updated on the Geophysical Laboratory web site (http://www.gl.ciw.edu).

3785 Åberg, D., B. Sadigh, J. Crowhurst, and A. Goncharov, Thermodynamic ground states of platinum metal nitrides, *Phys. Rev. Lett. 100,* 095501, 2008.

3776 Ahart, M., M. Somayazulu, R. E. Cohen, P. Ganesh, P. Dera, H. K. Mao, R. J. Hemley, Y. Ren, P. Liermann, and Z. Wu, Origin of morphotropic phase boundaries in ferroelectrics, *Nature 451,* 545-548, 2008.

3868 Alatas, A., H. Sinn, J. Zhao, A. H. Said, B. M. Leu, W. Sturhahn, E. E. Alp, G. Shen, and V. B. Prakapenka, Experimental aspects of inelastic X-ray scattering studies on liquids under extreme conditions (P-T), *High Pressure Res. 28,* 175-183, 2008.

3887 Alexander, C. M. O'D., G. D. Cody, M. Fogel, and H. Yabuta, Organics in meteorites—Solar or interstellar?, in *Organic Matter in Space,* S. Kwok and S. Sandford, eds., pp. 293-298, International Astronomical Union Symposium 251, Cambridge University Press, Cambridge, 2008.

____ Aubrey, A. D., H. J. Cleaves, and J. L. Bada, Organic synthesis in submarine hydrothermal vent systems I: amino acids, *Origins Life Evol. Biospheres,* in press.

3763 Bao, H., D. Rumble III, and D. R. Lowe, The five stable isotope compositions of Fig Tree barites: implications on sulfur cycle in ca. 3.2 Ga oceans, *Geochim. Cosmochim. Acta 71,* 4868-4879, 2007.

3824 Bass, J. D., S. V. Sinogeikin, and B. Li, Elastic properties of minerals: a key for understanding the composition and temperature of Earth's interior, *Elements 4,* 165-170, 2008.

3759 Beck, P., A. F. Goncharov, V. V. Struzhkin, B. Militzer, H. K. Mao, and R. J. Hemley, Measurement of thermal diffusivity at high pressure using a transient heating technique, *Appl. Phys. Lett. 91,* 181914, 2007.

3834 Bekker, A., C. Holmden, N. J. Beukes, F. Kenig, B. Eglinton, and W. P. Patterson, Fractionation between inorganic and organic carbon during the Lomagundi (2.22–2.1 Ga) carbon isotope excursion, *Earth Planet. Sci. Lett. 271,* 278-291, 2008.

3878 Borg, L. E., D. J. Des Marais, D. W. Beaty, O. Aharonson, S. A. Benner, D. D. Bogard, J. C. Bridges, C. J. Budney, W. M. Calvin, B. C. Clark, J. L. Eigenbrode, M. M. Grady, J. W. Head, S. R. Hemming, N. W. Hinners, V. Hipkin, G. J. MacPherson, L. Marinangeli, S. M. McLennan, H. Y. McSween, J. E. Moersch, K. H. Nealson, L. M. Pratt, K. Righter, S. W. Ruff, C. K. Shearer, A. Steele, D. Y. Sumner, S. J. Symes, J. L. Vago, and F. Westall, Science priorities for Mars Sample Return (The MEPAG Next Decade Science Analysis Group), *Astrobiology 8,* 489-535, 2008.

3863 Brandes, J. A., G. D. Cody, D. Rumble, P. Haberstroh, S. Wirick, and Y. Gelinas, Carbon K-edge XANES spectromicroscopy of natural graphite, *Carbon 46,* 1424-1434, 2008.

3874 Budai, J. D., W. Liu, J. Z. Tischler, Z. W. Pan, D. P. Norton, B. C. Larson, W. Yang, and G. E. Ice, Polychromatic X-ray micro- and nanodiffraction for spatially-resolved structural studies, *Thin Solid Films 516,* 8013-8021, 2008.

3758 Caracas, R., and R. E. Cohen, Post-perovskite phase in selected sesquioxides from density-functional calculations, *Phys. Rev. B 76,* 184101, 2007.

3831 Caracas, R., and R. E. Cohen, Effect of chemistry on the physical properties of perovskite and post-perovskite, in *Post-Perovskite: The Last Mantle Phase Transition,* K. Hirose et al., eds., pp. 115-128, American Geophysical Union, Washington, D.C., 2007.

3865 Caracas, R., and R. E. Cohen, Ferrous iron in post-perovskite from first-principles calculations, *Phys. Earth Planet. Inter. 168,* 147-152, 2008.

3789 Castro-Puyana, M., A. Salgado, R. M. Hazen, A. L. Crego, and M. L. Marina Alegre, The first contribution of capillary electrophoresis to the study of abiotic origins of homochirality: investigation of the enantioselective adsorption of 3-carboxy adipic acid on minerals, *Electrophoresis 29,* 1548-1555, 2008.

3770 Chen, X.-J., B. Liang, C. Ulrich, C.-T. Lin, V. V. Struzhkin, Z. Wu, R. J. Hemley, H. K. Mao, and H.-Q. Lin, Oxygen isotope effect in $Bi_2Sr_2Ca_{n-1}Cu_nO_{2n+4+\delta}$ (n=1,2,3) single crystals, *Phys. Rev. B 76,* 140502, 2007.

3769 Chen, X.-J., V. V. Struzhkin, Y. Song, A. F. Goncharov, M. Ahart, Z. Liu, H. K. Mao, and R. J. Hemley, Pressure-induced metallization of silane, *Proc. Natl. Acad. Sci. USA 105,* 20-23, 2008.

3837 Chen, X.-J., J.-L. Wang, V. V. Struzhkin, H. K. Mao, R. J. Hemley, and H.-Q. Lin, Superconducting behavior in compressed solid SiH_4 with a layered structure, *Phys. Rev. Lett. 101,* 077002, 2008.

3802 Chow, P., and B. Friedman, Low-energy non-resonant x-ray scattering of C_{60}, *Phys. Rev. B 77,* 073406, 2008.

3875 Ciezak, J. A., *Metastable Polymeric Nitrogen: The Ultimate Green High-Energy-Density Material,* Technical Report ARL-TR-4478, Army Research Laboratory, Aberdeen Proving Ground, Md., 2008. Available online at http://www.arl.army.mil/.

3876 Ciezak, J. A., and T. A. Jenkins, *The Low-Temperature Vibrational Behavior of Pentaerythritol Tetranitrate,* Technical Report ARL-TR-4470, Army Research Laboratory, Aberdeen Proving Ground, Md., 2008. Available online at http://www.arl.army.mil/.

3877 Ciezak, J. A., and T. A. Jenkins, *New Outlook on the High-Pressure Behavior of Pentaerythritol Tetranitrate,* Technical Report ARL-TR-4238, Army Research Laboratory, Aberdeen Proving Ground, Md., 2007. Available online at http://www.arl.army.mil/.

3794 Ciezak, J. A., T. A. Jenkins, and Z. Liu, Evidence for a high-pressure phase transition of ε-2,4,6,8,10,12-hexanitrohexaazaisowurtzitane (CL-20) using vibrational spectroscopy, *Propellants Explos. Pyrotech. 32,* 472-477, 2007.

3835 Cleaves, H. J., The prebiotic geochemistry of formaldehyde, *Precambr. Res. 164,* 111-118, 2008.

____ Cleaves, H. J., The origins of the coded amino acids, in *The Genetic Code,* S. Freeland and P. Farabaugh, eds., Springer, New York, in press.

____ Cleaves, H. J., A. D. Aubrey, and J. L. Bada, Organic synthesis in submarine hydrothermal vent systems II: peptides, *Origins Life Evol. Biospheres,* in press.

3807 Cleaves, H. J., J. H. Chalmers, A. Lazcano, S. L. Miller, and J. L. Bada, A reassessment of prebiotic organic synthesis in neutral planetary atmospheres, *Origins Life Evol. Biospheres 38,* 105-115, 2008.

____ Cleaves, H. J., and A. Lazcano, Origin of biomolecules, in *Chemical Evolution II: From Origins of Life to Modern Society,* L. Zaikowski, J. M. Friedrich, and S. R. Seidel, eds., American Chemical Society Symposium Series, Oxford University Press, New York, in press.

3817 Cody, G. D., H. Ade, C. M. O'D. Alexander, T. Araki, A. Butterworth, H. Fleckenstein, G. Flynn, M. K. Gilles, C. Jacobsen, A. L. D. Kilcoyne, K. Messenger, S. A. Sandford, T. Tyliszczak, A. J. Westphal, S. Wirick, and H. Yabuta, Quantitative organic and light element analysis of Comet 81P/Wild 2 particles using C-, N-, and O-μ-XANES, *Meteoritics Planet. Sci. 43,* 353-365, 2008.

3886 Cody, G. D., C. M. O'D. Alexander, A. L. D. Kilcoyne, and H. Yabuta, Unraveling the chemical history of the Solar System as recorded in extraterrestrial organic matter, in *Organic Matter in Space,* S. Kwok and S. Sandford, eds., pp. 277-284, International Astronomical Union Symposium 251, Cambridge University Press, Cambridge, 2008.

3857 Cody, G. D., C. M. O'D. Alexander, H. Yabuta, A. L. D. Kilcoyne, T. Araki, H. Ade, P. Dera, M. Fogel, B. Militzer, and B. O. Mysen, Organic thermometry for chondritic parent bodies, *Earth Planet. Sci. Lett. 272,* 446-455, 2008.

____ Cody, G. D., J. Brandes, C. Jacobsen, and S. Wirick, Soft x-ray induced chemical modification of polysaccharides in vascular plant cell walls, *J. Electron Spectrosc. Relat. Phenom.,* in press.

3891 Cohen, R. E., First-principles theories of piezoelectric materials, in *Piezoelectricity: Evolution and Future of a Technology,* W. Heywang, K. Lubitz, and W. Wersing, eds., pp. 471-492, Springer, Berlin, 2008.

3796 Corgne, A., S. Keshav, B. J. Wood, W. F. McDonough, and Y. Fei, Metal-silicate partitioning and constraints on core composition and oxygen fugacity during Earth accretion, *Geochim. Cosmochim. Acta 72,* 574-589, 2008.

3814 Corgne, A., B. J. Wood, and Y. Fei, C- and S-rich molten alloy immiscibility and core formation of planetesimals, *Geochim. Cosmochim. Acta 72,* 2409-2416, 2008.

3782 Crowhurst, J. C., J. M. Brown, A. F. Goncharov, and S. D. Jacobsen, Elasticity of (Mg,Fe)O through the spin transition of iron in the lower mantle, *Science 319,* 451-453, 2008.

3783 Crowhurst, J. C., A. F. Goncharov, B. Sadigh, J. M. Zaug, D. Aberg, Y. Meng, and V. B. Prakapenka, Synthesis and characterization of nitrides of iridium and palladium, *J. Mater. Res. 23,* 1-5, 2008.

3821 Cuk, T., V. V. Struzhkin, T. P. Devereaux, A. F. Goncharov, C. A. Kendziora, H. Eisaki, H. K. Mao, and Z.-X. Shen, Uncovering a pressure-tuned electronic transition in $Bi_{1.98}Sr_{2.06}Y_{0.68}Cu_2O_{8+\delta}$ using Raman scattering and x-ray diffraction, *Phys. Rev. Lett. 100,* 217003, 2008.

3767 Cunningham, N. C., W. Qiu, K. M. Hope, H.-P. Liermann, and Y. K. Vohra, Symmetry lowering under high pressure: structural evidence for *f*-shell delocalization in heavy rare earth metal terbium, *Phys. Rev. B 76,* 212101, 2007.

3772 Dattelbaum, D. M., L. L. Stevens, E. B. Orler, M. Ahart, and R. J. Hemley, Brillouin-scattering determination of the acoustic properties of polymers at high pressure, in *Shock Compression of Condensed Matter—2007,* M. Elert et al., eds., pp. 39-42, AIP Conference Proceedings 955, American Institute of Physics, Melville, N.Y., 2007.

3779 de Lill, D. T., and C. L. Cahill, Synthesis and characterization of a praseodymium-adipate framework templated with 1,2-bis(4-pyridyl)ethane: host-guest interactions and structural survey, *Cryst. Growth Des. 7,* 2390-2393, 2007.

____ Deng, L., Z. Gong, and Y. Fei, Direct shock wave loading of $MgSiO_3$ perovskite to lower mantle conditions and its equation of state, *Phys. Earth Planet. Inter.,* in press.

3815 Dera, P., B. Lavina, L. A. Borkowski, V. B. Prakapenka, S. R. Sutton, M. L. Rivers, R. T. Downs, N. Z. Boctor, and C. T. Prewitt, High-pressure polymorphism of Fe_2P and its implications for meteorites and Earth's core, *Geophys. Res. Lett. 35,* L10301, 10.1029/2008GL033867, 2008.

3801 Ding, Y., D. Haskel, S. G. Ovchinnikov, Y.-C. Tseng, Yu. C. Orlov, J. C. Lang, and H. K. Mao, Novel pressure-induced magnetic transition in magnetite (Fe_3O_4), *Phys. Rev. Lett. 100,* 045508, 2008.

3822 Eigenbrode, J. L., Fossil lipids for life-detection: a case study from the early Earth record, *Space Sci. Rev. 135,* 161-185, 2008.

3881 El Goresy, A., P. Dera, T. G. Sharp, C. T. Prewitt, M. Chen, L. Dubrovinsky, B. Wopenka, N. Z. Boctor, and R. J. Hemley, Seifertite, a dense orthorhombic polymorph of silica from the Martian meteorites Shergotty and Zagami, *Eur. J. Mineral. 20,* 523-528, 2008.

3862 Ernst, W. G., and D. Rumble III, eds., *Metamorphic Conditions along Convergent Plate Junctions: Mineralogy, Petrology, Geochemistry, and Tectonics,* Bellwether Publishing/Geological Society of America, Boulder, Colo., 863 pp., 2008.

3765 Ertem, G., R. M. Hazen, and J. P. Dworkin, Sequence analysis of trimer isomers formed by montmorillonite catalysis in the reaction of binary monomer mixtures, *Astrobiology 7,* 715-722, 2007.

3828 Ertem, G., A. M. Snellinger-O'Brien, M. C. Ertem, D. A. Rogoff, J. P. Dworkin, M. V. Johnston, and R. M. Hazen, Abiotic formation of RNA-like oligomers by montmorillonite catalysis: part II, *Int. J. Astrobiol. 7,* 1-7, 2008.

3803 Fernández-Remolar, D. C., F. Gómez, O. Prieto-Ballesteros, R. T. Schelble, N. Rodríguez, and R. Amils, Some ecological mechanisms to generate habitability in planetary subsurface areas by chemolithotrophic communities: the Río Tinto subsurface ecosystem as a model system, *Astrobiology 8,* 157-173, 2008.

____ Fiquet, G., J. Badro, E. Gregoryanz, Y. Fei, and F. Occelli, Sound velocity in iron carbide (Fe_3C) at high pressure: implications for the carbon content of the Earth's inner core, *Phys. Earth Planet. Inter.,* in press.

____ Fogel, M. L., M. J. Wooller, J. Cheeseman, B. J. Smallwood, Q. Roberts, I. Romero, and M. Jacobson Meyers, Unusually negative nitrogen isotopic compositions ($\delta^{15}N$) of mangroves and lichens in an oligotrophic, microbially-influenced ecosystem, *Biogeosciences,* in press.

____ Foustoukos, D. I., I. Savov, and D. R. Janecky, Chemical and isotopic constraints on water/rock interactions at the Lost City hydrothermal field, 30º N Mid-Atlantic Ridge, *Geochim. Cosmochim. Acta,* in press.

3873 Frank, M. R., H. P. Scott, S. J. Maglio, V. B. Prakapenka, and G. Shen, Temperature induced immiscibility in the NaCl-H_2O system at high pressure, *Phys. Earth Planet. Inter. 170,* 107-114, 2008.

3826 Freiman, Yu. A., A. F. Goncharov, S. M. Tretyak, A. Grechnev, J. S. Tse, D. Errandonea, H. K. Mao, and R. J. Hemley, Raman scattering in hcp rare gas solids under pressure, *Phys. Rev. B 78,* 014301, 2008.

3805 Fries, M., and A. Steele, Graphite whiskers in CV3 meteorites, *Science 320,* 91-93, 2008.

3751 Frisch, M., and C. L. Cahill, *In situ* ligand synthesis with the UO_2^{2+} cation under hydrothermal conditions, *J. Solid State Chem. 180,* 2597-2602, 2007.

3836 Frisch, M., and C. L. Cahill, Thorium(IV) coordination polymers in the pyridine and pyrazinedicarboxylic acid systems, *Cryst. Growth Des. 8,* 2921-2928, 2008.

3860 Gao, L., B. Chen, J. Wang, E. E. Alp, J. Zhao, M. Lerche, W. Sturhahn, H. P. Scott, F. Huang, Y. Ding, S. V. Sinogeikin, C. C. Lundstrom, J. D. Bass, and J. Li, Pressure-induced magnetic transition and sound velocities of Fe_3C: implications for carbon in the earth's inner core, *Geophys. Res. Lett. 35,* L17306, 10.1029/2008GL034817, 2008.

3781 Gavriliuk, A. G., I. S. Lyubutin, and V. V. Struzhkin, Electronic transition and the metallization effect in the $BiFeO_3$ crystal at high pressures, *JETP Lett. 86,* 532-536, 2007.

3793 Gavriliuk, A. G., V. V. Struzhkin, I. S. Lyubutin, S. G. Ovchinnikov, M. Y. Hu, and P. Chow, Another mechanism for the insulator-metal transition observed in Mott insulators, *Phys. Rev. B 77,* 155112, 2008.

3761 Gavriliuk, A. G., V. V. Struzhkin, I. S. Lyubutin, and I. A. Troyan, Equation of state and structural transition at high hydrostatic pressures in the $BiFeO_3$ crystal, *JETP Lett. 86,* 197-201, 2007.

3852 Giefers, H., M. Pravica, W. Yang, and P. Liermann, Radiation-induced decomposition of explosives under extreme conditions, *J. Phys. Chem. Solids 69,* 2208-2212, 2008.

____ Goncharov, A. F., P. Beck, V. V. Struzhkin, B. D. Haugen, and S. D. Jacobsen, Thermal conductivity of lower-mantle minerals, *Phys. Earth Planet. Inter.,* in press.

3850 Goncharov, A. F., P. Beck, V. V. Struzhkin, R. J. Hemley, and J. C. Crowhurst, Laser-heating diamond anvil cell studies of simple molecular systems at high pressures and temperatures, *J. Phys. Chem. Solids 69,* 2217-2222, 2008.

3749 Goncharov, A. F., and J. Crowhurst, Proton delocalization under extreme conditions of high pressure and temperature, *Phase Transitions 80,* 1051-1072, 2007.

3846 Goncharov, A. F., J. C. Crowhurst, V. V. Struzhkin, and R. J. Hemley, Triple point on the melting curve and polymorphism of nitrogen at high pressure, *Phys. Rev. Lett. 101,* 095502, 2008.

____ Goncharov, A. F., B. D. Haugen, V. V. Struzhkin, P. Beck, and S. D. Jacobsen, Radiative conductivity in the Earth's lower mantle, *Nature,* in press.

____ Goncharov, A. F., R. J. Hemley, and E. Gregoryanz, Comment on "The melting line of hydrogen at high pressures," *Phys. Rev. Lett.,* in press. 3784

3784 Goncharov, A., S. D. Jacobsen, V. Struzhkin, and P. Beck, Optical properties of deep-Earth minerals, in *McGraw-Hill Yearbook of Science and Technology 2008,* pp. 242-245, McGraw-Hill, New York, 2008.

3797 Goncharov, A. F., S. Sinogeikin, J. C. Crowhurst, M. Ahart, D. Lakshtanov, V. Prakapenka, J. Bass, P. Beck, S. N. Tkachev, J. M. Zaug, and Y. Fei, Cubic boron nitride as a primary calibrant for a high temperature pressure scale, *High Pressure Res. 27,* 409-417, 2007.

____ Graham, B., P. L. Koch, S. D. Newsome, K. McMahon, and D. Aurioles, Using isoscapes to trace the movement and foraging behavior of top predators in oceanic ecosystems, in *Isoscapes: Understanding Movement, Pattern, and Process on Earth through Isotope Mapping,* J. B. West et al., eds., Springer, Berlin, in press.

____ Gregoryanz, E., and A. F. Goncharov, Comment on "High-pressure melting curve of nitrogen and the liquid-liquid phase transition," *Phys. Rev. Lett.,* in press.

3754 Han, W.-Q., W. Wen, D. Yi, Z. Liu, M. M. Maye, L. Lewis, J. Hanson, and O. Gang, Fe-doped trititanate nanotubes: formation, optical and magnetic properties, and catalytic applications, *J. Phys. Chem. C 111,* 14339-14342, 2007.

3798 Han, W.-Q., H.-G. Yu, C. Zhi, J. Wang, Z. Liu, T. Sekiguchi, and Y. Bando, Isotope effect on band gap and radiative transitions properties of boron nitride nanotubes, *Nano Lett. 8,* 491-494, 2008.

3766 Hardy, S. J., "John Adam Fleming (1877-1956)," in *Encyclopedia of Geomagnetism and Paleomagnetism,* D. Gubbins and E. Herrero-Bervera, eds., pp. 273-274, Springer, New York, 2007.

3869 Haskel, D., Y. C. Tseng, N. M. Souza-Neto, J. C. Lang, S. Sinogeikin, Ya. Mudryk, K. A. Gschneidner, Jr., and V. K. Pecharsky, Magnetic spectroscopy at high pressures using X-ray magnetic circular dichroism, *High Pressure Res. 28,* 185-192, 2008.

____ Hausrath, E. M., A. H. Treiman, E. Vicenzi, D. L. Bish, D. Blake, P. Sarrazin, T. Hoehler, I. Midtkandl, A. Steele, and S. L. Brantley, Short- and long-term olivine weathering in Svalbard: implications for Mars, *Astrobiology,* in press.

3889 Hazen, R. M., The emergence of chemical complexity: an introduction, in *Chemical Evolution across Space and Time,* L. Zaikowski and J. M. Friedrich, eds., pp. 2-14, ACS Symposium Series 981, Oxford University Press, New York, 2008.

____ Hazen, R. M., Chemical evolution: an introduction, in *Chemical Evolution II: From Origins of Life to Modern Society,* L. Zaikowski, J. M. Friedrich, and S. R. Seidel, eds., American Chemical Society Symposium Series, Oxford University Press, New York, in press.

____ Hazen, R. M., Emergence and the experimental pursuit of the origin of life, in *Future of Life,* C. M. Bertka, ed., Cambridge University Press, New York, in press.

____ Hazen, R. M., The emergence of patterning in life's origin and evolution, *Int. J. Dev. Biol.,* in press.

3890 Hazen, R. M., P. L. Griffin, J. M. Carothers, and J. W. Szostak, Functional information and the emergence of biocomplexity, in *In the Light of Evolution I: Adaptation and Complex Design,* J. C. Avise and F. J. Ayala, eds., pp. 25-44, National Academies Press, Washington, D.C., 2007. Available online at http://www.nap.edu/.

____ Hazen, R. M., D. Papineau, W. Bleeker, R. T. Downs, J. M. Ferry, T. J. McCoy, D. A. Sverjensky, and H. Yang, Mineral evolution, *Am. Mineral.,* in press.

3885 Hemley, R. J., V. V. Struzhkin, and R. E. Cohen, Theory and practice – Measuring high-pressure electronic and magnetic properties, in *Treatise on Geophysics, Vol. 2: Mineral Physics,* A. M. Dziewonski and B. A. Romanowicz, eds., pp. 293-337, Elsevier, Amsterdam, 2007.

____ Hazen, R. M., and J. S. Trefil, *Science Matters,* 2nd ed., Doubleday, New York, in press.

3816 Hinrichsen, B., R. E. Dinnebier, H. Liu, and M. Jansen, The high pressure crystal structures of tin sulphate: a case study for maximal information recovery from 2D powder diffraction data, *Z. Kristallogr. 223,* 195-203, 2008.

3757 Hong, X., G. Shen, V. B. Prakapenka, M. L. Rivers, and S. R. Sutton, Density measurements of noncrystalline materials at high pressure with diamond anvil cell, *Rev. Sci. Instrum. 78,* 103905, 2007.

3879 Huntress, W. T., Jr., A date that will live in fame, in *Space: The First Step,* A. Zakharov, O. Zakutnyaya, and V. Kornilenko, eds., pp. 27-33, Space Research Institute of Russian Academy of Sciences, Moscow, 2007.

3832 Huntress, W. T., Jr., ed., *The Next Steps in Exploring Deep Space,* Universities Press (India), Hyderabad, 146 pp., 2007.

3773 Jacobsen, M. K., R. S. Kumar, A. L. Cornelius, S. V. Sinogeikin, and M. F. Nicol, High pressure x-ray diffraction studies of $Bi_{2-x}Sb_xTe_3$ (x = 0,1,2), in *Shock Compression of Condensed Matter—2007,* M. Elert et al., eds., pp. 171-174, AIP Conference Proceedings 955, American Institute of Physics, Melville, N.Y., 2007.

3804 Jia, L., J. R. Sun, F. W. Wang, T. Y. Zhao, H. W. Zhang, B. G. Shen, D. X. Li, S. Nimori, Y. Ren, and Q. S. Zeng, Volume dependence of the magnetic coupling in $LaFe_{13-x}Si_x$ based compounds, *Appl. Phys. Lett. 92,* 101904, 2008.

3864 Johnson, A. P., H. J. Cleaves, J. P. Dworkin, D. P. Glavin, A. Lazcano, and J. L. Bada, The Miller volcanic spark discharge experiment, *Science 322,* 404, 2008.

____ Jung, H., Y. Fei, P. G. Silver, and H. W. Green II, Frictional sliding in serpentine at very high pressure, *Earth Planet. Sci. Lett.,* in press.

3853 Kalita, P. E., A. L. Cornelius, K. E. Lipinska-Kalita, C. L. Gobin, and H. P. Liermann, *In situ* observations of temperature- and pressure-induced phase transitions in TiH_2: angle-dispersive and synchrotron energy-dispersive X-ray diffraction studies, *J. Phys. Chem. Solids 69,* 2240-2244, 2008.

____ Klotchko, K., G. D. Cody, J. A. Tossell, P. Dera, and A. J. Kaufman, Re-evaluating boron speciation in biogenic calcite and aragonite using 11B MAS NMR, *Geochim. Cosmochim. Acta,* in press.

3841 Knope, K. E., and C. L. Cahill, Structural variation within homometallic uranium(VI) carboxyphosphonates: in situ ligand synthesis, directed assembly, metal-ligand coordination, and hydrogen bonding, *Inorg. Chem. 47,* 7660-7672, 2008.

3882 Kolb, V. M., M. Bajagic, P. J. Liesch, A. Philip, and G. D. Cody, On the Maillard reaction of meteoritic amino acids, in *Instruments, Methods, and Missions for Astrobiology IX,* R. B. Hoover, G. V. Levin, and A. Y. Rozanov, eds., Paper 63090B, SPIE Proceedings Vol. 6309, SPIE, Bellingham, Wash., 2006.

3787 Kulkarni, S. R., N. A. Phatak, S. K. Saxena, Y. Fei, and J. Hu, High pressure structural behavior and synthesis of Zr_2SC, *J. Phys.: Cond. Matter 20,* 135211, 2008.

3849 Kumar, R. S., A. Svane, G. Vaitheeswaran, V. Kanchana, E. D. Bauer, M. Hu, M. F. Nicol, and A. L. Cornelius, Pressure-induced valence change in $YbAl_3$: a combined high-pressure inelastic x-ray scattering and theoretical investigation, *Phys. Rev. B 78,* 075117, 2008.

3859 Lee, S. K., G. D. Cody, Y. Fei, and B. O. Mysen, Oxygen-17 nuclear magnetic resonance study of the structure of mixed cation calcium-sodium silicate glasses at high pressure: implications for molecular link to element partitioning between silicate liquids and crystals, *J. Phys. Chem. B 112,* 11756-11761, 2008.

3819 Lee, S. K., J.-F. Lin, Y. Q. Cai, N. Hiraoka, P. J. Eng, T. Okuchi, H. K. Mao, Y. Meng, M. Y. Hu, P. Chow, J. Shu, B. Li, H. Fukui, B. M. Lee, H. N. Kim, and C.-S. Yoo, X-ray Raman scattering study of $MgSiO_3$ glass at high pressure: implication for triclustered $MgSiO_3$ melt in Earth's mantle, *Proc. Natl. Acad. Sci. USA 105,* 7925-7929, 2008.

3830 Li, J., Electronic transitions and spin states in the lower mantle, in *Post-Perovskite: The Last Mantle Phase Transition,* K. Hirose et al., eds., pp. 46-68, American Geophysical Union, Washington, D.C., 2007.

____ Lin, J.-F., H. Watson, G. Vankó, E. E. Alp, V. B. Prakapenka, P. Dera, V. V. Struzhkin, A. Kubo, J. Zhao, C. McCammon, and W. J. Evans, Intermediate-spin ferrous iron in lowermost mantle post-perovskite and perovskite, *Nature Geosci.,* in press.

3854 Lipinska-Kalita, K. E., O. A. Hemmers, P. E. Kalita, G. Mariotto, S. Gramsch, R. J. Hemley, and T. Hartmann, High-pressure structural integrity and structural transformations of glass-derived nanocomposites: a review, *J. Phys. Chem. Solids 69,* 2268-2273, 2008.

3866 Litasov, K. D., Y. Fei, E. Ohtani, T. Kuribayashi, and K. Funakoshi, Thermal equation of state of magnesite to 32 GPa and 2073 K, *Phys. Earth Planet. Inter. 168,* 191-203, 2008.

3848 Liu, H., L. Wang, X. Xiao, F. De Carlo, J. Feng, H. K. Mao, and R. J. Hemley, Anomalous high-pressure behavior of amorphous selenium from synchrotron x-ray diffraction and microtomography, *Proc. Natl. Acad. Sci. USA 105,* 13229-13234, 2008.

3845 Lundin, S., K. Catalli, J. Santillán, S.-H. Shim, V. B. Prakapenka, M. Kunz, and Y. Meng, Effect of Fe on the equation of state of mantle silicate perovskite over 1 Mbar, *Phys. Earth Planet. Inter. 168,* 97-102, 2008.

3750 Luo, W., R. Ahuja, Y. Ding, and H. K. Mao, Unusual lattice dynamics of vanadium under high pressure, *Proc. Natl. Acad. Sci. USA 104,* 16428-16431, 2007.

3884 Mao, H. K., and W. L. Mao, Theory and practice—Diamond-anvil cells and probes for high *P–T* mineral physics studies, in *Treatise on Geophysics, Vol. 2: Mineral Physics,* A. M. Dziewonski and B. A. Romanowicz, eds., pp. 231-267, Elsevier, Amsterdam, 2007.

3829 Mao, W. L., A. J. Campbell, V. B. Prakapenka, R. J. Hemley, and H. K. Mao, Effect of iron on the properties of post-perovskite silicate, in *Post-Perovskite: The Last Mantle Phase Transition,* K. Hirose et al., eds., pp. 37-46, American Geophysical Union, Washington, D.C., 2007.

3856 Mao, W. L., V. V. Struzhkin, A. Q. R. Baron, S. Tsutsui, C. E. Tommaseo, H.-R. Wenk, M. Y. Hu, P. Chow, W. Sturhahn, J. Shu, R. J. Hemley, D. L. Heinz, and H. K. Mao, Experimental determination of the elasticity of iron at high pressure, *J. Geophys. Res. 113,* B09213, 10.1029/2007JB005229, 2008.

3775 Martin, C. D., Y. Meng, V. Prakapenka, and J. B. Parise, Gasketing optimized for large sample volume in the diamond anvil cell: first application to $MgGeO_3$ and implications for structural systematics of the perovskite to post-perovskite transition, *J. Appl. Crystallogr. 41,* 38-43, 2008.

3792 Martins, Z., C. M. O'D. Alexander, G. E. Orzechowska, M. L. Fogel, and P. Ehrenfreund, Indigenous amino acids in primitive CR meteorites, *Meteoritics Planet. Sci. 42,* 2125-2136, 2007.

3825 Martins, Z., O. Botta, M. L. Fogel, M. A. Sephton, D. P. Glavin, J. S. Watson, J. P. Dworkin, A. W. Schwartz, and P. Ehrenfreund, Extraterrestrial nucleobases in the Murchison meteorite, *Earth Planet. Sci. Lett. 270,* 130-136, 2008.

____ McCanta, M. C., A. H. Treiman, M. D. Dyar, C. M. O'D. Alexander, D. Rumble III, and E. J. Essene, The LaPaz Icefield 04840 meteorite: mineralogy, metamorphism, and origin of an amphibole- and biotite-bearing R chondrite, *Geochim. Cosmochim. Acta,* in press.

3762 McCarthy, M. D., R. Benner, C. Lee, and M. L. Fogel, Amino acid nitrogen isotopic fractionation patterns as indicators of heterotrophy in plankton, particulate, and dissolved organic matter, *Geochim. Cosmochim. Acta 71,* 4727-4744, 2007.

____ McCarty, G. W., L. L. McConnell, C. J. Hapeman, A. Sadeghi, C. Graff, W. D. Hively, M. W. Lang, T. R. Fisher, T. Jordan, C. P. Rice, E. E. Codling, D. Whitall, A. Lynn, J. Keppler, and M. L. Fogel, Water quality and conservation practice effects in the Choptank River watershed, *J. Soil Water Conserv.,* in press.

3839 Meng, Y., P. J. Eng, J. S. Tse, D. M. Shaw, M. Y. Hu, J. Shu, S. A. Gramsch, C.-C. Kao, R. J. Hemley, and H. K. Mao, Inelastic x-ray scattering of dense solid oxygen: evidence for intermolecular bonding, *Proc. Natl. Acad. Sci. USA 105,* 11640-11644, 2008.

____ Meng, Y., C. S. Yan, J. Lai, S. Krasnicki, H. Shu, Q. Liang, H. K. Mao, and R. J. Hemley, Enhanced optical properties of chemical vapor deposited single crystal diamond by low-pressure/high-temperature annealing, *Proc. Natl. Acad. Sci. USA,* in press.

3774 Militzer, B., and W. B. Hubbard, Implications of shock wave experiments with precompressed materials for giant planet interiors, in *Shock Compression of Condensed Matter—2007,* M. Elert et al., eds., pp. 1395-1398, AIP Conference Proceedings 955, American Institute of Physics, Melville, N.Y., 2007.

____ Miyakawa, S., and H. J. Cleaves, Eutectic reactions and the origin of life, in *Recent Development of Chemistry and Photochemistry in Ice,* N. Takenaka, ed., Research Signpost, Trivandrum, India, in press.

3777 Mysen, B. O., Olivine/melt transition metal partitioning, melt composition, and melt structure—influence of Al^{3+} for Si^{4+} substitution in the tetrahedral network of silicate minerals, *Geochim. Cosmochim. Acta 71,* 5500-5513, 2007.

____ Mysen, B. O., Olivine/melt transition metal partitioning, melt composition, and melt structure—melt polymerization and Q^n-speciation in alkaline earth silicate systems, *Geochim. Cosmochim. Acta,* in press.

____ Mysen, B. O., G. D. Cody, and P. L. Morrill, Solution behavior of reduced C-O-H volatiles in silicate melts at high pressure and temperature, *Geochim. Cosmochim. Acta,* in press.

____ Mysen, B. O., S. Yamashita, and N. Chertkova, Solubility and solution mechanisms of NOH volatiles in silicate melts at high pressure and temperature—ammine groups and hydrogen fugacity, *Am. Mineral.,* in press.

____ Newsome, S. D., M. A. Etnier, D. H. Monson, and M. L. Fogel, Retrospective characterization of killer whale (*Orcinus orca*) maternal strategies and foraging ecology via $\delta^{13}C$ and $\delta^{15}N$ analysis of teeth, *Mar. Ecol. Prog. Ser.,* in press.

3747 Newsome, S. D., C. Martinez del Rio, S. Bearhop, and D. L. Phillips, A niche for isotopic ecology, *Front. Ecol. Environ. 5,* 429-436, 2007.

____ Newsome, S. D., M. T. Tinker, D. H. Monson, O. Oftedal, K. Ralls, M. L. Fogel, and J. A. Estes, Using stable isotopes to investigate individual diet specialization in California sea otters (*Enhydra lutris nereis*), *Ecology,* in press.

3768 Noffke, N., N. Beukes, D. Bower, R. M. Hazen, and D. J. P. Swift, An actualistic perspective into Archean worlds—(cyano-)bacterially induced sedimentary structures in the siliciclastic Nhlazatse Section, 2.9 Ga Pongola Supergroup, South Africa, *Geobiology 6,* 5-20, 2008.

____ Ohmoto, H., B. Runnegar, L. R. Kump, M. L. Fogel, B. Kamber, A. D. Anbar, P. L. Knauth, D. R. Lowe, D. Y. Sumner, and Y. Watanabe, Biosignatures in ancient rocks: a summary of discussions at Field Workshop on Biosignatures in Ancient Rocks, *Astrobiology,* in press.

3827 Ono, S., Multiple-sulphur isotope biosignatures, *Space Sci. Rev. 135,* 203-220, 2008.

3840 Phatak, N. A., S. R. Kulkarni, V. Drozd, S. K. Saxena, L. Deng, Y. Fei, J. Hu, W. Luo, and R. Ahuja, Synthesis and compressive behavior of Cr_2GeC up to 48 GPa, *J. Alloys Compounds 463,* 220-225, 2008.

3844 Ponosov, Yu. S., V. V. Struzhkin, S. V. Streltsov, and A. F. Goncharov, Pressure-induced effect on electronic excitations in osmium, *J. Phys.: Conf. Ser. 121,* 042001, 2008. Available online at http://www.iop.org/EJ/journal/1742-6596.

3778 Ponosov, Yu. S., V. V. Struzhkin, S. V. Streltsov, and A. F. Goncharov, Light scattering by electrons in osmium: effect of pressure, *JETP Lett. 86,* 398-403, 2007.

3753 Pravica, M., O. Grubor-Urosevic, M. Hu, P. Chow, B. Yulga, and P. Liermann, X-ray Raman spectroscopic study of benzene at high pressure, *J. Phys. Chem. B 111,* 11635 -11637, 2007.

3771 Pravica, M., Z. Quine, E. Romano, S. Bajar, B. Yulga, W. Yang, and D. Hooks, Anisotropic decomposition of energetic materials, in *Shock Compression of Condensed Matter—2007,* M. Elert et al., eds., pp. 1117-1120, AIP Conference Proceedings 955, American Institute of Physics, Melville, N.Y., 2007.

3809 Presnall, D. C., and G. H. Gudfinnsson, Origin of the oceanic lithosphere, *J. Petrol. 49,* 615-632, 2008.

____ Roskosz, M., M. J. Toplis, D. R. Neuville, and B. O. Mysen, Quantification of the kinetics of iron oxidation in silicate melts using Raman spectroscopy: What role of oxygen diffusion?, *Am. Mineral.,* in press.

3818 Rotundi, A., G. A. Baratta, J. Borg, J. R. Brucato, H. Busemann, L. Colangeli, L. D'Hendecort, Z. Djouadi, G. Ferrini, I. A. Franchi, M. Fries, F. Grossemy, L. P. Keller, V. Mennella, K. Nakamura, L. R. Nittler, M. E. Palumbo, S. A. Sandford, A. Steele, and B. Wopenka, Combined micro-Raman, micro-infrared, and field emission scanning electron microscope analyses of Comet 81P/Wild 2 particles collected by Stardust, *Meteoritics Planet. Sci. 43,* 367-397, 2008.

3811 Rouxel, O., S. Ono, J. Alt, D. Rumble, and J. Ludden, Sulfur isotope evidence for microbial sulfate reduction in altered oceanic basalts at ODP Site 801, *Earth Planet. Sci. Lett. 268,* 110-123, 2008.

3892 Rumble, D., III, Earth's early atmosphere, biosphere, lithosphere, and hydrosphere, in *Chemical Evolution across Space and Time,* L. Zaikowski and J. M. Friedrich, eds., pp. 261-281, ACS Symposium Series 981, Oxford University Press, New York, 2008.

3748 Santoro, M., E. Gregoryanz, H. K. Mao, and R. J. Hemley, Anomalous optical emission in hot dense oxygen, *Solid State Commun. 144,* 225-229, 2007.

3880 Schrenk, M. O., J. F. Holden, and J. A. Baross, Magma-to-microbe networks in the context of sulfide hosted microbial ecosystems, in *Magma to Microbe: Modeling Hydrothermal Processes at Ocean Spreading Centers,* R. P. Lowell et al., eds., pp. 233-258, American Geophysical Union, Washington, D.C., 2008.

3806 Schröder, S., A. Bekker, N. J. Beukes, H. Strauss, and H. S. van Niekerk, Rise in seawater sulphate concentration associated with the Paleoproterozoic positive carbon isotope excursion: evidence from sulphate evaporites in the ~2.2–2.1 Gyr shallow-marine Lucknow Formation, South Africa, *Terra Nova 20,* 108-117, 2008. [Correction published in *Terra Nova 20,* 252, 2008.]

3746 Schweizer, M. K., A. Steele, J. K. W. Toporski, and M. L. Fogel, Stable isotopic evidence for fossil food webs in Eocene Lake Messel, *Paleobiology 33,* 590-609, 2007.

3808 Scott, C., T. W. Lyons, A. Bekker, Y. Shen, S. W. Poulton, X. Chu, and A. D. Anbar, Tracing the stepwise oxygenation of the Proterozoic ocean, *Nature 452,* 456-459, 2008.

3872 Scott, H. P., B. Kiefer, C. D. Martin, N. Boateng, M. R. Frank, and Y. Meng, *P-V* equation of state for Fe_2P and pressure-induced phase transition in Fe_3P, *High Pressure Res. 28,* 375-384, 2008.

3760 Scott, H. P., Z. Liu, R. J. Hemley, and Q. Williams, High-pressure infrared spectra of talc and lawsonite, *Am. Mineral. 92,* 1814-1820, 2007.

3764 Seager, S., M. Kuchner, C. A. Hier-Majumder, and B. Militzer, Mass-radius relationships for solid exoplanets, *Astrophys. J. 669,* 1279-1297, 2007.

3867 Shen, G., P. Chow, Y. Xiao, S. Sinogeikin, Y. Meng, W. Yang, H.-P. Liermann, O. Shebanova, E. Rod, A. Bommannavar, and H. K. Mao, HPCAT: an integrated high-pressure synchrotron facility at the Advanced Photon Source, *High Pressure Res. 28,* 145-162, 2008.

3788 Singh, A. K., H.-P. Liermann, Y. Akahama, S. K. Saxena, and E. Menéndez-Proupin, Strength of polycrystalline coarse-grained platinum to 330 GPa and of nanocrystalline platinum to 70 GPa from high-pressure x-ray diffraction data, *J. Appl. Phys. 103,* 063524, 2008.

3800 Somayazulu, M., J. Shu, C.-S. Zha, A. F. Goncharov, O. Tschauner, H. K. Mao, and R. J. Hemley, *In situ* high-pressure x-ray diffraction study of H_2O ice VII, *J. Chem. Phys. 128,* 064510, 2008. [Correction published in *J. Chem. Phys. 128*, 149903, 2008.]

3851 Soyer Uzun, S., S. J. Gaudio, S. Sen, Q. Mei, C. J. Benmore, C. A. Tulk, J. Xu, and B. G. Aitken, In situ high-pressure X-ray diffraction study of densification of a molecular chalcogenide glass, *J. Phys. Chem. Solids 69,* 2336-2340, 2008.

____ Steele, A., D. W. Beaty, J. Amend, R. Anderson, L. Beegle, L. G. Benning, J. Bhattacharya, D. Blake, W. Brinckerhoff, J. Biddle, S. Cady, P. Conrad, J. Lindsay, R. Mancinelli, G. Mungas, J. Mustard, K. Oxnevad, J. Toporski, and H. Waite, The science goals of the Astrobiology Field Laboratory (AFL). Report of the MEPAG Science Steering Group, *Astrobiology,* in press.

3780 Steele, A., M. D. Fries, H. E. F. Amundsen, B. O. Mysen, M. L. Fogel, M. Schweizer, and N. Z. Boctor, Comprehensive imaging and Raman spectroscopy of carbonate globules from Martian meteorite ALH84001 and a terrestrial analogue from Svalbard, *Meteoritics Planet. Sci. 42,* 1549-1566, 2007.

3813 Struzhkin, V. V., A. F. Goncharov, R. Caracas, H. K. Mao, and R. J. Hemley, Synchrotron infrared spectroscopy of the pressure-induced insulator-metal transitions in glassy As_2S_3 and As_2Se_3, *Phys. Rev. B 77,* 165133, 2008.

3752 Struzhkin, V. V., B. Militzer, W. L. Mao, H. K. Mao, and R. J. Hemley, Hydrogen storage in molecular clathrates, *Chem. Rev. 107,* 4133-4151, 2007.

3838 Sverjensky, D. A., C. M. Jonsson, C. L. Jonsson, H. J. Cleaves, and R. M. Hazen, Glutamate surface speciation on amorphous titanium dioxide and hydrous ferric oxide, *Environ. Sci. Technol. 42,* 6034-6039, 2008.

____ Terwilliger, V. J., Z. Eshetu, A. Colman, T. Bekele, A. Gezahgne, and M. L. Fogel, Reconstructing palaeoenvironment from $\delta^{13}C$ and $\delta^{15}N$ values of soil organic matter: a calibration from arid and wetter elevation transects in Ethiopia, *Geoderma,* in press.

3790 Tschauner, O., B. Kiefer, H. Liu, S. Sinogeikin, M. Somayazulu, and S.-N. Luo, Possible structural polymorphism in Al-bearing magnesiumsilicate post-perovskite, *Am. Mineral. 93,* 533-539, 2008.

____ Ueno, Y., S. Ono, D. Rumble, and S. Maruyama, Quadruple sulfur isotope analysis of ca. 3.5 Ga Dresser Formation: new evidence for microbial sulfate reduction in the early Archean, *Geochim. Cosmochim. Acta,* in press.

3888 Van Orman, J. A., S. Keshav, and Y. Fei, High-pressure solid/liquid partitioning of Os, Re, and Pt in the Fe-S system, *Earth Planet. Sci. Lett. 274,* 250-257, 2008.

____ Vennila, R. S., V. Drozd, L. George, S. K. Saxena, P. Liermann, H. Liu, A. C. Stowe, P. Berseth, D. Anton, and R. Zidan, Structural study of ball-milled sodium alanate under high pressure, *J. Alloys Compounds,* in press.

3847 Wang, Y., J. Zhang, J. Wu, J. L. Coffer, Z. Lin, S. V. Sinogeikin, W. Yang, and Y. Zhao, Phase transition and compressibility in silicon nanowires, *Nano Lett. 8,* 2891-2895, 2008.

3861 Wang, Z., Y. Zhao, C.-S. Zha, Q. Xiue, R. T. Downs, R.-G. Duan, R. Caracas, and X. Liao, X-ray induced synthesis of 8H diamond, *Adv. Mater. 20,* 3303-3307, 2008.

3833 Watson, H. C., E. B. Watson, and Y. Fei, Diffusion of Au, Pd, Re, and P in FeNi alloys at high pressure, *Geochim. Cosmochim. Acta 72,* 3550-3561, 2008.

3820 Wiedemann-Bidlack, F. B., A. S. Colman, and M. L. Fogel, Phosphate oxygen isotope analysis on microsamples of bioapatite: removal of organic contamination and minimization of sample size, *Rapid Commun. Mass Spectrom. 22,* 1807-1816, 2008.

3795 Wooller, M. J., R. Morgan, S. Fowell, H. Behling, and M. Fogel, A multiproxy peat record of Holocene mangrove palaeoecology from Twin Cays, Belize, *Holocene 17,* 1129-1139, 2007.

3858 Yabuta, H., M. Fukushima, M. Kawasaki, F. Tanaka, T. Kobayashi, and K. Tatsumi, Multiple polar components in poorly-humified humic acids stabilizing free radicals: carboxyl and nitrogen-containing carbons, *Org. Geochem. 39,* 1319-1335, 2008.

3871 Yamanaka, T., Electron-lattice interaction under high-pressure examined by maximum entropy method using single-crystal diffraction, *High Pressure Res. 28,* 203-216, 2008.

3756 Yang, K., Q. Cui, Y. Hou, B. Liu, Q. Zhou, J. Hu, H. K. Mao, and G. Zou, Pressure-induced crystallization and phase transformation of amorphous selenium: Raman spectroscopy and x-ray diffraction studies, *J. Phys.: Cond. Matter 19,* 425220, 2007.

3842 Yang, L. X., Y. W. Long, C. Q. Jin, R. C. Yu, J. S. Zhou, J. B. Goodenough, H. Z. Liu, G. Y. Shen, and H. K. Mao, Pressure induced metallization in $ACrO_3$ in perovskite compounds, *J. Phys.: Conf. Ser. 121,* 022017, 2008. Available online at http://www.iop.org /EJ/journal/1742-6596.

3870 Yang, W., G. Shen, Y. Wang, and H. K. Mao, A scanning angle energy-dispersive X-ray diffraction technique for high-pressure structure studies in diamond anvil cells, *High Pressure Res. 28,* 193-201, 2008.

3755 Yoshimura, Y., H. K. Mao, and R. J. Hemley, *In situ* Raman spectroscopy of reversible low-temperature transition between low-density and high-density amorphous ices, *J. Phys.: Cond. Matter 19,* 425214, 2007.

3843 Yoshimura, Y., H. K. Mao, and R. J. Hemley, In-situ Raman study of the pressure-induced bulk melting of hexagonal ice, *J. Phys.: Conf. Ser. 121,* 042004, 2008. Available online at http://www.iop.org/EJ/journal/1742-6596.

3791 Zeng, Q., Z. He, X. San, Y. Ma, F. Tian, T. Cui, B. Liu, G. Zou, and H. K. Mao, A new phase of solid iodine with different molecular covalent bonds, *Proc. Natl. Acad. Sci. USA 105,* 4999-5001, 2008.

3786 Zha, C.-S., K. Mibe, W. A. Bassett, O. Tschauner, H. K. Mao, and R. J. Hemley, *P-V-T* equation of state of platinum to 80 GPa and 1900 K from internal resistive heating/x-ray diffraction measurements, *J. Appl. Phys. 103,* 054908, 2008.

3812 Zhang, L., and Y. Fei, Effect of Ni on Fe-FeS phase relations at high pressure and high temperature, *Earth Planet. Sci. Lett. 268,* 212-218, 2008.

3823 Zhang, L., and Y. Fei, Melting behavior of (Mg,Fe)O solid solutions at high pressure, *Geophys. Res. Lett. 35,* L13302, 10.1029/2008GL034585, 2008.

3855 Zhang, L., Z. Gong, and Y. Fei, Shock-induced phase transitions in the MgO-FeO system to 200 GPa, *J. Phys. Chem. Solids 69,* 2344-2348, 2008.

3810 Zhang, Z. M., J. S. Yang, H. Rong, J. Z. Hu, J. F. Shu, and H. K. Mao, Discovery of diamond in eclogite from the Chinese Continental Scientific Drilling Project Main Hole (CCSD-MH) in the Sulu UHPM belt [in Chinese], *Acta Petrol. Sin. 23,* 3201-3206, 2007.

3799 Ziegelgruber, K. L., K. E. Knope, M. Frisch, and C. L. Cahill, Hydrothermal chemistry of Th(IV) with aromatic dicarboxylates: new framework compounds and *in situ* ligand syntheses, *J. Solid State Chem. 181,* 373-381, 2008.

GLOBAL ECOLOGY

Archer, C. L., and K. Caldeira, Historical trends in the jet streams, *Geophys. Res. Lett. 35*, L08803, doi: 10.1029/2008GL033614, 2008.

Asner, G. P., Hyperspectral remote sensing of canopy chemistry, physiology, and biodiversity in tropical rainforests, in *Hyperspectral Remote Sensing of Tropical and Subtropical Forests*, M. Kalacska and G. Arturo Sanchez-Azofeifa, eds. pp. 261-297, CRC Press, Boca Raton, Fla., 2008.

Asner, G. P., R. S. Haxo, and D. E. Knapp, Computing for analysis and modeling of hyperspectral imagery, in *High Performance Computing in Remote Sensing*, A. Plaza and C. Chang, eds., pp. 109-130, Chapman & Hall/CRC, 2007.

Asner, G. P., R. F. Hughes, P. M. Vitousek, D. E. Knapp, T. Kennedy-Bowdoin, J. Boardman, R. E. Martin, M. Eastwood, and R. O. Green, Invasive plants transform the three-dimensional structure of rain forests, *Proc. Natl. Acad. Sci. USA 105*, 4519- 4523, doi: 10.1073/pnas.0710811105, 2008.

Asner, G .P., M. O. Jones, R. E. Martin, D. E. Knapp, and R. F. Hughes, Remote sensing of native and invasive species in Hawaiian forests, *Remote Sens. Environ. 112*, 1912-1926, 2008.

Asner, G. P., D. E. Knapp, T. Kennedy-Bowdoin, M. O. Jones, R. E. Martin, J. Boardman, and C. B. Field, Carnegie Airborne Observatory: in-flight fusion of hyperspectral imaging and waveform light detection and ranging (wLiDAR) for three-dimensional studies of ecosystems, *J. Appl. Remote Sens. 1*, 1-21, 2007.

Asner, G. P., D. E. Knapp, T. Kennedy-Bowdoin, M. O. Jones, R. E. Martin, J. Boardman, and R. F. Hughes, Invasive species detection in Hawaiian rainforests using airborne imaging spectroscopy and LiDAR, *Remote Sens. Environ. 112*, 1942-1955, 2008.

Asner, G. P., and R. E. Martin, Airborne spectranomics: mapping canopy chemical and taxonomic diversity in tropical forests, *Frontiers Ecol. Environ. 7*, doi: 10.1890/070152, 2008.

Ayres, E., D. H. Wall, B. L. Simmons, C. B. Field, D. G. Milchunas, J. A. Morgan, and J. Roy, Belowground nematode herbivores are resistant to elevated atmospheric CO_2 concentrations in grassland ecosystems, *Soil Biol. Biochem. 40*, 978-985, 2008.

Boelman, N. T., G. P. Asner, P. J. Hart, and R. E. Martin, Multi-trophic invasion resistance in Hawaii: bioacoustics, field surveys, and airborne remote sensing, *Ecol. Appl. 17*, 2137-2144, 2007.

Broadbent, E. N., G. P. Asner, M. Keller, D. E. Knapp, P. J. C. Oliveira, and J. N. Silva, Forest fragmentation and edge effects from deforestation and selective logging in the Brazilian Amazon, *Biol. Conserv. 141,* 1745-1757, doi: 10.1016/j.biocon.2008.04.024, 2008.

Broadbent, E. N., G. P. Asner, M. Peña-Claros, M. Palace, and M. Soriano, Spatial partitioning of biomass and diversity in a lowland Bolivian forest: linking field and remote sensing measurements, *For. Ecol. Manage. 255*, 2602-2616, doi:10.1016/j.foreco.2008.01.044, 2008.

Browning, D. E., S. R. Archer, G. P. Asner, M. P. McClaran, and C.A. Wessman, Woody plants in grasslands: post-encroachment stand dynamics, *Ecol. Appl. 18*, 928-944, 2008.

Buesseler, K. O., S. C. Doney, D. M. Karl, P. W. Boyd, K. Caldeira, F. Chai, K. H. Coale, H. J. W. de Baar, P. G. Falkowski, K. S. Johnson, R. S. Lampitt, A. F. Michaels, S.W.A. Naqvi, V. Smetacek, S. Takeda, and A. J. Watson, Ocean iron fertilization—moving forward in a sea of uncertainty, *Science 319*, 162, 2008.

Caldeira, K., D. Archer, J. P. Barry, R. G. J. Bellerby, P. G. Brewer, L. Cao, A. G. Dickson, S. C. Doney, H. Elderfield, V. J. Fabry, R. A. Feely, J.-P. Gatusso, P. M. Haugan, O. Hoegh-Guldberg, A. K. Jain, J. A. Kleypas, C. Langdon, J. C. Orr, A. Ridgwell, C. L. Sabine, B. A. Seibel, Y. Shirayama, C. Turley, A. J. Watson, and R. E. Zeebe, Comment on "Modern-age buildup of CO_2 and its effects on seawater acidity and salinity" by Hugo A. Loaiciga, *Geophys. Res. Lett. 34*, LI8608, doi: 10.1029/ 2006GL027288, 2007.

Caldeira, K., P. R. Lankao, and A. Z. Rose, The carbon cycle of North America in a global context, in *The First State of the Carbon Cycle Report (SOCCR)-Synthesis and Assessment Product 2.2, Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research*, A. W. King, L. Dilling, G. P. Zimmerman, D. M. Fairman, R. A. Houghton, G. Marland, A. Z. Rose, and T. J. Wilbanks, eds., pp. 37-48, U.S. Climate Change Science Program and the Subcommittee on Global Change Research, 2007.

Caldeira, K., and L. Wood, Global and Arctic climate engineering: numerical model studies, *Phil. Trans. Roy. Soc. London A 366*, 4039-4056, doi: 10.1098/ rsta.2008.0132, 2008.

Campbell, J. E., D. B. Lobell, R. C. Genova, and C. B. Field, The global potential of bioenergy on abandoned agricultural lands, *Envir. Sci. Technol. 42*, 5791-5794, doi: 10.1021/es800052w, 2008.

Canadell, J. G., C. Le Quere, M. R. Raupach, C. B. Field, E. T. Buitenhuis, P. Ciais, T. J. Conway, N. P. Gillett, R. A. Houghton, and G. Marland, Contributions to accelerating atmospheric CO_2 growth from economic activity, carbon intensity, and efficiency of natural sinks, *Proc. Natl. Acad. Sci. USA 104,* 18353-18354, doi: 10.1073/pnas.0702737104, 2007.

Carlson, K. M., G. P. Asner, R. F. Hughes, R. Ostertag, and R. E. Martin, Hyperspectral remote sensing of canopy biodiversity in Hawaiian lowland rainforests, *Ecosystems 10*, 536-549, doi: 10.1007/s10021-007-9041-z, 2007.

Chambers, J. Q., G. P. Asner, D. C. Morton, L. O. Anderson, S. S. Saatchi, F. D. B. Espirito-Santo, M. Palace, and C. Souza, Jr., Regional ecosystem structure and function: ecological insights from remote sensing of tropical forests, *Trends Ecol. Evol. 22*, 414-423, 2007.

Davidson, E. A., G. P. Asner, T. A. Stone, C. Neill, and R. O. Figueiredo, Objective indicators of pasture degradation from spectral mixture analysis of Landsat imagery, *J. Geophys. Res. 113*, G00B03, doi: 10.1029/2007JG000622, 2008.

Ellis, E. C., and N. Ramankutty, Putting people in the map: anthropogenic biomes of the world, *Frontiers Ecol. Environ. 6*, 439-447, doi: 10.1890/070062, 2008.

Feret, J.-B., C. François, G. P. Asner, A. A. Gitelson, R. E. Martin, L. P. R. Bidel, S. L. Ustin, G. leMaire, and S. Jacquemoud, PROSPECT-4 and 5: advances in the leaf optical properties model separating photosynthetic pigments, *Remote Sens. Environ. 110*, doi: 10.1016/j.rse.2008.02.012, 2008.

Field, C.B., D. B. Lobell, H. A. Peters, and N. R. Chiariello, Feedbacks of terrestrial ecosystems to climate change, *Annu. Rev. Environ. Res. 32*, 1-29. 2007.

Field, C. B., L. D. Mortsch, M. Brklacich, D. L. Forbes, P. Kovacs, J. A. Patz, S.W. Running, and M. J. Scott, North America climate change 2007: impacts, adaptation, and vulnerability, in *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson, eds., pp. 617-652, Cambridge University Press, Cambridge, 2007.

Field, C. B., J. Sarmiento, and B. Hales, The carbon cycle of North America in a global context, in *The First State of the Carbon Cycle Report (SOCCR)-Synthesis and Assessment Product 2.2, Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research,* A. W. King, L. Dilling, G. P. Zimmerman, D. M. Fairman, R. A. Houghton, G. Marland, A. Z. Rose, and T. J. Wilbanks, eds., pp. 21-28, U.S. Climate Change Science Program and the Subcommittee on Global Change Research, 2007.

Foley, J. A., G. P. Asner, M. H. Costa, M. T. Coe, R. DeFries, H. K. Gibbs, E. A. Howard, S. Olson, J. Patz, N. Ramankutty, and P. Snyder, Amazonia revealed: forest degradation and loss of ecosystem goods and services in the Amazon Basin, *Frontiers Ecol. Environ. 5*, 25-32, 2007.

Gullison, R. E., P. C. Frumhoff, J. G. Canadell, C. B. Field, D. C. Nepstad, K. Hayhoe, R. Avissar, L. M. Curran, P. Friedlingstein, C. D. Jones, and C. Nobre, Tropical forests and climate policy, *Science 316*, 985-986, 2007.

Gurwick, N. P., P. M. Groffman, J. B. Yavitt, A. J. Gold, G. Blazejewski, and M. Stolt, Microbially available carbon in buried riparian soils in a glaciated landscape, *Soil Biol. Biochem. 40*, 85-96, 2007.

Gurwick, N. P., D. M. McCorkle, P. M. Groffman, A. J. Gold, D. Q. Kellogg, and P. Seitz-Rundlett, Mineralization of ancient carbon in the subsurface of riparian forests, *J. Geophys. Res. 113*, GO2021, doi: 10.1029/2007JG000482, 2008.

Haites, E., K. Caldeira, P. R. Lankao, A. Z. Rose, and T. J. Wilbanks, What are the options that could significantly affect the North American carbon cycle? chapter 4 of *The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle*, A. W. King, L. Dilling, G. P. Zimmerman, D. M. Fairman, R. A. Houghton, G. Marland, A. Z. Rose, and T. J. Wilbanks, eds., pp. 37-48, U.S. Climate Change Science Program and the Subcommittee on Global Change Research, 2007.

Hall, S. J., and G. P. Asner, Biological invasion alters regional nitrogen-oxide emissions from tropical rainforests, *Glob. Change Biol. 13*, 2143-2160, doi: 10.1111/j.1365-2486.2007.01410.x, 2007.

Hoegh-Guldberg, O., P. J. Mumby, A. J. Hooten, R. S. Steneck, P. Greenfield, E. Gomez, C. D. Harvell, P. F. Sale, A. J. Edwards, K. Caldeira, N. Knowlton, C. M. Eakin, R. Iglesias-Prieto, N. Muthiga, R. H. Bradbury, A. Dubi, and M. E. Hatziolos, Coral reefs under rapid climate change and ocean acidification, *Science 18*, 1737-1742, 2007.

Houlton, B. Z., D. M. Sigman, E. A. G. Schuur, and L. O. Hedin, A climate-driven switch in plant nitrogen acquisition within tropical forest communities, *Proc. Natl. Acad. Sci. USA 104*, 8902-8906. 2007.

Houlton, B. Z., Y.-P. Wang, P. M. Vitousek, and C. B. Field, A unifying framework for dinitrogen fixation in the terrestrial biosphere, *Nature (Lett.) 454*, 327-330, doi: 10.1038/nature07028, 2008.

Huang, C.-Y., and E. L. Geiger, Climate anomalies provide opportunities for large-scale mapping of non-native plant abundance in desert grasslands, *Divers. Distrib. 14*, 875-884, 2008.

Huang, C.-Y., S. E. Marsh, M. P. McClaran, and S. R. Archer, Postfire stand structure in a semiarid savanna: cross-scale challenges estimating biomass, *Ecol. Appl. 17*, 1899-1910, 2007.

Huang, M., G. P. Asner, M. Keller, and J. A. Berry, An ecosystem model for tropical forest disturbance and selective logging, *J. Geophys. Res. 113*, G01002, doi: 10.1029/2007JG000438, 2008.

Kaiser, J. M., G. Hastings, B. Z. Houlton, T. Rockmann, and D. M. Sigman, Triple oxygen isotope analysis of nitrate using the denitrifier method and thermal decomposition of N_2O, *Anal. Chem. 79*, 599-607, 2007.

Keller, M., G. P. Asner, G. Blate, J. McGlocklin, F. Merry, M. Peña-Claros, and J. Zweede, Timber production in selectively logged tropical forests in South America, *Frontiers Ecol. Environ. 5*, 213-216, 2007.

Lobell, D. B., M. B. Burke, C. Tebaldi, M. D. Mastrandrea, W. P. Falcon, and R. L. Naylor, Prioritizing climate change adaptation needs for food security in 2030, *Science 319*, 607-610, 2008.

Lobell, D. B., and C. B. Field, Global scale climate-crop yield relationships and the impacts of recent warming, *Environ. Res. Lett. 2*, 1-7. 2007.

Lobell, D. B., K. Nicholas-Cahill, and C. B. Field, Historical effects of temperature and precipitation on California crop yields, *Climatic Change 81*, 187-203, 2007.

Lutz, M. J., K. Caldeira, R. B. Dunbar, and M. J. Behrenfeld, Seasonal rhythms of net primary production and particulate organic carbon flux to depth describe the efficiency of biological pump in the global ocean, *J. Geophys. Res. 112*, C10011, doi: 10.1029/2006JC003706, 2007.

Matthews, H. D., and K. Caldeira, Stabilizing climate requires near-zero emissions, *Geophys. Res. Lett. 35*, L04705, doi: 10.1029/2007GL032388, 2008.

Matthews, H. D., and K. Caldeira, Transient climate-carbon simulations of planetary geoengineering, *Proc. Natl. Acad. Sci. USA 104*, 9949-9954, 2007.

Menge, D. N. L., and C. B. Field, Simulated global changes alter phosphorus demand in annual grassland, *Glob. Change Biol. 13*, 2582-2591, doi: 10.1111/j.1365-2486.2007.01456.x, 2007.

Najjar, R. G., X. Jin, F. Louanchi, O. Aumont, K. Caldeira, S. C. Doney, J.-C. Dutay, M. Follows, N. Gruber, F. Joos, K. Lindsay, E. Maier-Reimer, R. J. Matear, K. Matsumoto, P. Monfray, A. Mouchet, J. C. Orr, G.-K. Plattner, J. L. Sarmiento, R. Schlitzer, R. D. Slater, M.-F. Weirig, Y. Yamanaka, and A. Yool, Impact of circulation on export production, dissolved organic matter, and dissolved oxygen in the ocean: results from Phase II of the Ocean Carbon-Cycle Model Intercomparison Project (OCMIP-2), *Glob. Biogeochem. Cycl. 21*, GB 3007, doi: 10.1029/2006GB0028557, 2007.

Oliveira, P. J. C., G. P. Asner, D. E. Knapp, A. Almeyda, R. Galvan-Gildenmeister, S. Keene, R. F. Raybin, and R. C. Smith, Land-use allocation protects the Peruvian Amazon, *Science 317*, 1233-1236, 2007.

Palace, M., M. Keller, G. P. Asner, S. Hagen, and B. Braswell, Amazon forest structure from IKONOS satellite data and the automated characterization of forest canopy properties, *Biotropica 40*, 141-150, 2008.

Palace, M., M. Keller, G. P. Asner, J. N. M. Silva, and C. Passos, Neocromass in undisturbed and logged forests in the Brazilian Amazon, *For. Ecol. Manage. 238*, 309-318, 2007.

Peters, H. A., The significance of small herbivores in structuring annual grassland, *J. Veg. Sci. 18*, 173-180, 2007.

Rau, G. H., K. G. Knauss, W. H. Langer, and K. Caldeira, Reducing energy-related CO_2 emissions using accelerated weathering of limestone, *Energy 32*, 1471-1477, 2007.

Raupach, M. R., G. Marland, P. Ciais, C. LeQuere, J. G. Canadell, G. Klepper, and C. B. Field, Global and regional drivers of accelerating CO_2 emissions, *Proc. Natl. Acad. Sci. USA 104*, 10288-10293, 2007.

Roberts, B. W., D. H. Shepard, K. Caldeira, M. E. Cannon, D. G. Eccles, A. J. Grenier, and J. F. Freidin, Harnessing high-altitude wind power, *IEEE Trans. Energy Convers. 22*, 136-144, 2007.

Sano, E. E., L. G. Ferreira, G. P. Asner, and E. T. Steinke, Spatial and temporal probabilities of obtaining cloud-free Landsat images over the Brazilian tropical savanna, *Int. J. Remote Sens. 28*, 2739-2752, 2007.

Schuur, E. A. G., J. Bockheim, J. G. Canadell, E. Euskirchen, C. B. Field, S. V. Goryachkin, S. Hagemann, P. Kuhry, P. Lafleur, H. Lee, G. Mazhitova, F. E. Nelson, A. Rinke, V. E. Romanovsky, N. Shiklomanov, C. Tarnocai, S. Venevsky, J. G. Vogel, and S. A. Zimov, Vulnerability of permafrost carbon to climate change: implications for the global carbon cycle, *BioScience 58*, 701-714, 2008.

Schwartzman, D., K. Caldeira, and A. Pavlov, Cyanobacterial emergence at 2.8 Gya and greenhouse feedbacks, *Astrobiology 8*, 187, doi: 10.1089/ast.2006.0074, 2008.

Seibt, U., A. Rajabi, H. Griffiths, and J. Berry, Carbon isotopes and water use efficiency: sense and sensitivity, *Oecologia 115*, 441-454, doi: 10.1007/ss00442-007-0932-7, 2008.

Thayer, S. S., S. B. St. Claire, C. B. Field, and S. C. Somerville, Accentuation of phosphorus limitation in Geranium dissectum by nitrogen: an ecological genomics study, *Glob. Change Biol. 14*, 1877-1890, 2008.

Townsend, A. R., G. P. Asner, and C. C. Cleveland, The biogeochemical heterogeneity of tropical forests, *Trends Ecol. Evol. 23*, 424-431, 2008.

Townsend, A. R., C. C. Cleveland, G. P. Asner, and M. M. C. Bustamante, Controls over foliar N:P ratios in tropical rain forests, *Ecology 88*, 107-118, 2007.

Varga, T. A., and G. P. Asner, Hyperspectral and LiDAR remote sensing of fire fuels in Hawaii Volcanoes National Park, *Ecol. Appl. 18*, 613-623, 2008.

Wang, Y.-P., B. Z. Houlton, and C. B. Field, A model of biogeochemical cycles of carbon, nitrogen, and phosphorus including symbiotic nitrogen fixation and phosphatase production, *Glob. Biogeochem. Cycl. 21*, 1-15, 2007.

Wheeler, C. W., S. R. Archer, G. P. Asner, and C. R. McMurtry, Climatic/edaphic controls on soil carbon/nitrogen response to shrub encroachment in desert grassland, *Ecol. Appl. 17*, 1911-1928, 2007.

Wolf, A., and E. A. Laca, Cospectral analysis of high frequency signal loss in eddy covariance measurements, *Atmos. Chem. Phys. Discuss. 7*, 13151-13173, 2007.

Wolf, A., N. Saliendra, K. Akshalov, D. A. Johnson, and E. Laca, Effects of different eddy covariance correction schemes on energy balance closure and comparisons with the modified Bowen ratio system, *Agric. For. Meteorol. 148,* 942-952, doi: 10.1016/j.agrformet.2008.01.005, 2008.

Zeebe, R. E., and K. Caldeira, Close mass balance of long-term carbon fluxes from ice-core CO_2 and ocean chemistry records, *Nature Geosci. 1*, 312-315, doi: 10.1038/ngeo18, 2008.

Zeebe, R. E., J. C. Zachos, K. Caldeira, and T. Tyrrell, Carbon emissions and acidification, *Science 321*, 51-52, 2008.

OBSERVATORIES

Abraham, R. G., P. Nair, P. J. McCarthy, K. Glazebrook, E. Mentuch, H. Yan, et al., The Gemini Deep Deep Survey. VIII. When did early-type galaxies form? *Astrophys. J. 669*, 184, 2007.

Adelman-McCarthy, J. K., M. A. Agueros, S. S. Allam, K. S. J. Anderson, . . . A. Uomoto, et al., The Fifth Data Release of the Sloan Digital Sky Survey, *Astrophys. J. Suppl. Ser. 172*, 634, 2007.

Adelman-McCarthy, J. K., M. A. Agueros, S. S. Allam, C. Allende Prieto, . . . A. Uomoto, et al., The Sixth Data Release of the Sloan Digital Sky Survey, *Astrophys. J. Suppl. Ser. 175*, 297, 2008.

Alonso-Herrero, A., P. G. Perez-Gonzalez, G. H. Rieke, D. M. Alexander, J. R. Rigby, et al., The host galaxies and black holes of typical *z* ~ 0.5-1.4 AGNs, *Astrophys. J. 677*, 127, 2008.

Appleton, P. N., A. Gil de Paz, B. Madore, et al., Massive star formation and dust in collisional ring galaxies: from GALEX to Spitzer, in *The Second Annual Spitzer Science Center Conference: Infrared Diagnostics of Galaxy Evolution*, ASP Conf. Series 381, R.-R. Chary, H. I. Teplitz, and K. Sheth, eds., p. 128, Astronomical Society of the Pacific, San Francisco, 2008.

Basu-Zych, A. R., D. Schiminovich, B. D. Johnson, C. Hoopes, . . . B. F. Madore, . . . M. Seibert, et al., The young and dustless: interpreting radio observations of ultraviolet-luminous galaxies, *Astrophys. J. Suppl. Ser. 173*, 457, 2007.

Begum, A., J. N. Chengalur, R. C. Kennicutt, I. D. Karachentsev, and J. C. Lee, Life in the last lane: star formation and chemical evolution in an extremely gas rich dwarf, *Mon. Not. Roy. Astron. Soc. 383*, 809, 2008.

Bennert, N., G. Canalizo, B. Jungwiert, A. Stockton, F. Schweizer, et al., Evidence for merger remnants in early-type host galaxies of low-redshift QSOs, *Astrophys. J. 677*, 846, 2008.

Bennert, N., G. Canalizo, B. Jungwiert, A. Stockton, F. Schweizer, et al., Searching for mergers in early-type QSO host galaxies and a control sample of inactive ellipticals, in *Formation and Evolution of Galaxy Bulges,* IAU Symp. 245, M. Bureau, E. Athanassoula, and B. Barbuy, eds., p. 235, Cambridge University Press, Cambridge, 2008.

Berger, E., The prompt gamma-ray and afterglow energies of short-duration gamma-ray bursts, *Astrophys. J. 670*, 1254, 2007.

Berger, E., et al., A new population of high-redshift short-duration gamma-ray bursts, *Astrophys. J. 664*, 1000, 2007.

Berger, E., et al., Simultaneous multiwavelength observations of magnetic activity in ultracool dwarfs. II. Mixed trends in VB 10 and LSR 1835+32 and the possible role of rotation, *Astrophys. J. 676*, 1307, 2008.

Berger, E., et al., Simultaneous multiwavelength observations of magnetic activity in ultracool dwarfs. I. The complex behavior of the M8.5 dwarf TVLM 513-46546, *Astrophys. J. 673*, 1080, 2008.

Berger, E., R. Chary, L. L. Cowie, P. A. Price, . . . P. J. McCarthy, M. D. Gladders, et al., Hubble Space Telescope and Spitzer observations of the afterglow and host galaxy of GRB 050904 at *z* = 6.295, *Astrophys. J. 665*, 102, 2007.

Bianchi, L., L. Rodriguez-Merino, M. Viton, M. Laget, . . . B. F. Madore, et al., Statistical properties of the GALEX-SDSS matched source catalogs, and classification of the UV sources, *Astrophys. J. Suppl. Ser. 173*, 659, 2007.

Bianchi, L., D. Thilker, A. Gil de Paz, and B. Madore, Extended UV disk (XUV-disk) galaxies, in *Galaxy Evolution across the Hubble Time*, IAU Symp. 235, F. Combes and J. Palous, eds., p. 301, Cambridge University Press, Cambridge, 2007.

Bigiel, F., F. Walter, E. de Blok, E. Brinks, and B. Madore, Star formation thresholds derived from THINGS, in *Triggered Star Formation in a Turbulent ISM,* IAU Symp. 237, B. G. Elmegreen and J. Palous, eds., p. 397, Cambridge University Press, Cambridge, 2007.

Bisterzo, S., R. Gallino, O. Straniero, I. I. Ivans, G. W. Preston, and W. Aoki, CEMP-s stars: AGB yield predictions and thermohaline mixing, in *First Stars III: First Stars II Conference*, AIP Conf. Proceedings 990, B. W. O'Shea, A. Heger, and T. Abel, eds., p. 330, American Institute of Physics, Melville, NY, 2008.

Boissier, S., A. Gil de Paz, A. Boselli, B. F. Madore, et al., Radial variation of attenuation and star formation in the largest late-type disks observed with GALEX, *Astrophys. J. Suppl. Ser. 173*, 524, 2007.

Brusa, M., G. Zamorani, A. Comastri, G. Hasinger, . . . P. J. McCarthy, et al., The XMM-Newton Wide-Field Survey in the COSMOS field. III. Optical indentification and multi-wavelength properties of a large sample of x-ray-selected sources, *Astrophys. J. Suppl. Ser. 172*, 353, 2007.

Buat, V., T. T. Takeuchi, J. Iglesias-Paramo, C. K. Xu, . . . B. F. Madore, et al., The local universe as seen in the far-infrared and far-ultraviolet: a global point of view of the local recent star formation, *Astrophys. J. Suppl. Ser. 173*, 404, 2007.

Burgarella, D., P. G. Perez-Gonzalez, K. D. Tyler, G. H. Reike, . . . B. F. Madore, et al., UV-to-FIR properties of Lyman break galaxies and luminous infrared galaxies at *z* ~ 1, in *The Second Annual Spitzer Science Center Conference: Infrared Diagnostics of Galaxy Evolution*, ASP Conf. Series 381, R.-R. Chary, H. I. Teplitz, and K. Sheth, eds., p. 203, Astronomical Society of the Pacific, San Francisco, 2008.

Calzetti, D., M. Regan, L. van Zee, L. Armus, R. Chandar, et al., The Warm Spitzer Mission for the investigation of nearby galaxies, in *The Science Opportunities for the Warm Spitzer Mission Workshop*, AIP Conf. Proceedings 943, L. J. Storrie-Lombardi and N. A. Silbermann, eds., p. 175, American Institute of Physics, Melville, N.Y., 2007.

Canalizo, G., N. Bennert, B. Jungwiert, A. Stockton, F. Schweizer, et al., Spectacular shells in the host galaxy of QSO MC2 1635+119, *Astrophys. J. 669*, 801, 2007.

Cao, C., H. Wu, L. C. Ho, et al., Large misalignment between stellar bar and dust pattern in NGC 3488 revealed by Spitzer and SDSS, *New Astron. 13*, 16, 2008.

Cardamone, C. N., M. C. Urry, M. Damen, P. van Dokkum, E. Treister, I. Labbé, et al., Mid-infrared properties and color selection for x-ray-detected active galactic nuclei in the MUSYC extended Chandra deep field south, *Astrophys. J. 680*, 130, 2008.

Cenko, S. B., D. B. Fox, A. Cucchiara, B. E. Penprase, P. A. Price, and E. Berger, GRB 070125: the first long-duration gamma-ray burst in a halo environment, in *Gamma-Ray Bursts 2007*, AIP Conf. Proceedings 1000, M. Galassi, D. Palmer and E. Fenimore, eds., p. 342, American Institute of Physics, Melville, N.Y., 2008.

Cenko, S. B., D. B. Fox, B. E. Penprase, A. Cucchiara, P. A. Price, E. Berger, et al., GRB 070125: the first long duration gamma-ray burst in a halo environment, *Astrophys. J. 677*, 441, 2008.

Chandar, R., M. S. Fall, and D. E. McLaughlin, Density dependence of the mass function of globular star clusters in the Sombrero Galaxy and its dynamical implications, *Astrophys. J. (Lett.) 668*, L119, 2007.

Chou, M.-Y., S. R. Majewski, K. Cunha, V. V. Smith, . . . J. D. Crane, et al., A 2MASS all-sky view of the Sagittarius dwarf galaxy. V. Variation of the metallicity distribution function along the Sagittarius stream, *Astrophys. J. 670*, 346, 2007.

Clocchiatti, A., J. C. Wheeler, R. P. Kirshner, D. Branch, . . . M. M. Phillips, et al., Late-time HST photometry of SN 1994I: hints of positron annihilation energy deposition, *Publ. Astron. Soc. Pacific 120*, 290, 2008.

Cohen, J. G., N. Christlieb, A. McWilliam, S. Shectman, and I. Thompson, An update on the 0Z Project, in *First Stars III: First Stars II Conference*, AIP Conf. Proceedings 990, B. W. O'Shea, A. Heger, and T. Abel, eds., p. 118, American Institute of Physics, Melville, N.Y., 2008.

Cohen, J. G., N. Christlieb, A. McWilliam, S. Shectman, I. Thompson, et al., New extremely metal-poor stars in the Galactic halo, *Astrophys. J. 672*, 320, 2008.

Cooksey, K. L., J. X. Prochaska, H.-W. Chen, J. S. Mulchaey, and B. J. Weiner, Characterizing the low-redshift intergalactic medium toward PKS 1302-102, *Astrophys. J. 676*, 262, 2008.

Damineli, A., D. J. Hillier, M. F. Corcoran, O. Stahl, . . . N. Morrell, et al., A multispectral view of the periodic events in eta Carinae, *Mon. Not. Roy. Astron. Soc. 386*, 2330, 2008.

Damineli, A., D. J. Hillier, M. F. Corcoran, O. Stahl, . . . N. Morrell, et al., The periodicity of the eta Carinae events, *Mon. Not. Roy. Astron. Soc. 384*, 1649, 2008.

Dasyra, K. M., L. C. Ho, et al., High-ionization mid-infrared lines as black hole mass and bolometric luminosity indicators in active galactic nuclei, *Astrophys. J. (Lett.) 674*, L9, 2008.

Deharveng, J.-M., T. Small, T. A. Barlow, C. Peroux, . . . B. F. Madore, et al., Lyalpha-emitting galaxies at 0.2 < *z* < 0.35 from GALEX spectroscopy, *Astrophys. J. 680*, 1072, 2008.

Doherty, M., A. J. Bunker, R. S. Ellis, and P. J. McCarthy, Tracing the life cycle of massive red galaxies, in *At The Edge of the Universe: Latest Results from the Deepest Astronomical Surveys*, ASP Conf. Series 380, J. Afonso et al., eds., p. 405, Astronomical Society of the Pacific, San Francisco, 2007.

Donas, J., J.-M. Deharveng, M. R. Rich, S. K. Yi, . . . B. F. Madore, et al., GALEX UV color relations for nearby early-type galaxies, *Astrophys. J. Suppl. Ser. 173*, 597, 2007.

Dong, S., A. Udalski, A. Gould, W. T. Reach, . . . G. W. Preston, I. B. Thompson, et al., First space-based microlens parallax measurement: Spitzer observations of OGLE-2005-SMC-001, *Astrophys. J. 664*, 862, 2007.

Donley, J. L., G. H. Rieke, P. G. Perez-Gonzalez, J. R. Rigby, and A. Alonso-Herrero, Detecting obscured AGN in the distant universe with Spitzer, in *At the Edge of the Universe: Latest Results from the Deepest Astronomical Surveys*, ASP Conf. Series 380, J. Afonso et al., eds., p. 119, Astronomical Society of the Pacific, San Francisco, 2007.

Dressler, A., The Hubble Sequence, in *From Stars to Galaxies: Building the Pieces to Build Up the Universe*, ASP Conf. Series 374, A. Vallenari et al., eds., p. 415, Astronomical Society of the Pacific, San Francisco, 2007.

Eastman, J., P. Martini, G. Sivakoff, D. D. Kelson, J. S. Mulchaey, and K.-V. Tran, First measurement of a rapid increase in the AGN fraction in high-redshift clusters of galaxies, *Astrophys. J. (Lett.) 664*, L9, 2007.

Ellingson, E., Y. S. Loh, H. K. C. Yee, D. G. Gilbank, M. D. Gladders, and F. Barrientos, Color bimodality in galaxy clusters since *z* ~ 0.9, in *Cosmic Frontiers*, ASP Conf. Series 379, N. Metcalfe and T. Shanks, eds., p. 294, Astronomical Society of the Pacific, San Francisco, 2007.

Eskridge, P. B., R. de Grijs, P. Anders, R. A. Windhorst, V. A. Mager, and R. A. Jansen, Star clusters in the nearby late-type galaxy NGC 1311, *Astron. J. 135*, 120, 2008.

Foellmi, C., G. Koenigsberger, L. Georgiev, O. Toledano, . . . N. Morrell, et al., New insights into the nature of the SMC WR/LBV binary HD 5980, *Rev. Mex. Astron. Astrofis. 44*, 3, 2008.

Freedman, W. L., B. F. Madore, J. Rigby, S. E. Persson, and L. Sturch, The Cepheid period-luminosity relation at mid-infrared wavelengths. I. First-epoch LMC data, *Astrophys. J. 679*, 71, 2008.

Fritz, J., B. M. Poggianti, D. Bettoni, A. Cava, W. J. Couch, M. D'Onofrio, A. Dressler, et al., A spectrophoto-metric model applied to cluster galaxies: the WINGS dataset, *Astron. Astrophys. 470*, 137, 2007.

Fryer, C. L., P. A. Mazzali, J. Prochaska, E. Cappellaro, A. Panaitescu, E. Berger, et al., Constraints on type Ib/c supernovae and gamma-ray burst progenitors, *Pub. Astron. Soc. Pacific 119*, 1211, 2007.

Furusawa, H., G. Kosugi, M. Akiyama, T. Takata, . . . M. Ouchi, et al., The Subaru/XMM-Newton Deep Survey (SXDS). II. Optical imaging and photometric catalogs, *Astrophys. J. Suppl. Ser. 176*, 1, 2008.

Gamen, R., R. Barba, N. Morrell, et al., Spectroscopic monitoring of Southern Galactic O and WN stars: state of the art in 2007, *Bol. Asoc. Argentina Astron. 50*, 105, 2007.

Garavini, G., G. Folatelli, et al., Quantitative comparison between type Ia supernova spectra at low and high red-shifts: a case study, *Astron. Astrophys. 470*, 411, 2007.

Gebhardt, K., T. R. Lauer, J. Pinkney, . . .A. Dressler, . . . L. C. Ho, et al., The black hole mass and extreme orbital structure in NGC 1399, *Astrophys. J. 671*, 1321, 2007.

Gezari, S., S. Basa, D. C. Martin, G. Bazin, . . . M. Seibert, et al., UV/optical detections of candidate tidal disruption events by GALEX and CFHTLS, *Astrophys. J. 676*, 944, 2008.

Gilbank, D. G., M. D. Gladders, and H. K. C. Yee, Strong lensing clusters in the Red-Sequence Cluster Survey 2, in *Cosmic Frontiers*, ASP Conf. Series 379, N. Metcalfe and T. Shanks, eds., p. 298, Astronomical Society of the Pacific, San Francisco, 2007.

Gilbank, D. G., H. K. C. Yee, E. Ellington, M. D. Gladders, et al., Spectroscopy of moderately high redshift RCS-1 clusters, *Astron. J. 134*, 282, 2007.

Gilbank, D. G., H. K. C. Yee, E. Ellington, A. K. Hicks, M. D. Gladders, et al., A *z* = 0.9 supercluster of x-ray lumi-nous, optically selected, massive galaxy clusters, *Astrophys. J. (Lett.) 677*, L89, 2008.

Gil de Paz, A., S. Boissier, B. F. Madore, M. Seibert, Y. H. Joe, et al., The GALEX Ultraviolet Atlas of Nearby Galaxies, *Astrophys. J. Suppl. Ser. 173,* 185, 2007.

Glazebrook, K., C. Blake, W. Couch, D. Forbes, . . . B. Madore, . . . M. Gladders, et al., The WiggleZ Project: AAOmega and dark energy, in *Cosmic Frontiers*, ASP Conf. Series 379, N. Metcalfe and T. Shanks, eds., p. 72, Astronomical Society of the Pacific, San Francisco, 2007.

Greene, J. E., and L. C. Ho, The black hole mass function of local active galaxies, in *The Central Engine of Active Galactic Nuclei*, ASP Conf. Series 373, L. C. Ho and J.-M. Wang, eds., p. 33, Astronomical Society of the Pacific, San Francisco, 2007.

Greene, J. E., and L. C. Ho, The mass function of active black holes in the local universe, *Astrophys. J. 667*, 131, 2007.

Greene, J. E., and L. C. Ho, A new sample of low-mass black holes in active galaxies, *Astrophys. J. 670*, 92, 2007.

Haehnelt, M. G., M. Rauch, A. Bunker, G. Becker, et al. Hunting for the building blocks of galaxies like our own Milky Way with FORS, *Messenger 132*, 41, 2008.

Heinis, S., B. Milliard, S. Arnouts, J. Blaizot, . . . B. F. Madore, et al., Clustering properties of rest-frame UV-selected galaxies. II. Migration of star formation sites with cosmic time from GALEX and CFHTLS, *Astrophys. J. Suppl. Ser. 173*, 503, 2007.

Hennawi, J. F., M. D. Gladders, et al., A new survey for giant arcs, *Astron. J. 135*, 664, 2008.

Henry, A. L., M. A. Malkan, J. W. Colbert, B. Siana, H. I. Teplitz, and P. McCarthy, A Lyman break galaxy candidate at *z* ~ 9, *Astrophys. J. (Lett.) 680*, L97, 2008.

Ho, L. C., Bulge and halo kinematics across the Hubble Sequence, *Astrophys. J. 668*, 94, 2007.

Ho, L. C., The CO Tully-Fisher Relation and implications for the host galaxies of high-redshift quasars, *Astrophys. J. 669*, 821, 2007.

Ho, L. C., and J.-W. Wang, eds., *The Central Engine of Active Galactic Nuclei*, ASP Conf. Series 373, Astronomical Society of the Pacific, San Francisco, 2007.

Holden, B. P., G. D. Illingworth, M. Franx, J. P. Blakeslee, M. Postman, D. D. Kelson, et al., Mass selection and the evolution of the morphology-density relation from *z* = 0.8 to 0, *Astrophys. J. 670*, 190, 2007.

Holden, B. and D. Kelson, Mass and the morphology-density relation, in *Cosmic Frontiers*, ASP Conf. Series 379, N. Metcalfe and T. Shanks, eds., p. 239, Astronomical Society of the Pacific, San Francisco, 2007.

Hoopes, C. G., T. M. Heckman, S. Salim, M. Seibert, . . . B. F. Madore, et al., The diverse properties of the most ultraviolet-luminous galaxies discovered by GALEX, *Astrophys. J. Suppl. Ser. 173*, 441, 2007.

Howell, J. H., J. M. Mazzarella, B. H. P. Chan, S. Lord, . . . B. F. Madore, et al., Tracing polycyclic aromatic hydro-carbons and warm dust emission in the Seyfert galaxy NGC 1068, *Astron. J. 134*, 2086, 2007.

Hsiao, E. Y., A. Conley, D. A. Howell, M. Sullivan, . . . M. M. Phillips, et al., K-corrections and spectral templates of type Ia supernovae, *Astrophys. J. 663*, 1187, 2007.

Hurley, M., B. F. Madore, and W. L. Freedman, The peculiar Cepheid FN Aq1, *Astron. J. 135*, 2217, 2008.

Iglesias-Paramo, J., V. Buat, J. Hernandez-Fernandez, C. K. Xu, . . . B. F. Madore, et al., UV to IR SEDS of UV-selected galaxies in the ELAIS fields: evolution of dust attenuation and star formation activity from *z* = 0.7 to 0.2, *Astrophys. J. 670*, 279, 2007.

Jeltema, T. E., B. Binder, and J. S. Mulchaey, The hot gas halos of galaxies in groups, *Astrophys. J. 679*, 1162, 2008.

Jeltema, T. E., J. S. Mulchaey, et al., The evolution of groups and group galaxies to intermediate redshifts, in *Galaxy Evolution across the Hubble Time*, IAU Symp. 235, F. Combes and J. Palous, eds., p. 208, Cambridge University Press, Cambridge, 2007.

Johns, M., The Giant Magellan Telescope (GMT), in *Extremely Large Telescopes: Which Wavelengths? Retirement Symposium for Arne Ardeberg*, SPIE Proceedings 6986, T. E. Andersen, ed., p. 698603, The International Society for Optical Engineering, Bellingham, Wash., 2008.

Johnson, B. D., D. Schiminovich, M. Seibert, M. Treyer, . . . B. F. Madore, et al., Ultraviolet, optical, and infrared constraints on models of stellar populations and dust attenuation, *Astrophys. J. Suppl. Ser. 173*, 377, 2007.

Johnson, B. D., D. Schiminovich, M. Seibert, M. Treyer, . . . B. F. Madore, et al., Ultraviolet through infrared spectral energy distributions from 1000 SDSS galaxies: dust attenuation, *Astrophys. J. Suppl. Ser. 173*, 392, 2007.

Kalirai, J. S., P. Bergeron, B. M. S. Hansen, D. D. Kelson, et al., Stellar evolution in NGC 6791: mass loss on the red giant branch and the formation of low-mass white dwarfs, *Astrophys. J. 671*, 748, 2007.

Kalirai, J. S., B. M. S. Hansen, D. D. Kelson, et al., The initial-final mass relation: direct constraints at the low-mass end, *Astrophys. J. 676*, 594, 2008.

Kaluzny, J., and I. Thompson, Variability of EHB stars in the globular cluster NGC 6752, in *Hot Subdwarf Stars and Related Objects*, ASP Conf. Series 392, U. Heber, C. S. Jeffery and R. Napiwotzki, eds., p. 55, Astronomical Society of the Pacific, San Francisco, 2008.

Kaluzny, J., I. B. Thompson, S. M. Rucinski, W. Pych, G. Stachowski, W. Krzeminski, and G. S. Burley, The Cluster Ages Experiment (CASE). II. The eclipsing blue straggler OGLEGC 228 in the globular cluster 47 Tuc, *Astron. J. 134*, 541, 2007.

Kasliwal, M. M., S. B. Cenko, S. R. Kulkarni, P. B. Cameron, . . . E. Berger, et al., GRB 070610: a curious galactic transient, *Astrophys. J. 678*, 1127, 2008.

Kauffmann, G., T. M. Heckman, T. Budavari, S. Charlot, . . . B. F. Madore, et al., Ongoing formation of bulges and black holes in the local universe: new insights from GALEX, *Astrophys. J. Suppl. Ser. 173*, 357, 2007.

Kawata, D., A numerical simulation study of environmental effects on star formation of group galaxies, *Astron. Herald 101*, 214, 2008.

Kawata, D., et al., Where do metal-free stars and their products end up in our galaxy? in *From Stars to Galaxies: Building the Pieces to Build Up the Universe*, ASP Conf. Series 374, A. Vallenari et al., eds., p. 21, Astronomical Society of the Pacific, San Francisco, 2007.

Kawata, D., R. Cen, and L. C. Ho, Gravitational stability of circumnuclear disks in elliptical galaxies, *Astrophys. J. 669*, 232, 2007.

Kawata, D., and J. S. Mulchaey, Strangulation in galaxy groups, *Astrophys. J. (Lett.) 672*, L103, 2008.

Kawata, D., and M. Rauch, Galactic wind signatures around high-redshift galaxies, *Astrophys. J. 663*, 38, 2007.

Kim, M., L. C. Ho, et al., Is the quasar HE 0450-2958 really naked? in *The Central Engine of Active Galactic Nuclei*, ASP Conf. Series 373, L. C. Ho and J.-M. Wang, eds., p. 677, Astronomical Society of the Pacific, San Francisco, 2007.

Knudsen, K. K., P. van der Werf, M. Franx, N. M. Forster Schreiber, . . . I. Labbé, et al., Obscured star formation in distant red galaxies – 850mum detection, in *Cosmic Frontiers*, ASP Conf. Series 379, N. Metcalfe and T. Shanks, eds., p. 306, Astronomical Society of the Pacific, San Francisco, 2007.

Koch, A., and A. McWilliam, A new abundance scale for the globular cluster 47 Tuc, *Astron. J. 135*, 1551, 2008.

Kollmeier, J., and A. Gould, Where are the old-population hypervelocity stars? *Astrophys. J. 664*, 343, 2007.

Kriek, M., P. G. van Dokkum, M. Franx, G. D. Illingworth, . . . I. Labbé, et al., A near-infrared spectroscopic survey of K-selected galaxies at $z \sim 2.3$: redshifts and implications for broadband photometric studies, *Astrophys. J. 677*, 219, 2008.

Kriek, M., P. G. van Dokkum, M. Franx, G. D. Illingworth, . . . I. Labbé, et al., The origin of line emission in massive $z \sim 2.3$ galaxies: evidence for cosmic downsizing of AGN host galaxies, *Astrophys. J. 669*, 776, 2007.

Krugler, J. A., T. C. Beers, Y. S. Lee, T. Sivarani, . . . I. Ivans, et al., Revised parameter estimates for the most metal-poor candidates in SDSS-I and SEGUE, in *First Stars III: First Stars II Conference*, AIP Conf. Proceedings 990, B. W. O'Shea, A. Heger, and T. Abel, eds., p. 151, American Institute of Physics, Melville, N.Y., 2008.

Labbé, I., et al., The color-magnitude distribution of field galaxies to $z \sim 3$: The evolution and modeling of the blue sequence, *Astrophys. J. 665*, 994, 2007.

Lai, K., J.-S. Huang, G. Fazio, E. Gawiser, . . . I. Labbé, et al., Spitzer constraints on the stellar populations of Lyalpha-emitting galaxies at $z = 3.1$, *Astrophys. J. 674*, 70, 2008.

Lal, D. V., and L. C. Ho, The radio properties of type 2 quasars, in *The Central Engine of Active Galactic Nuclei*, ASP Conf. Series 373, L. C. Ho and J.-M. Wang, eds., p. 479, Astronomical Society of the Pacific, San Francisco, 2007.

Lauer, T. R., K. Gephardt, S. M. Faber, . . . A. Dressler, . . . L. C. Ho, et al., The centers of early-type galaxies with Hubble Space Telescope. VI. Bimodal central surface brightness profiles, *Astrophys. J. 664*, 226, 2007.

Lederer, S. M., D. L. Domingue, J. E. Thomas-Osip, F. Vilas, D. J. Osip, et al., The 2004 Las Campanas/Lowell Observatory Campaign II. Surface properties of Hayabusa target Asteroid 25143 Itokawa inferred from Hapke modeling, *Earth Planets Space 60*, 49, 2008.

Lee, J. C., et al., The star formation demographics of galaxies in the local volume, *Astrophys. J. (Lett.) 671*, L113, 2007.

Leroy, A., F. Bigiel, F. Walter, E. Brinks, W. J. G. de Blok, and B. Madore, Star formation in The HI Nearby Galaxy Survey, in *Massive Star Formation: Observations Confront Theory*, ASP Conf. Series 387, H. Beuther, H. Linz, and T. Henning, eds., p. 408, Astronomical Society of the Pacific, San Francisco, 2008.

Li, I. H., H. K. C. Yee, B. C. Hsieh, D. G. Milbank, and M. D. Gladders, The evolution of galaxies and groups in cluster environments at $0.3 < z < 0.6$, in *Galaxy Evolution across the Hubble Time*, IAU Symp. 235, F. Combes and J. Palous, eds., p. 220, Cambridge University Press, Cambridge, 2007.

Lopez, S., L. F. Barrientos, P. Lira, N. Padilla, D. G. Gilbank, M. D. Gladders, et al., Galaxy clusters in the line of sight to background quasars. I. Survey design and incidence of Mg II absorbers at cluster redshifts, *Astrophys. J. 679*, 1144, 2008.

Madore, B. F., S. Boissier, A. Gil de Paz, E. Nelson, and K. Petrillo, Spontaneous and stimulated star formation in galaxies: ultraviolet limits on star formation thresholds and optical constraints on lambda-CDM cosmological simulations of galaxy formation, in *From Stars to Galaxies: Building the Pieces to Build Up the Universe*, ASP Conf. Series 374, A. Vallenari et al., eds., p. 455, Astronomical Society of the Pacific, San Francisco, 2007.

Madore, B. F., A. Gil de Paz, O. Pevunova, and I. Thompson, The curious case of NGC 6908, *Astron. J. 134*, 314, 2007.

Mallery, R. P., L. Kewley, M. R. Rich, S. Salim, . . . B. F. Madore, et al., Nitrogen production in starburst galaxies detected by GALEX, *Astrophys. J. Suppl. Ser. 173*, 482, 2007.

Mallery, R. P., M. R. Rich, S. Salim, T. Small, . . . B. F. Madore, et al., Keck DEIMOS spectroscopy of a GALEX UV-selected sample from the Medium Imaging Survey, *Astrophys. J. Suppl. Ser. 173*, 471, 2007.

Martel, H., C. Brook, D. Kawata, et al., A guide for primordial star hunters, in *Cosmic Frontiers*, ASP Conf. Series 379, N. Metcalfe and T. Shanks, eds., p. 314, Astronomical Society of the Pacific, San Francisco, 2007.

Marshall, J. L., Finding extreme subdwarfs, *Astron. J. 135*, 1000, 2008.

Martin, C. L., M. Sawicki, A. Dressler, and P. McCarthy, A Magellan IMACS spectroscopic search for Lyalpha-emitting galaxies at redshift 5.7, *Astrophys. J. 679*, 942. 2008.

Martin, D. C., M. Seibert, J. D. Neill, D. Schiminovich, K. Foster, M. R. Rich, B. Y. Welsh, B. F. Madore, et al., A turbulent wake as a tracer of 30,000 years of Mira's mass loss history, *Nature 448*, 780, 2007.

Martin, D. C., T. Small, D. Schiminovich, T. K. Wyder, . . . B. F. Madore, et al., The star formation and extinction coevolution of UV-selected galaxies over $0.05 < z < 1.2$, *Astrophys. J. Suppl. Ser. 173*, 415, 2007.

Martin, D. C., T. K. Wyder, D. Schiminovich, T. A. Barlow, . . . B. F. Madore, et al., The UV-optical galaxy color-magnitude diagram. III. Constraints on evolution from the blue to the red sequence, *Astrophys. J. Suppl. Ser. 173*, 342, 2007.

Martini, P., J. S. Mulchaey, and D. D. Kelson, The distribution of active galactic nuclei in clusters of galaxies, *Astrophys. J. 664*, 761, 2007.

Maybhate, A., P. Goudfrooij, F. Schweizer, et al., Evidence for three subpopulations of globular clusters in the early-type poststarburst shell galaxy AM 0139-655, *Astron. J. 134*, 1729, 2007.

Mayer, P., P. Harmanec, S. Nesslinger, R. Lorenz, H. Drechsel, N. Morrell, and M. Wolf, Improved estimates of the physical properties of the O-star binary V1007 Sco = HD 152248 and notes on several other binaries in the NGC 6231 cluster, *Astron. Astrophys. 481*, 183, 2008.

McCarthy, P. J., Spitzer science in the post cryogen era, in *The Science Opportunities of the Warm Spitzer Mission Workshop*, AIP Conf. Proceedings 943, L. J. Storrie-Lombardi and N. A. Silbermann, eds., p. 3, American Institute of Physics, Melville, N.Y., 2007.

McCarthy, P. J., H. Yan, R. G. Abraham, E. Mentuch, K. Glazebrook, L. Yan, H.-W. Chen, S. E. Persson, et al., A compact cluster of massive red galaxies at a redshift of 1.5, *Astrophys. J. (Lett.) 664*, L17, 2007.

Melena, N. W., P. Massey, N. I. Morrell, and A. M. Zangari, The massive star content of NGC 3603, *Astron. J. 135*, 878, 2008.

Milliard, B., S. Heinis, J. Blaizot, S. Arnouts, . . . B. F. Madore, et al., Clustering properties of rest-frame UV-selected galaxies. I. The correlation length derived from GALEX data in the local universe, *Astrophys. J. Suppl. Ser. 173*, 494, 2007.

Morrissey, P., T. Conrow, T. A. Barlow, T. Small, M. Seibert, . . . B. F. Madore, et al., The calibration and data products of GALEX, *Astrophys. J. Suppl. Ser. 173*, 682, 2007.

Ouchi, M., et al., The Subaru/XMM-Newton Deep Survey (SXDS). IV. Evolution of Lyalpha emitters from $z = 3.1$ to 5.7 in the 1 deg^2 field: luminosity functions and AGN, *Astrophys. J. Suppl. Ser. 176*, 301, 2008.

Overzier, R. A., T. M. Heckman, G. Kauffmann, M. Seibert, . . . B. F. Madore, et al., Hubble Space Telescope morphologies of local Lyman break galaxy analogs. I. Evidence for starbursts triggered by merging, *Astrophys. J. 677*, 37, 2008.

Panessa, F., X. Barcons, L. Bassani, M. Cappi, F. J. Carrera, M. Dadina, L. C. Ho, et al., Multi-wavelength and black hole mass properties of low luminosity active nuclei, in *The Multicolored Landscape of Compact Objects and Their Explosive Origins*, AIP Conf. Proceedings 924, L. A. Antonelli et al., eds., p. 830, American Institute of Physics, Melville, N.Y., 2007.

Persi, P., M. Gomez, M. Tapia, M. Roth, et al., Star formation in the Southern Dark Cloud DC 296.2-3.6, *Astron. J. 135*, 2279, 2008.

Persi, P., M. Tapia, M. Roth, M. Gomez, and A. R. Marenzi, An infrared study of southern dark clouds, *Mem. Soc. Astron. Italiana 78*, 673, 2007.

Pessev, P. M., P. Goudfrooij, T. H. Puzia, and R. Chandar, A comparison of optical and near-infrared colours of Magellanic Cloud star clusters with predictions of simple stellar population models, *Mon. Not. Roy. Astron. Soc. 385*, 1535, 2008.

Pessev, P., P. Goudfrooij, T. Puzia, and R. Chandar, Towards a calibration of SSP models from the optical to the mid-infrared, in *Stellar Populations as Building Blocks of Galaxies*, IAU Symp. 241, A. Vazdekis and R. F. Peletier, eds., p. 195, Cambridge University Press, Cambridge, 2007.

Phillips, M. M., The Carnegie Supernova Project, in *Supernova 1987A: 20 Years After: Supernova and Gamma-Ray Bursters*, AIP Conf. Proceedings 937, S. Immler, K. Weiler, and R. McCray, eds., p. 212, American Institute of Physics, Melville, N.Y., 2007.

Preston, G. W., Stellar astronomy: phenomenal weather, *Nature Phys. 3*, 515, 2007.

Price, P. A., A. Songaila, L. L. Cowie, J. Bell Burnell, E. Berger, et al., Properties of a gamma-ray burst host galaxy at $z \sim 5$, *Astrophys. J. (Lett.) 663*, L57, 2007.

Ramella, M., A. Biviano, A. Pisani, J. Varela, D. Bettoni, W. J. Couch, M. D'Onofrio, A. Dressler, et al., Substructures in WINGS clusters, *Astron. Astrophys. 470*, 39, 2007.

Rasmussen, J., T. J. Ponman, and J. S. Mulchaey, Caught in the act: witnessing a transforming spiral in a galaxy group, in *Galaxy Evolution Across the Hubble Time*, IAU Symp. 235, F. Combes and J. Palous, eds., p. 239, Cambridge University Press, Cambridge, 2007.

Ree, C. H., Y.-W. Lee, S. K. Yi, S.-J. Yoon, . . . B. F. Madore, et al., The look-back time evolution of far-ultraviolet flux from the brightest cluster elliptical galaxies at $z < 0.2$, *Astrophys. J. Suppl. Ser. 173*, 607, 2007.

Rest, A., T. Matheson, S. Blondin, M. Bergmann, . . . R. Covarrubias, et al., Spectral identification of an ancient supernova using light echoes in the Large Magellanic Cloud, *Astrophys. J. 680*, 1137, 2008.

Rey, S.-C., M. R. Rich, S. T. Sohn, S.-J. Yoon, . . . B. F. Madore, et al., GALEX ultraviolet photometry of globular clusters in M31: three-year results and a catalog, *Astrophys. J. Suppl. Ser. 173*, 643, 2007.

Rigby, J. R., et al., Mid-infrared spectroscopy of lensed galaxies at $1 < z < 3$: the nature of sources near the MIPS confusion limit, *Astrophys. J. 675*, 262, 2008.

Rothberg, B., B. Whitmore, F. Schweizer, R. Chandar, et al., The formation of young clusters in three ongoing galaxy mergers, in *Galaxy Evolution across the Hubble Time*, IAU Symp. 235, F. Combes and J. Palous, eds., p. 240, Cambridge University Press, Cambridge, 2007.

Rozyczka, M., J. Kaluzny, W. Krzeminski, and B. Mazur, Variable stars in the field of the open cluster NGC 2204, *Acta Astron. 57*, 323, 2007.

Saito, T., K. Shimasaku, S. Okamura, M. Ouchi, et al., Deep spectroscopy of systematically surveyed extended Lyalpha sources at $z \sim 3$-5, *Astrophys. J. 675*, 1076, 2008.

Salim, S., M. R. Rich, S. Charlot, J. Brinchmann, B. D. Johnson, D. Schiminovich, M. Seibert, . . . B. F. Madore, et al., UV star formation rates in the local universe, *Astrophys. J. Suppl. Ser. 173*, 267, 2007.

Schiminovich, D., T. K. Wyder, C. D. Martin, B. D. Johnson, S. Salim, M. Seibert, . . . B. F. Madore, et al., The UV-optical color magnitude diagram. II. Physical properties and morphological evolution on and off of a star-forming sequence, *Astrophys. J. Suppl. Ser. 173*, 315, 2007.

Seymour, N., D. Stern, C. De Breuck, J. Vernet, . . . P. J. McCarthy, et al., The massive hosts of radio galaxies across cosmic time, *Astrophys. J. Suppl. Ser. 171*, 353, 2007.

Seymour, N., D. Stern, C. De Breuck, J. Vernet, . . . P. J. McCarthy, et al., Spitzer observations of high r edshift radio galaxies, in *The Second Annual Spitzer Science Center Conference: Infrared Diagnostics of Galaxy Evolution*, ASP Conf. Series 381, R.-R. Chary, H. I. Teplitz, and K. Sheth, eds., p. 398, Astronomical Society of the Pacific, San Francisco, 2008.

Sharon, K., A. Gal-Yam, D. Maoz, M. Donahue, . . . W. L. Freedman, . . . J. S. Mulchaey, et al., Survey for supernovae in massive high-redshift clusters, in *The Multicolored Landscape of Compact Objects and Their Explosive Origins*, AIP Conf. Proceedings 924, L. A. Antonelli et al., eds., p. 460, American Institute of Physics, Melville, N.Y., 2007.

Shields, J. C., C. J. Walcher, T. Boeker, L. C. Ho, et al., An accreting black hole in the nucleus of the bulgeless galaxy NGC 1042, in *Formation and Evolution of Galaxy Bulges*, IAU Symp. 245, M. Bureau, E. Athanassoula, and B. Barbuy, eds., p. 259, Cambridge University Press, Cambridge, 2008.

Sobeck, J. S., F. Primas, C. Sneden, and I. I. Ivans, A new study of copper abundances in metal-poor stars, in *First Stars III: First Stars II Conference*, AIP Conf. Proceedings 990, B. W. O'Shea, A. Heger, and T. Abel, eds., p. 187, American Institute of Physics, Melville, N.Y., 2008.

Soderberg, A. M., E. Berger, et al., An extremely luminous x-ray outburst at the birth of a supernova, *Nature 453*, 469, 2008.

Sohn, S. T., S. R. Majewski, R. R. Munoz, W. E. Kunkel, et al., Exploring halo substructure with giant stars. X. Extended dark matter or tidal disruption?: the case for the Leo I dwarf spheroidal galaxy, *Astrophys. J. 663*, 960, 2007.

Szkody, P., B. T. Gansicke, T. E. Harrison, S. B. Howell, . . . M. Seibert, et al., Hotter than expected: GALEX and HST results on white dwarfs in cataclysmic variables, in *15th Workshop on White Dwarfs*, ASP Conf. Series 372, R. Napiwotzki and M. R. Burleigh, eds., p. 547, Astronomical Society of the Pacific, San Francisco, 2007.

Tammann, G. A., A. Sandage, and B. Reindl, Comparison of distances from RR Lyrae stars, the tip of the Red Giant Branch, and classical Cepheids, *Astrophys. J. 679*, 52, 2008.

Taubenberger, S., S. Hachinger, G. Pignata, P. A. Mazzali, C. Contreras, . . . G. Folatelli, W. L. Freedman, S. Gonzalez, M. Hamuy, W. Krzeminski, N. Morrell, H. Navasardyan, S. E. Persson, M. M. Phillips, C. Ries, M. Roth, et al., The underluminous type Ia supernova 2005b1 and the class of objects similar to SN 1991bg, *Mon. Not. Roy. Astron. Soc. 385*, 75, 2008.

Thilker, D. A., L. Bianchi, G. Meurer, A. Gil de Paz, S. Boissier, B. F. Madore, et al., A search for extended ultraviolet disk (XUV-disk) galaxies in the local universe, *Astrophys. J. Suppl. Ser. 173*, 538, 2007.

Thilker, D. A., S. Boissier, L. Bianchi, D. Calzetti, . . . A. Gil de Paz, . . . B. F. Madore, et al., Ultraviolet and infrared diagnostics of star formation and dust in NGC 7331, *Astrophys. J. Suppl. Ser. 173*, 572, 2007.

Thomas-Osip, J., GMT site evaluation at Las Campanas Observatory, in *Workshop on Astronomical Site Evaluation*, Rev. Mex. Astron. Astrofis. Conf. Series 31, I. Cruz-Gonzalez, J. Echevarria, and D. Hiriart, eds., p. 18, Instituto de Astronomia, Universidad Nacional Autonoma de Mexico, Ciudad Universitaria, Mexico.

Thomas-Osip, J. E., S. M. Lederer, D. J. Osip, et al., The 2004 Las Campanas/Lowell Observatory Campaign I. Simultaneous visible and near-infrared photometry of the Hayabusa mission target, *Earth Planets Space 60*, 39, 2008.

Thompson, I. B., I. I. Ivans, S. Bisterzo, C. Sneden, R. Gallino, S. Vauclair, G. S. Burley, S. A. Shectman, and G. W. Preston, CS 22964-161: a double-lined carbon- and s-process-enhanced metal-poor binary star, *Astrophys. J. 677*, 556, 2008.

Toft, S., P. van Dokkum, M. Franx, I. Labbé, et al., Hubble Space Telescope and Spitzer imaging of red and blue galaxies at $z \sim 2.5$: a correlation between size and star formation activity from compact quiescent galaxies to extended star-forming galaxies, *Astrophys. J. 671*, 285, 2007.

Trager, S. C., S. M. Faber, and A. Dressler, The stellar population histories of early-type galaxies. III. The Coma cluster, *Mon. Not. Roy. Astron. Soc. 386*, 715, 2008.

Trancho, G., N. Bastian, B. W. Miller, and F. Schweizer, Gemini spectroscopic survey of young star clusters in merging/interacting galaxies. II. NGC 3256 clusters, *Astrophys. J. 664*, 284, 2007.

Treyer, M., D. Schiminovich, B. Johnson, M. Seibert, . . . B. F. Madore, et al., Extinction-corrected star formation rates empirically derived from ultraviolet-optical colors, *Astrophys. J. Suppl. Ser. 173*, 256, 2007.

Trump, J. R., C. D. Impey, J. M. Gabor, P. J. McCarthy, et al., Magellan spectroscopy of AGN candidates in the COSMOS field, *Astrophys. J. Suppl. Ser. 172*, 383, 2007.

Trump, J. R., C. D. Impey, J. M. Gabor, P. J. McCarthy, et al., A multiwavelength study of AGN with COSMOS: do low-Eddington ratio type 1 AGN exist? in *The Central Engine of Active Galactic Nuclei*, ASP Conf. Series 373, L. C. Ho and J.-M. Wang, eds., p. 726, Astronomical Society of the Pacific, San Francisco, 2007.

van der Marel, R. P., J. Rossa, C. J. Walcher, T. Boeker, L. C. Ho, et al., Nuclear star clusters (nuclei) in spirals and connection to supermassive black holes, in *Stellar Populations as Building Blocks of Galaxies*, IAU Symp. 241, A. Vazdekis and R. F. Peletier, eds., p. 475, Cambridge University Press, Cambridge, 2007.

van der Wel, A., B. P. Holden, M. Franx, G. D. Illingworth, M. P. Postman, D. D. Kelson, I. Labb, et al., The evolution of the field and cluster morphology-density relation for mass-selected samples of galaxies, *Astrophys. J. 670*, 206, 2007.

van Dokkum, P., A. Cooray, I. Labbé, et al., The Spitzer Warm Mission: prospects for studies of the distant universe, in *The Science Opportunities for the Warm Spitzer Mission Workshop*, AIP Conf. Proceedings 943, L. J. Storrie-Lombardi and N. A. Silbermann, eds., p. 122, American Institute of Physics, Melville, N.Y., 2007.

Viel, M., G. D. Becker, J. S. Bolton, M. G. Haehnelt, M. Rauch, and W. L. W. Sargent, How cold is cold dark matter? Small-scales constraints from the flux power spectrum of the high-redshift Lyman-alpha forest, *Phys. Rev. Lett. 100*, 041304, 2008.

Wang, Z., C. Bassa, V. M. Kaspi, J. J. Bryant, and N. Morrell, Optical/infrared observations of the anomalous x-ray pulsar 1E 1048.1-5937 during its 2007 x-ray flare, *Astrophys. J. 679*, 1443, 2008.

Wareing, C. J., A. A. Zijlstra, T. J. O'Brien, and M. Seibert, It's a wonderful tail: the mass-loss history of Mira, *Astrophys. J. (Lett.) 670*, L125, 2007.

Williams, R., E. B. Jenkins, J. A. Baldwin, Y. Zhang, B. Sharpee, E. Pellegrini, and M. Phillips, Independent emission and absorption abundances for planetary nebulae, *Astrophys. J. 677*, 1100, 2008.

Wilman, D. J., M. L. Balogh, R. G. Bower, J. S. Mulchaey, A. Oemler, Jr. and R. G. Carlberg, Morphologies and star formation in $z \sim 0.5$ group galaxies, in *Groups of Galaxies in the Nearby Universe*, I. Saviane, V. D. Ivanov, and J. Borissova, eds., p. 145, Springer-Verlag, Berlin, 2007.

Wilman, D. J., D. Pierini, K. Tyler, S. L. McGee, A. Oemler, Jr., S. L. Morris, M. L. Balogh, R. G. Bower, and J. S. Mulchaey, Unveiling the important role of groups in the evolution of massive galaxies: insights from an infrared passive sequence at intermediate redshift, *Astrophys. J. 680*, 1009, 2008.

Wilson, G., A. Muzzin, M. Lacy, H. Yee, . . . M. Gladders, et al., Clusters of galaxies at $1 < z < 2$: the Spitzer adaptation of the Red-Sequence Cluster Survey, in *The Second Annual Spitzer Science Conference: Infrared Diagnostics of Galaxy Evolution*, ASP Conf. Series 381, R.-R. Chary, H. I. Teplitz, and K. Sheth, eds., p. 210, Astronomical Society of the Pacific, San Francisco, 2008.

Windhorst, R. A., N. P. Hathi, S. H. Cohen, R. A. Jansen, D. Kawata, et al., High resolution science with high redshift galaxies, *Adv. Space Res. 41*, 1965, 2008.

Wrobel, J. M., Y. Terashima, and L. C. Ho, Outflow-dominated emission from the quiescent massive black holes in NGC 4621 and NGC 4697, *Astrophys. J. 675*, 1041, 2008.

Wyder, T. K., D. C. Martin, D. Schiminovich, M. Seibert, . . . B. F. Madore, et al., The UV-optical galaxy color-magnitude diagram. I. Basic properties, *Astrophys. J. Suppl Ser. 173*, 293, 2007.

Yan, H., Passively evolving galaxy population as seen by GOODS, in *Relativistic Astrophysics: 4th Italian-Sino Workshop*, AIP Conf. Proceedings 966, C. L. Bianco and S.-S. Xue, eds., p. 71, American Institute of Physics, Melville, N.Y., 2008.

Yan, H., et al., The stellar masses and star formation histories of galaxies at $z \sim 6$: constraints from Spitzer GOODS observations, in *At the Edge of the Universe: Latest Results from the Deepest Astronomical Surveys*, ASP Conf. Series 380, J. Afonso et al., eds., p. 35, Astronomical Society of the Pacific, San Francisco, 2007.

Yan, H., N. P. Hathi, and R. A. Windhorst, An overdensity of i-dropouts among a population of excess field objects in the Virgo cluster, *Astrophys. J. 675*, 136, 2008.

Yee, H. K. C., M. D. Gladders, et al., The Red-Sequence Cluster Survey, in *Cosmic Frontiers*, ASP Conf. Series 379, N. Metcalfe and T. Shanks, eds., p. 103, Astronomical Society of the Pacific, San Francisco, 2007.

Younger, J. D., J.-S. Huang, G. G. Fazio, T. J. Cox, . . . H. Yan, et al., Rest-frame ultraviolet to near-infrared observations of an interacting Lyman break galaxy at $z = 4.42$, *Astrophys. J. 671*, 1241, 2007.

Yoshida, M., K. Shimasaku, M. Ouchi, et al., The Subaru/XMM-Newton Deep Survey (SXDS). VII. Clustering segregation with ultraviolet and optical luminosities of Lyman break galaxies at $z \sim 3$, *Astrophys. J. 679*, 269, 2008.

Zalucha, A., A. Fitzsimmons, J. L. Elliot, J. Thomas-Osip, et al., The 2003 November 14 occultation by Titan of TYC 1343-1865-1. II. Analysis of light curves, *Icarus 192*, 503, 2007.

Zamojski, M. A., D. Schiminovich, R. M. Rich, B. Mosbasher, . . . B. F. Madore, et al., Deep GALEX imaging of the COSMOS HST Field: a first look at the morphology of $z \sim 0.7$ star-forming galaxies, *Astrophys. J. Suppl. Ser. 172*, 468, 2007.

Zloczewski, K., J. Kaluzny, W. Krzeminski, A. Olech, and I. B. Thompson, Variable stars in the field of the old open cluster Melotte 66, *Mon. Not. Roy. Astron. Soc. 380*, 1191, 2007.

PLANT BIOLOGY

Avraham, S., C.-W. Tung, K. Ilic, P. Jaiswal, E. A. Kellogg, S. McCouch, A. Pujar, L. Reiser, S. Y. Rhee, M. M. Sachs, M. Schaeffer, L. Stein, P. Stevens, L. Vincent, F. Zapata, and D. Ware, The Plant Ontology Database: a community resource for plant structure and developmental stages controlled vocabulary and annotations, *Nucl. Acids Res. 36*, D449-D454, 2008.

Bai, M.-Y., L.-Y. Zhang, S. S. Gampala, S.-W. Zhu, W.-Y. Song, K. Chong, and Z.-Y. Wang, Functions of OsBZR1 and 14-3-3 proteins in brassinosteroid signaling in rice, *Proc. Natl. Acad. Sci. USA 104*, 13839-13844, 2007.

Bailey, S., and A. R. Grossman, Photoprotection in cyanobacteria: regulation of light harvesting, *Photochem. & Photobiol. 84,* 1410-1420, 2008

Bailey, S., A. Melis, G. van Dijken, K. Mackey, G. M. Berg, K. Arrigo, J. Shrager, and A. R. Grossman, Photosynthesis in marine *Synechococcus* and the critical nature of electron flow to O_2, *Biochem. Biophys. Acta 1777*, 269-276, 2008.

Bannigan, A., W. R. Scheible, W. Lukowitz, C. Eagerstron, P. Wadsworth, C. R. Somerville, and T. Baskin, A conserved role for kinesin-5 in plant mitosis, *J. Cell Sci. 120*, 2819-2827, 2007.

Barton, M. K., The ins and outs of *Arabidopsis* embryogenesis, *Dev. Cell 12*, 849-850, 2007.

Barton, M. K., Making holes in leaves: promoting cell state transitions in stomatal development, *Plant Cell 19*, 1140-1143, 2007.

Berg, G. M., K. R. Arrigo, G. Glöckner, and A. R. Grossman, Understanding nitrogen limitation in the marine pelagophyte *Aureococcus anophagefferens* through cDNA analysis*, J. Phycol*., in press.

Bhaya, D., A. R. Grossman, A.-S. Steunou, N. Khuri, F. M. Cohan, N. Hamamura, M. C. Melendrez, M. M. Bateson, D. M. Ward, and J. F. Heidelberg, Genomic, metagenomic and functional analyses of cyanobacteria from hot-spring microbial mats reveal an unexpected diversity in nutrient utilization strategies, *ISME J. 1*, 703-713, 2007.

Bhaya, D., D. Levy, and T. Requeijo, Group dynamics of phototaxis: interacting stochastic many-particles systems and their continuum limit, in *Hyperbolic Problems: Theory, Numerics, Applications*, Proceedings of the 11th International Conference on Hyperbolic Problems, Lyon, France, 2006, S. Benzoni-Gavage and D. Serre., eds., pp. 145-159, Springer-Verlag, Berlin, 2008.

Blanch, H. W., P. D. Adams, K. M. Andrews-Cramer, W. B. Frommer, B. A. Simmons, and J. D. Keasling, Addressing the need for alternative transportation fuels: The Joint BioEnergy Institute (JBEI), *ACS Chem Biol*. *3*, 17-20, 2008.

Blouin, N., A. R. Grossman, C. Yarish, and S. H. Brawley, The use of cDNA libraries to investigate asexual reproduction in *Porphyra umbilicalis* (L.) Kützing, *Proceedings of the 19th International Seaweed Symposium*, Kobe, Japan, in press, 2008.

Briggs, W. R., In the light of day: plant photomorphogenesis, *Mol. Plant 1*, 2-3, 2008.

Briggs, W., and D. Koller, *ASPB News 35*, 30, 2008.

Burriesci, M., and D. Bhaya, Tracking phototactic responses and modeling motility of *Synechocystis* sp. strain PCC6803, *J. Photochem. Photobiol*. *91*, 77-86, 2008.

Cardol, P., B. Bailleul, E. Derelle, D. Béal, F. Rappaport, C. Breyton, S. Bailey, F.-A. Wollman, A. R. Grossman, H. Moreau, and G. Finazzi, A novel adaptation of photosynthesis in the marine picoeukaryote *Ostreococcus* sp., *Proc. Natl. Acad. Sci. USA 105*, 7881-7886, 2008.

Caspi, R., H. Foerster, C. A. Fulcher, P. Kaipa, M. Krummenacker, M. Latendresse, S. Paley, S. Y. Rhee, A. G. Shearer, C. Tissier, T. C. Walk, P. Zhang, and P. D. Karp, The MetaCyc Database of metabolic pathways and enzymes and the BioCyc collection of Pathway/Genome Databases, *Nucl. Acids Res*. doi: 10.1093/nar/gkm900, 2007.

Chang, C.-S., Y.-H. Li, L.-T. Chen, W.-C. Chen, W.-P. Hsieh, J. Shin, W.-N. Jane, S.-J. Chou, G. Choi, J.-M. Hu, S. Somerville, and S.-H. Wu, LZF1, a HY-5-regulated transcriptional factor, functions in *Arabidopsis* de-etiolation, *Plant J. 54*, 205-219, 2008.

Chaudhuri, B., T. Niittylä, F. Hörmann, and W. B. Frommer, Fluxomics with ratiometric metabolite dyes, *Plant Sig. Behav*. *2*, 120-122, 2007.

Christie, J. M., S. Corchnoy, T. E. Swartz, M. Hokenson, I.-S. Han, W. R. Briggs, and R. A. Bogomolni, Steric interactions stabilize adduct formation in the LOV2 domain of phototropin 1, *Biochemistry 46*, 9310-9319, 2007.

DeBolt, S., R. Gutierrez, D. W. Ehrhardt, and C. R. Somerville, Non-motile CESA rosettes repeatedly accumulate within localized sub-resolution regions at the plasma membrane in *Arabidopsis* hypocotyl cells following 2,6-dichlorobenzonitrile (DCB) treatment, *Plant Physiol. 145*, 334-338, 2007.

Deng Z., X. Zhang, W. Tang, J. A. Oses-Prieto, N. Suzuki, J. M. Gendron, H. Chen, S. Guan, R. J. Chalkley, T. K. Peterman, A. L. Burlingame, and Z.-Y. Wang, A proteomic study of brassinosteroid response in *Arabidopsis*, *Mol. Cell. Proteomics 6*, 2058-2071, 2007.

Dulla, C., S. Okumoto, R. Reimer, W. B. Frommer, and J. Huguenard, Imaging of glutamate in brain slices using FRET sensors, *J. Neurosci. Meth*. *168*, 306-319, 2008.

Ehrhardt, D. W., Straighten up and fly right: microtubule dynamics and organization of non-centrosomal arrays in higher plants, *Curr. Opin. Cell Biol. 20*, 107-116, 2008.

Espinoza, G., C. Medina, S. Somerville, and P. Arce-Johnson, Senescence-associated genes induced during compatible viral interactions with grapevine and *Arabidopsis*, *J. Exp. Biol*. *58*, 3197-3212, 2007.

Fabro, G., J. A. Di Rienzo, C. Voigt, T. Savchenko, K. Dehesh, S. Somerville, and M. E. Álvarez, Genome-wide expression profiling *Arabidopsis thaliana* at the stage of *Golovinomyces cichoracearum* haustorium formation, *Plant Physiol. 146*, 1421-1439, 2008.

Gampala, S. S., T.-W. Kim, J.-X. He, W. Tang, Z. Deng, M.-Y. Bai, S. Guan, S. Lalonde, Y. Sun, J. M. Gendron, H. Chen, N. Shibagaki, R. J. Ferl, D. Ehrhardt, K. Chong, A. L. Burlingame, and Z.-Y. Wang, An essential role for 14-3-3 proteins in brassinosteroid signal transduction in *Arabidopsis*, *Dev. Cell 13*, 177-189, 2007.

Gendron, J. M., A. Haque, N. Gendron, T. Chang, T. Asami, and Z.-Y. Wang, Chemical genetic dissection of brassinosteroid-ethylene interaction, *Mol. Plant 1*, 368-379, 2008.

Gendron, J. M., and Z.-Y. Wang, Multiple mechanisms modulate brassinosteroid signaling, *Curr. Opin. Plant Biol. 10*, 436-441, 2007.

Gonzalez-Ballester, D., and A. R. Grossman, Sulfur limitation from the physiological to the genomic, in *The Chlamydomonas Sourcebook*, E. Harris, D. Stern, and G. Witman, eds.. in press, Academic Press, 2008.

Gonzalez-Ballester, D., S. V. Pollock, W. Pootakham, and A. R. Grossman, The central role of a SNRK2 kinase in sulfur deprivation responses, *Plant Physiol*. *147*, 216-227, 2008.

Grossman, A. R., In the grip of algal genomics, in *Transgenic Microalgae as Green Cell Factories*, vol. 616 of Advances in Experimental Medicine and Biology, Landers Bioscience Publishers, 54-76, 2007.

Grossman, A. R., D. Gonzalez-Ballester, N. Shibagaki, W. Pootakham, and J. Moseley, Algal responses to macronutrient deprivation, in *Abiotic Stress Adaptation in Plants*, A. Pareek, S. K. Sopory, H. J. Bohnert, and R. Govindjee, eds., in press, 2008.

Han, I.-S., W. Eisinger, T.-S. Tseng, and W. R. Briggs, Control of the intracellular distribution of phototropin 1-GFP by phytochrome, submitted to *Plant Cell,* 2008.

Ilic, K., P. F. Stevens, E. A. Kellogg, and S. Y. Rhee, Structure ontology–anatomical ontology of flowering plants, in *Anatomy Ontologies for Bioinformatics: Principles and Practice*, A. Burger, D. Davidson, and R. Baldock, eds., pp. 27-42, The Gene Ontology Consortium 2007, The Gene Ontology Project in 2008, *Nucl. Acids Res*. doi: 10.1093/nar/gkm883, 2008.

Kaper, T., I. Lager, L. L. Looger, D. Chermak, and W. B. Frommer, FRET sensors for quantitative monitoring of pentose and disaccharide accumulation in bacteria, *Biotechnol. Biofuels 1*, 11, 2008.

Kaper, T., L. L. Looger, H. Takanaga, M. Platten, L. Steinman, and W. B. Frommer, Nanosensor detection of an immunoregulatory tryptophan influx/kynurenine efflux cycle, *PloS Biol*. *5*, e257, 2007.

Kilian, O., A-.S. Steunou, A. R. Grossman, and D. Bhaya, A novel two domain-fusion protein in cyanobacteria with similarity to the CAB/ELIP/HLIP superfamily: evolutionary implications and regulation, *Mol. Plant 1*, 155-166, 2007.

Kirik, V., U. Herrmann, C. Parupalli, J. C. Sedbrook, D. W. Ehrhardt, and M. Hülskamp, CLASP localizes in two discrete patterns on cortical microtubules and is required for cell morphogenesis and cell division in *Arabidopsis*, *J. Cell Sci. 120*, 4416-4425, 2007.

Kutschera, U., The growing outer epidermal wall: design and physiological role of a composite structure, *Ann. Bot*. *101*, 615-621, 2008.

Kutschera, U., The pacemaker of plant growth, *Trends Plant Sc*i. *13*, 105-107, 2008.

Lalonde, S., S. Y. Rhee, D. Loqué, D. W. Ehrhardt, and W. B. Frommer, Molecular and cellular approaches for the detection of protein/protein interactions and generation of large-scale protein interaction maps: latest techniques and current limitations, *Plant J. 53*, 610-635, 2008.

Loqué, D., S. Lalonde, L. L. Looger, N. von Wirén, and W. B. Frommer, A cytosolic trans-activation domain essential for ammonium uptake, *Nature 446*, 195-198, 2007.

Luan, S., X.-Y. Chen, N. Raikhel, and W. R. Briggs, Foreword: A new “silk road” for a new era of plant science, *Mol. Plant 1*, 1, 2008.

Mackey, K., A. Paytan, and S. Bailey, Oxygen reduction in picocyanobacterial photosynthesis: a novel strategy for coping in a high light, low nutrient environment, *Limnol. Oceanogr. 53*, 900-913, 2008.

Merchant, S., et al., *Chlamydomonas reinhardtii* genome reveals evolutionary insights into critical animal- and plant-associated functions, *Science 318*, 245-250, 2007.

Mohnen, D., M. Bar-Peled, and C. Somerville, Cell wall synthesis, in *Biomass Recalcitrance*, M. Himmel, ed., pp. 94-159, Blackwell, 2008.

Moseley, J., and A. R. Grossman, Phosphorus limitation from the physiological to the genomic, in *The Chlamydomonas Sourcebook,* E. Harris, D. Stern, and G. Witman, eds., Academic Press, in press, 2008.

Niittylä, T., B. Chaudhuri, U. Sauer, and W. B. Frommer, Comparison of quantitative metabolite imaging tools and carbon-13 techniques for fluxomics, in *Methods in Molecular Biology,* D. Belostotsky, ed., Humana Press, in press, 2008.

Niittylä, T., A. T. Fuglsang, M. G. Palmgren, W. B. Frommer, and W. X. Schulze, Temporal analysis of sucrose-induced phosphorylation changes in plasma membrane proteins of *Arabidopsis*, *Mol. Cell. Proteomics 6*, 1711-1726, 2007.

Okumoto, S., H. Takanaga, and W. B. Frommer, Tansley review: The use of quantitative imaging for the discovery and modeling of metabolic control networks, *New Phytol*., in press, 2008.

Paredez, A. R., S. Persson, D. W. Ehrhardt, and C. R. Somerville, Genetic evidence that cellulose synthase activity influences microtubule cortical array organization, *Plant Physiol*. *147*, 16723-16734; doi: 10.1104/pp.108.120196.

Pennycooke, J. C., H. Cheng, S. M. Roberts, Q. Yang, S. Y. Rhee, and E. Stockinger, The low temperature-responsive, Solanum CBF1 genes maintain high identity in their upstream regions in a genomic environment undergoing gene duplications, deletions, and rearrangements, *Plant Mol. Biol. 67*, 483-497, 2008.

Persson, S., A. Paredez, A. Carroll, H. Palsdottir, M. Doblin, P. Poindexter, N. Khitrov, M. Auer, and C. R. Somerville, Genetic evidence for three unique components in primary cell wall cellulose synthase complexes in *Arabidopsis*, *Proc. Natl. Acad. Sci. USA 104*, 15566-15571, 2007.

Rhee, S. Y., V. Wood, K. Dolinski, and S. Draghici, Use and misuse of the gene ontology (GO) annotations, *Nat. Rev. Genet. 9*, 509-515, 2008.

Ribas-Carbo, M., L. Giles, J. Flexas, W. Briggs, and J. Berry, Phytochrome-driven changes in respiratory electron transport partitioning in soybean (*Glycine max* L.) cotyledons, *Plant Biol. 10*, 281-287, 2008.

Ryu, W. Y., Z. Huang, Z. S. Park, J. Moseley, A. R. Grossman, R. J. Fasching, and F. B. Prinz, Open microfluidic system for *in situ* electrochemical atomic force microscopy analysis of a single cell to measure photosynthetic electron transport, *Lab on a Chip*, in press, 2008.

Shibagaki, N., W. Pootakham, and A. R. Grossman, The responses of algae to their sulfur environment, in *Advances in Photosynthesis and Respiration*, R. Hell, C. Dahl, D. Knaff, T. Leustek, eds., invited review, in press, Springer Science+Business Media, 2008.

Silady, R. A., D. W. Ehrhardt, K. Jackson, C. Faulkner, K. Oparka, and C. R. Somerville, The GRV2/RME-8 protein of *Arabidopsis* functions in the late endocytic pathway and is required for vacuolar membrane flow, *Plant J. 53*,29-41, 2008.

Steunou, A.-S., S. Jensen, E. Brecht, E. D. Becraft, M. M. Bateson, O. Kilian, D. Bhaya, D. M. Ward, J. W. Peters, A. R. Grossman, and M. Kühl, Regulation of *nif* gene xxpression and the energetics of N_2 fixation over the diel cycle in a hot spring microbial mat, *ISME J. 2*, 364-378, 2008; doi: 10.1038/ismej.2007.117.

Sun, H., A. M. Scharff-Poulsen, H. Gu, I. Jakobsen, J. Kossmann, W. B. Frommer, and K. Almdal, Phosphate sensing by fluorescent reporter proteins embedded in polyacrylamide nanoparticles, *ACS Nano 2*, 19-24, 2008.

Swarbreck, D., C. Wilks, P. Lamesch, T. Z. Berardini, M. Garcia-Hernandez, H. Foerster, D. Li, T. Meyer, R. Muller, L. Ploetz, A. Radenbaugh, S. Singh, V. Swing, C. Tissier, P. Zhang, E. Huala, The Arabidopsis Information Resource (TAIR): gene structure and function annotation, *Nucl. Acids Res. 36*, D1009-D1014, 2008.

Swartz, T. E., T.-S. Tseng, M. A. Frederickson, G. Paris, D. J. Comerci, G. Rajeshekara, J.-G. Kim, M. B. Mudgett, G. Splitter, R. A. Ugalde, F. Goldbaum, W. R. Briggs, and R. A. Bogomolni, Blue light-activated histidine kinases: two-component sensors in bacteria, *Science 317*, 1090-1093, 2007.

Takanaga, H., B. Chaudhuri, and W.B. Frommer, GLUT1 and GLUT9 as the major contributors to glucose influx in HEPG2 cells identified by a high sensitivity intramolecular FRET glucose sensor, *Biochim. Biophys. Acta 1778*, 1091-1099, 2008.

Tang, W., Z. Deng, J. A. Oses-Prieto, N. Suzuki, S. Zhu, X. Zhang, A. L. Burlingame, and Z.-Y. Wang, Proteomic studies of brassinosteroid signal transduction using prefractionation and 2-D DIGE, *Mol. Cell. Proteomics 7*, 728-738, 2008.

Tang, W., T.-W. Kim, J. A. Oses-Prieto, Y. Sun, Z. Deng, S. Zhu, R. Wang, A. L. Burlingame, and Z.-Y. Wang, BSKs mediate signal transduction from the receptor kinase BRI1 in *Arabidopsis*, *Science 321*, 557-560, 2008.

Thayer, S. S., S. B. St. Clair, C. B. Field, and S. C. Somerville, Accentuation of phosphorus limitation in *Geranium dissectum* by nitrogen: an ecological genomics study, *Glob. Change Biol. 14*, 1877-1890, 2008.

Ulijasz, A. T., G. Cornilescu, D. von Stetten, S. Kaminsky, M. A. Mroginski, J. Zhang, D. Bhaya, P. Hildebrandt, and R. D. Vierstra, Characterization of two thermostable cyanobacterial phytochromes reveal global movements in the chromophore-binding domain during photoconversion, *J. Biol. Chem*. *283*, 21251-21266, 2008.

Underwood, W., and S. C. Somerville, Focal accumulation of defenses at sites of fungal pathogen attack, *J. Exp. Bot.*; doi: 10.1093/jxb/em 205.

Voigt, C. A., and S. C. Somerville, Callose in biotic stress (pathogenesis), in *(1-3)-β-Glucans and Related Polysaccharides: Chemistry, Biochemistry, and Biology*, B. Stone, G. Fincher, and A. Bacic, eds., Elsevier Publishing, New York (in revision), 2008.

Walker, K. L., S. Müller, D. Moss, D. W. Ehrhardt, and L. G. Smith, Arabidopsis TANGLED identifies the division plane throughout mitosis and cytokinesis, *Curr. Biol*. 17, 1827-1836; doi: 10.1016/j.cub.2007.10.032.

Wan, Y.-L., W. Eisinger, D. Ehrhardt, F. Baluska, and W. Briggs, The subcellular localization and blue light-induced movement of phototropin1-GFP in etiolated seedlings of *Arabidopsis thaliana*, *Mol. Plant 1*, 103-117, 2008.

Weise, A., S. Lalonde, C. Kühn, W. B. Frommer, and J. W. Ward, Introns control expression of sucrose transporter LeSUT1 in trichomes, companion cells, and in guard cells, *Plant Mol. Biol. 68,* 251-262, 2008.

Wenkel, S., J. Emery, M. Evans, B. H. Hou, and M. K. Barton, A feedback regulatory module formed by LITTLE ZIPPER and HD-ZIPIII genes, *Plant Cell 19,* 3379-3390, 2007.

Wiechert, W., O. Schweissgut, H. Takanaga, and W. B. Frommer, Fluxomics: mass spectrometry versus quantitative imaging, *Curr. Opin. Plant Biol. 10*, 323-330, 2007.

Youngs, H. L., T. Hamann, E. Osborne, and C. R. Somerville, The cellulose synthase superfamily, in *Cellulose: Molecular and Structural Biology: Selected Articles on the Synthesis, Structure, and Applications of Cellulose*, M. Brown and I. Saxena, eds., pp. 35-49, Springer, 2007.

Yuan, L., D. Loqué, F. Ye, W. B. Frommer, and N. von Wirén, Nitrogen-dependent posttranscriptional regulation of the ammonium transporter AtAMT1;1, *Plant Physiol. 143*, 732-744, 2007.

Zhang, X., Y. Chen, Z.-Y. Wang, Z. Chen, H. Gu, and L. J. Qu, Constitutive expression of *CIR1* (*RVE2*) affects several circadian-regulated processes and seed germination in Arabidopsis, *Plant J. 51*, 512-525, 2007.

Zhang, Z., A. Lenk, M. X. Andersson, T. Gjetting, C. Pedersen, M. E. Nielsen, P. Hagedorn, B.-H. Hou, S. C. Somerville, and H. Thordal-Christensen, A lesion-mimic syntaxin double mutant in *Arabidopsis* reveals novel complexity of pathogen defense signaling, *Mol. Plant 1*, 510-527, 2008.

Zimmerli, L., B.-H. Hou, C.-H. Tsai, G. Jakab, B. Mauch-Mani, and S. Somerville, The xenobiotic β-aminobutyric acid enhances Arabidopsis thermotolerance, *Plant J. 53*, 144-156, 2007.

DEPARTMENT OF TERRESTRIAL MAGNETISM

Here updated through September 30, 2008. The list is regularly updated on the DTM Web site (http://www.dtm.ciw.edu).

____ Aarnio, A. N., A. J. Weinberger, K. G. Stassun, E. E. Mamajek, and D. J. James, A survey for a coeval, comoving group associated with HD 141569, *Astron. J.,* in press.

6586 Alexander, C. M. O'D., G. D. Cody, M. Fogel, and H. Yabuta, Organics in meteorites—Solar or interstellar?, in *Organic Matter in Space,* S. Kwok and S. Sandford, eds., pp. 293-298, International Astronomical Union Symposium 251, Cambridge University Press, Cambridge, 2008.

6526 Alexander, C. M. O'D., J. N. Grossman, D. S. Ebel, and F. J. Ciesla, The formation conditions of chondrules and chondrites, *Science 320,* 1617-1619, 2008.

6485 Amoruso, A., L. Crescentini, A. T. Linde, I. S. Sacks, R. Scarpa, and P. Romano, A horizontal crack in a layered structure satisfies deformation for the 2004-2006 uplift of Campi Flegrei, *Geophys. Res. Lett. 34,* L22313, 10.1029/2007GL031644, 2007.

6537 Anderson, B. J., M. H. Acuña, H. Korth, M. E. Purucker, C. L. Johnson, J. A. Slavin, S. C. Solomon, and R. L. McNutt, Jr., The structure of Mercury's magnetic field from MESSENGER's first flyby, *Science 321,* 82-85, 2008.

____ Aulbach, S., S. B. Shirey, T. Stachel, S. Creighton, K. Muehlenbach, and J. W. Harris, Diamond formation episodes at the southern margin of the Kaapvaal Craton: Re-Os systematics of sulfide inclusions from the Jagersfontein Mine, *Contrib. Mineral. Petrol.,* in press.

6483 Bakos, G. Á., G. Kovács, G. Torres, D. A. Fischer, D. W. Latham, R. W. Noyes, D. D. Sasselov, T. Mazeh, A. Shporer, R. P. Butler, R. P. Stefanik, J. M. Fernández, A. Sozzetti, A. Pál, J. Johnson, G. W. Marcy, J. N. Winn, B. Sipőcz, J. Lázár, I. Papp, and P. Sári, HD 147506b: a supermassive planet in an eccentric orbit transiting a bright star, *Astrophys. J. 670,* 826-832, 2007.

6494 Balogh, A., R. Grard, S. C. Solomon, R. Schulz, Y. Langevin, Y. Kasaba, and M. Fujimoto, Missions to Mercury, *Space Sci. Rev. 132,* 611-645, 2007.

6491 Benjamin, E. R., T. Plank, J. A. Wade, K. A. Kelley, E. H. Hauri, and G. E. Alvarado, High water contents in basaltic magmas from Irazú Volcano, Costa Rica, *J. Volcanol. Geotherm. Res. 168,* 68-92, 2007.

____ Blackburn, T. J., D. F. Stockli, R. W. Carlson, and P. Berendsen, (U–Th)/He dating of kimberlites—a case study from north-eastern Kansas, *Earth Planet. Sci. Lett.,* in press.

____ Boardsen, S. A., B. J. Anderson, M. H. Acuña, J. A. Slavin, H. Korth, and S. C. Solomon, Narrow-band ultra-low-frequency wave observations by MESSENGER during its January 2008 flyby through Mercury's magnetosphere, *Geophys. Res. Lett.,* in press.

6520 Bonanos, A. Z., M. López-Morales, I. Hunter, and R. S. I. Ryans, Low metallicity indicates that the hypervelocity star HE 0437-5439 was ejected from the Large Magellanic Cloud, *Astrophys. J. (Lett.) 675,* L77-L80, 2008.

6548 Bonanos, A. Z., K. Z. Stanek, A. H. Szentgyorgyi, D. D. Sasselov, and G. Á. Bakos, Erratum: "The RR Lyrae distance to the Draco dwarf spheroidal galaxy," *Astron. J. 136,* 896-897, 2008.

6557 Bond, J. C., D. S. Lauretta, C. G. Tinney, R. P. Butler, G. W. Marcy, H. R. A. Jones, B. D. Carter, S. J. O'Toole, and J. Bailey, Beyond the iron peak: *r*- and *s*-process elemental abundances in stars with planets, *Astrophys. J. 682,* 1234-1247, 2008.

6508 Boss, A. P., Flux-limited diffusion approximation models of giant planet formation by disk instability, *Astrophys. J. 677,* 607-615, 2008.

6517 Boss, A. P., Mixing in the solar nebula: implications for isotopic heterogeneity and large-scale transport of refractory grains, *Earth Planet. Sci. Lett. 268,* 102-109, 2008.

6546 Boss, A. P., Rapid formation of gas giants, ice giants, and super-Earths, *Phys. Scr. T130,* 014020, 2008.

6553 Boss, A. P., Outlook: testing planet formation theories, in *Planetary Systems and Planets in Systems,* S. Udry, W. Benz, and R. von Steiger, eds., pp. 287-302, ISSI Scientific Report SR-006, International Space Science Institute/ESA Publications, Noordwijk, Netherlands, 2006. Available online at http://www.issibern.ch/publications/sr.html.

6554 Boss, A. P., Solar system, in *McGraw-Hill Encyclopedia of Science and Technology,* 10th ed., vol. 16, pp. 727-730, McGraw-Hill, New York, 2007.

6555 Boss, A. P., Extrasolar planets: past, present, and future, in *A Decade of Extrasolar Planets around Normal Stars,* M. Livio, K. Sahu, and J. Valenti, eds., pp. 1-14, Cambridge University Press, New York, 2008.

____ Boss, A. P., Commission 51: Bioastronomy (IAU Triennial Report), in *Transactions of the International Astronomical Union, Vol. XXVII A,* K. van der Hucht, ed., Cambridge University Press, New York, in press.

____ Boss, A. P., Commission 53: Extrasolar Planets (IAU Triennial Report), in *Transactions of the International Astronomical Union, Vol. XXVII A,* K. van der Hucht, ed., Cambridge University Press, New York, in press.

____ Boss, A. P., S. I. Ipatov, S. A. Keiser, E. A. Myhill, and H. A. T. Vanhala, Simultaneous triggered collapse of the presolar dense cloud core and injection of short-lived radioisotopes by a supernova shock wave, *Astrophys. J. (Lett.),* in press.

6493 Boyet, M., and R. W. Carlson, A highly depleted Moon or a non-magma ocean origin for the lunar crust?, *Earth Planet. Sci. Lett. 262,* 505-516, 2007.

6487 Boynton, W. V., A. L. Sprague, S. C. Solomon, R. D. Starr, L. G. Evans, W. C. Feldman, J. I. Trombka, and E. A. Rhodes, MESSENGER and the chemistry of Mercury's surface, *Space Sci. Rev. 131,* 85-104, 2007.

____ Brandenburg, J. P., E. H. Hauri, P. E. van Keken, and C. J. Ballentine, A multiple-system study of the geochemical evolution of the mantle with force-balanced plates and thermochemical effects, *Earth Planet. Sci. Lett.,* in press.

6470 Busemann, H., C. M. O'D. Alexander, and L. R. Nittler, Characterization of insoluble organic matter in primitive meteorites by microRaman spectroscopy, *Meteoritics Planet. Sci. 42,* 1387-1416, 2007.

6577 Butler, R. P., The search for rocky planets around the nearest stars, in *Frontiers of Astrophysics: A Celebration of NRAO's 50th Anniversary,* A. H. Bridle, J. J. Condon, and G. C. Hunt, eds., pp. 203-212, Conference Series, Vol. 395, Astronomical Society of the Pacific, San Francisco, 2008.

____ Carlson, R. W., and M. Boyet, Composition of the Earth's interior: the importance of early events, *Phil. Trans. Roy. Soc. London A,* in press.

6570 Carlson, R. W., S. B. Shirey, and M. Schönbächler, Applications of PGE radioisotope systems in geo- and cosmochemistry, *Elements 4,* 239-245, 2008.

6497 Catalán, S., J. Isern, E. García-Berro, I. Ribas, C. Allende Prieto, and A. Z. Bonanos, The initial-final mass relationship from white dwarfs in common proper motion pairs, *Astron. Astrophys. 477,* 213-221, 2008.

____ Chambers, J., Oligarchic growth with migration and fragmentation, *Icarus,* in press.

____ Chambers, J. E., N-body integrators for planets in binary star systems, in *Planets in Binary Star Systems,* N. Haghighipour, ed., Springer, in press.

____ Chambers, J. E., D. P. O'Brien, and A. M. Davis, Accretion of planetesimals and the formation of rocky planets, in *Protoplanetary Dust,* D. Apai and D. Lauretta, eds., Cambridge University Press, in press.

6500 Cho, J. Y.-K., K. Menou, B. M. S. Hansen, and S. Seager, Atmospheric circulation of close-in extra-solar giant planets: I. Global, barotropic, adiabatic simulations, *Astrophys. J. 675,* 817-845, 2008.

6475 Ciesla, F. J., Outward transport of high-temperature materials around the midplane of the solar nebula, *Science 318,* 613-615, 2007.

6501 Ciesla, F. J., Observing our origins, *Science 319,* 1488-1489, 2008.

6567 Ciesla, F. J., Radial transport in the solar nebula: implications for moderately volatile element depletions in chondritic meteorites, *Meteoritics Planet. Sci. 43,* 639-655, 2008.

6583 Coccato, L., R. Swaters, V. C. Rubin, S. D'Odorico, and S. McGaugh, VLT/VIMOS integral-field kinematics of the giant low surface brightness galaxy ESO 323-G064, in *Formation and Evolution of Galaxy Disks,* J. G. Funes and E. M. Corsini, eds., pp. 481-482, Conference Series, Vol. 396, Astronomical Society of the Pacific, San Francisco, 2008.

____ Coccato, L., R. A. Swaters, V. C. Rubin, S. D'Odorico, and S. S. McGaugh, VIMOS-VLT integral field kinematics of the giant low surface brightness galaxy ESO 323-G064, *Astron. Astrophys.,* in press.

6527 Cody, G. D., H. Ade, C. M. O'D. Alexander, T. Araki, A. Butterworth, H. Fleckenstein, G. Flynn, M. K. Gilles, C. Jacobsen, A. L. D. Kilcoyne, K. Messenger, S. A. Sandford, T. Tyliszczak, A. J. Westphal, S. Wirick, and H. Yabuta, Quantitative organic and light element analysis of Comet 81P/Wild 2 particles using C-, N-, and O-μ-XANES, *Meteoritics Planet. Sci. 43,* 353-365, 2008.

6585 Cody, G. D., C. M. O'D. Alexander, A. L. D. Kilcoyne, and H. Yabuta, Unraveling the chemical history of the Solar System as recorded in extraterrestrial organic matter, in *Organic Matter in Space,* S. Kwok and S. Sandford, eds., pp. 277-284, International Astronomical Union Symposium 251, Cambridge University Press, Cambridge, 2008.

6568 Cody, G. D., C. M. O'D. Alexander, H. Yabuta, A. L. D. Kilcoyne, T. Araki, H. Ade, P. Dera, M. Fogel, B. Militzer, and B. O. Mysen, Organic thermometry for chondritic parent bodies, *Earth Planet. Sci. Lett. 272,* 446-455, 2008.

____ Coughlin, J. L., G. S. Stringfellow, A. C. Becker, M. López-Morales, F. Mezzalira, and T. Krajci, New observations and a possible detection of parameter variations in the transits of Gliese 436b, *Astrophys. J. (Lett.),* in press.

6575 Crane, J. D., S. A. Shectman, R. P. Butler, I. B. Thompson, and G. S. Burley, The Carnegie Planet Finder Spectrograph: a status report, in *Ground-based and Airborne Instrumentation for Astronomy II,* I. S. McLean and M. M. Casali, eds., Paper 701479, SPIE Proceedings Vol. 7014, SPIE, Bellingham, Wash., 2008.

6518 Cumming, A., R. P. Butler, G. W. Marcy, S. S. Vogt, J. T. Wright, and D. A. Fischer, The Keck Planet Search: detectability and the minimum mass and orbital period distribution of extrasolar planets, *Publ. Astron. Soc. Pacific 120,* 531-554, 2008.

6506 Daradich, A., J. X. Mitrovica, I. Matsuyama, J. T. Perron, M. Manga, and M. A. Richards, Equilibrium rotational stability and figure of Mars, *Icarus 194,* 463-475, 2008.

6547 Davies, M. B., D. Malmberg, J. E. Chambers, R. P. Church, F. De Angeli, D. Mackey, and M. I. Wilkinson, Is our Sun a singleton?, *Phys. Scr. T130,* 014030, 2008.

6513 Debes, J. H., and M. López-Morales, A second look at the metal line variability of G29-38, *Astrophys. J. (Lett.) 677,* L43-L46, 2008.

6469 Debes, J. H., and S. Sigurdsson, The survival rate of ejected terrestrial planets with moons, *Astrophys. J. (Lett.) 668,* L167-L170, 2007.

6582 Debes, J. H., and S. Sigurdsson, Spitzer search for mid-IR excesses around five DAZs, in *15th European Workshop on White Dwarfs,* R. Napiwotzki and M. R. Burleigh, eds., pp. 309-314, Conference Series, Vol. 372, Astronomical Society of the Pacific, San Francisco, 2007.

6465 Debes, J. H., S. Sigurdsson, and B. Hansen, Cool customers in the stellar graveyard. IV. *Spitzer* search for mid-IR excesses around five DAs, *Astron. J. 134,* 1662-1670, 2007.

6512 Debes, J. H., A. J. Weinberger, and G. Schneider, Complex organic materials in the circumstellar disk of HR 4796A, *Astrophys. J. (Lett.) 673,* L191-L194, 2008. [Erratum published in *Astrophys. J. (Lett.) 682,* L145, 2008.]

6565 Debes, J. H., A. J. Weinberger, and I. Song, Color gradients detected in the HD 15115 circumstellar disk, *Astrophys. J. (Lett.) 684,* L41-L44, 2008.

6574 Des Marais, D. J., J. A. Nuth III, L. J. Allamandola, A. P. Boss, J. D. Farmer, T. M. Hoehler, B. M. Jakosky, V. S. Meadows, A. Pohorille, B. Runnegar, and A. M. Spormann, The NASA astrobiology roadmap, *Astrobiology 8,* 715-730, 2008.

6498 Endl, M., W. D. Cochran, R. A. Wittenmyer, and A. P. Boss, An $m \sin i = 24\ M_{\oplus}$ planetary companion to the nearby M dwarf GJ 176, *Astrophys. J. 673,* 1165-1168, 2008.

____ Fahed, R., A. F. J. Moffat, and A. Z. Bonanos, Photometric variability of WC9 stars, *Mon. Not. Roy. Astron. Soc.,* in press.

6499 Fischer, D. A., G. W. Marcy, R. P. Butler, S. S. Vogt, G. Laughlin, G. W Henry, D. Abouav, K. M. G. Peek, J. T. Wright, J. A. Johnson, C. McCarthy, and H. Isaacson, Five planets orbiting 55 Cancri, *Astrophys. J. 675,* 790-801, 2008.

6480 Fischer, D. A., S. S. Vogt, G. W. Marcy, R. P. Butler, B. Sato, G. W. Henry, S. Robinson, G. Laughlin, S. Ida, E. Toyota, M. Omiya, P. Driscoll, G. Takeda, J. T. Wright, and J. A. Johnson, Five intermediate-period planets from the N2K sample, *Astrophys. J. 669,* 1336-1344, 2007.

____ Foustoukos, D. I., I. Savov, and D. R. Janecky, Chemical and isotopic constraints on water/rock interactions at the Lost City hydrothermal field, 30° N Mid-Atlantic Ridge, *Geochim. Cosmochim. Acta,* in press.

6591 Ghosh, A., W. E. Holt, L. M. Flesch, and A. J. Haines, Gravitational potential energy of the Tibetan Plateau and the forces driving the Indian plate, *Geology 34,* 321-324, 2006.

6468 Hardy, S. J., "John Adam Fleming (1877-1956)," in *Encyclopedia of Geomagnetism and Paleomagnetism,* D. Gubbins and E. Herrero-Bervera, eds., pp. 273-274, Springer, New York, 2007.

6533 Head, J. W., S. L. Murchie, L. M. Prockter, M. S. Robinson, S. C. Solomon, R. G. Strom, C. R. Chapman, T. R. Watters, W. E. McClintock, D. T. Blewett, and J. J. Gillis-Davis, Volcanism on Mercury: evidence from the first MESSENGER flyby, *Science 321,* 69-72, 2008.

____ Herzog, G. F., C. M. O'D. Alexander, E. L. Berger, J. S. Delaney, and B. Glass, Potassium isotope fractionation in Australasian microtektites: evidence for potassium evaporation and condensation in a vapor plume, *Meteoritics Planet. Sci.,* in press.

6507 Ipatov, S. I., A. S. Kutyrev, G. J. Madsen, J. C. Mather, S. H. Moseley, and R. J. Reynolds, Dynamical zodiacal cloud models constrained by high resolution spectroscopy of the zodiacal light, *Icarus 194,* 769-788, 2008.

6584 James, D. E., Crust and lithosphere structure—Natural source portable array studies of continental lithosphere, in *Treatise on Geophysics, Vol. 1: Seismology and Structure of the Earth,* A. M. Dziewonski and B. A. Romanowicz, eds., pp. 479-531, Elsevier, Amsterdam, 2007.

6523 Jang-Condell, H., Planet shadows in protoplanetary disks. I. Temperature perturbations, *Astrophys. J. 679,* 797-812, 2008.

6590 Jeanloz, R., S. L. Beck, M. Lisowski, J. M. Lorenzo, C. I. Mora, J. D. Rimstidt, S. B. Shirey, S. Stein, and K. Wirth, Earth science instrumentation and facilities program review, *Eos, Trans. Am. Geophys. Union 89,* 61, 2008.

____ Jicha, B. R., G. L. Hart, C. M. Johnson, W. Hildreth, B. L. Beard, S. B. Shirey, and J. W. Valley, Isotopic and trace element constraints on the petrogenesis of lavas from the Mount Adams volcanic field, Washington, *Contrib. Mineral. Petrol.,* in press.

6484 Johnson, J. A., R. P. Butler, G. W. Marcy, D. A. Fischer, S. S. Vogt, J. T. Wright, and K. M. G. Peek, A new planet around an M dwarf: revealing a correlation between exoplanets and stellar mass, *Astrophys. J. 670,* 833-840, 2007.

____ Johnson, J. A., J. N. Winn, N. Narita, K. Enya, P. K. G. Williams, G. W. Marcy, B. Sato, Y. Ohta, A. Taruya, Y. Suto, E. L. Turner, G. Bakos, R. P. Butler, S. S. Vogt, W. Aoki, M. Tamura, T. Yamada, Y. Yoshii, and M. G. Hidas, Measurement of the spin-orbit angle of exoplanet HAT-P-1b, *Astrophys. J.,* in press.

6578 Jones, H. R. A., R. P. Butler, J. T. Wright, G. W. Marcy, D. A. Fischer, S. S. Vogt, C. G. Tinney, B. D. Carter, J. A. Johnson, C. McCarthy, and A. J. Penny, A catalogue of nearby exoplanets, in *Precision Spectroscopy in Astrophysics,* N. C. Santos et al., eds., pp. 205-206, Springer, Berlin, 2008.

____ Jung, H., Y. Fei, P. G. Silver, and H. W. Green II, Frictional sliding in serpentine at very high pressure, *Earth Planet. Sci. Lett.,* in press.

6561 Kennedy, P. J., A. M. Freed, and S. C. Solomon, Mechanisms of faulting in and around Caloris basin, Mercury, *J. Geophys. Res. 113,* E08004, 10.1029/2007JE002992, 2008.

6559 Kjeldsen, H., T. R. Bedding, T. Arentoft, R. P. Butler, T. H. Dall, C. Karoff, L. L. Kiss, C. G. Tinney, and W. J. Chaplin, The amplitude of solar oscillations using stellar techniques, *Astrophys. J. 682,* 1370-1375, 2008.

6519 Kneller, E. A., M. D. Long, and P. E. van Keken, Olivine fabric transitions and shear wave anisotropy in the Ryukyu subduction system, *Earth Planet. Sci. Lett. 268,* 268-282, 2008.

6481 Kovács, G., G. Á. Bakos, G. Torres, A. Sozzetti, D. W. Latham, R. W. Noyes, R. P. Butler, G. W. Marcy, D. A. Fischer, J. M. Fernández, G. Esquerdo, D. D. Sasselov, R. P. Stefanik, A. Pál, J. Lázár, I. Papp, and P. Sári, HAT-P-4b: a metal-rich low-density transiting hot Jupiter, *Astrophys. J. (Lett.) 670,* L41-L44, 2007.

____ Küppers, Michael, H. U. Keller, E. Kührt, M. F. A'Hearn, K. Altwegg, R. Bertrand, H. Busemann, M. T. Capria, L. Colangeli, B. Davidsson, P. Ehrenfreund, J. Knollenberg, S. Mottola, A. Rathke, P. Weiss, M. Zolensky, E. Akim, A. Basilevsky, E. Galimov, M. Gerasimov, O. Korablev, I. Lomakin, M. Marov, M. Martynov, M. Nazarov, A. Zakharov, L. Zelenyi, A. Aronica, A. J. Ball, C. Barbieri, A. Bar-Nun, J. Benkhoff, J. Biele, N. Biver, J. Blum, D. Bockelée-Morvan, O. Botta, J.-H. Bredehöft, F. Capaccioni, S. Charnley, E. Cloutis, H. Cottin, G. Cremonese, J. Crovisier, S. A. Crowther, E. M. Epifani, F. Esposito, A. C. Ferrari, F. Ferri, M. Fulle, J. Gilmour, F. Goesmann, N. Gortsas, S. F. Green,O. Groussin, E. Grün, P. J. Gutiérrez, P. Hartogh, T. Henkel, M. Hilchenbach, T.-M. Ho, G. Horneck, S. F. Hviid, W.-H. Ip, A. Jäckel, E. Jessberger, R. Kallenbach, G. Kargl, N. I. Kömle, A. Korth, K. Kossacki, C. Krause, H. Krüger, Z.-Y. Li, J. Licandro, J. J. Lopez-Moreno, S. C. Lowry, I. Lyon, G. Magni, U. Mall, I. Mann, W. Markiewicz, Z. Martins, M. Maurette, U. Meierhenrich, V. Mennella, T. C. Ng, L. R. Nittler, P. Palumbo, M. Pätzold, D. Prialnik, M. Rengel, H. Rickman, J. Rodriguez, R. Roll, D. Rost, A. Rotundi, S. Sandford, M. Schönbächler, H. Sierks, R. Srama, R. M. Stroud, S. Szutowicz, C. Tornow, S. Ulamec, M. Wallis, W. Waniak, P. Weissman, R. Wieler, P. Wurz, K. L. Yung, and J. C. Zarnecki, Triple F—a comet nucleus sample return mission, *Experim. Astron.,* in press.

____ Lim, L. F., and L. R. Nittler, Elemental composition of 433 Eros: new calibration of the NEAR-Shoemaker XRS data, *Icarus,* in press.

6514 Lissauer, J. J., and J. E. Chambers, Solar and planetary destabilization of the Earth-Moon triangular Lagrangian points, *Icarus 195,* 16-27, 2008.

6492 Long, M. D., and P. G. Silver, The subduction zone flow field from seismic anisotropy: a global view, *Science 319,* 315-318, 2008.

6581 López-Morales, M., and A. Z. Bonanos, "Slow" and fast rotators among hypervelocity stars, *Astrophys. J. (Lett.) 685,* L47-L50, 2008.

____ López-Morales, M., R. P. Butler, D. A. Fischer, D. Minniti, S. A. Shectman, G. Takeda, F. C. Adams, J. T. Wright, and P. Arriagada, Two Jupiter-mass planets orbiting HD 154672 and HD 205739, *Astron. J.,* in press.

6466 López-Morales, M., and S. Seager, Thermal emission from transiting very hot Jupiters: prospects for ground-based detection at optical wavelengths, *Astrophys. J. (Lett.) 667,* L191-L194, 2007.

6545 Marcy, G. W., R. P. Butler, S. S. Vogt, D. A. Fischer, J. T. Wright, J. A. Johnson, C. G. Tinney, H. R. A. Jones, B. D. Carter, J. Bailey, S. J. O'Toole, and S. Upadhyay, Exoplanet properties from Lick, Keck, and AAT, *Phys. Scr. T130,* 014001, 2008.

6552 Marcy, G. W., D. A. Fischer, R. P. Butler, and S. S. Vogt, Systems of multiple planets, in *Planetary Systems and Planets in Systems,* S. Udry, W. Benz, and R. von Steiger, eds., pp. 89-104, ISSI Scientific Report SR-006, International Space Science Institute/ESA Publications, Noordwijk, Netherlands, 2006. Available online at http://www.issibern.ch/publications/sr.html.

6509 Martins, Z., C. M. O'D. Alexander, G. E. Orzechowska, M. L. Fogel, and P. Ehrenfreund, Indigenous amino acids in primitive CR meteorites, *Meteoritics Planet. Sci. 42,* 2125-2136, 2007.

6479 Matsuyama, I., and F. Nimmo, Rotational stability of tidally deformed planetary bodies, *J. Geophys. Res. 112,* E11003, 10.1029/2007JE002942, 2007.

6515 Matsuyama, I., and F. Nimmo, Tectonic patterns on reoriented and despun planetary bodies, *Icarus 195,* 459-473, 2008.

____ Matsuyama, I., and F. Nimmo, Gravity and tectonic patterns of Mercury: the effect of tidal deformation, spin:orbit resonance, non-zero eccentricity, despinning, and reorientation, *J. Geophys. Res.,* in press.

6472 Matsuyama, I., F. Nimmo, and J. X. Mitrovica, Reorientation of planets with lithospheres: the effect of elastic energy, *Icarus 191,* 401-412, 2007.

____ Mayer, L., A. Boss, and A. F. Nelson, Gravitational instability in binary protoplanetary disks, in *Planets in Binary Star Systems,* N. Haghighipour, ed., Springer, in press.

6540 McClintock, W. E., E. T. Bradley, R. J. Vervack, Jr., R. M. Killen, A. L. Sprague, N. R. Izenberg, and S. C. Solomon, Mercury's exosphere: observations during MESSENGER's first Mercury flyby, *Science 321,* 92-94, 2008.

6531 McClintock, W. E., N. R. Izenberg, G. M. Holsclaw, D. T. Blewett, D. L. Domingue, J. W. Head III, J. Helbert, T. J. McCoy, S. L. Murchie, M. S. Robinson, S. C. Solomon, A. L. Sprague, and F. Vilas, Spectroscopic observations of Mercury's surface reflectance during MESSENGER's first Mercury flyby, *Science 321,* 62-65, 2008.

6587 McNutt, R. L., Jr., and S. C. Solomon, MESSENGER arrives at Mercury, *Planetary Report 28 (no. 5),* 12-17, 2008.

6549 McNutt, R. L., Jr., S. C. Solomon, D. G. Grant, E. J. Finnegan, P. D. Bedini, and the MESSENGER Team, The MESSENGER mission to Mercury: status after the Venus flybys, *Acta Astronaut. 63,* 68-73, 2008.

6588 Meyer, B. S., L. R. Nittler, A. N. Nguyen, and S. Messenger, Nucleosynthesis and chemical evolution of oxygen, *Rev. Mineral. Geochem. 68,* 31-53, 2008.

____ Minniti, D., R. P. Butler, M. López-Morales, S. A. Shectman, F. C. Adams, P. Arriagada, A. P. Boss, and J. E. Chambers, Low mass companions for five solar-type stars from the Magellan Planet Search program, *Astrophys. J.,* in press.

6534 Murchie, S. L., T. R. Watters, M. S. Robinson, J. W. Head, R. G. Strom, C. R. Chapman, S. C. Solomon, W. E. McClintock, L. M. Prockter, D. L. Domingue, and D. T. Blewett, Geology of the Caloris basin, Mercury: a view from MESSENGER, *Science 321,* 73-76, 2008.

6556 Nicholson, P. D., M. Ćuk, S. S. Sheppard, D. Nesvorný, and T. V. Johnson, Irregular satellites of the giant planets, in *The Solar System Beyond Neptune,* M. A. Barucci et al., eds., pp. 411-424, University of Arizona Press, Tucson, 2008.

6476 Nimmo, F., and I. Matsuyama, Reorientation of icy satellites by impact basins, *Geophys. Res. Lett. 34,* L19203, 10.1029/2007GL030798, 2007.

6579 Nittler, L. R., Presolar stardust in the solar system: implications for nucleosynthesis and galactic chemical evolution, in *Origin of Matter and Evolution of Galaxies,* T. Suda et al., eds., pp. 375-382, AIP Conference Proceedings 1016, American Institute of Physics, Melville, N.Y., 2008.

6580 Nittler, L. R., and C. M. O'D. Alexander, Pre-solar grains: outlook and opportunities for astrophysics, in *Highlights of Astronomy 14,* K. A. Van der Hucht, ed., pp. 357-360, Cambridge University Press, Cambridge, 2007.

6560 Nittler, L. R., C. M. O'D. Alexander, R. Gallino, P. Hoppe, A. N. Nguyen, F. J. Stadermann, and E. K. Zinner, Aluminum-, calcium- and titanium-rich oxide stardust in ordinary chondrite meteorites, *Astrophys. J. 682,* 1450-1478, 2008. [Erratum published in *Astrophys. J. 686,* 1524, 2008.]

6543 Niu, F., P. G. Silver, T. M. Daley, X. Cheng, and E. L. Majer, Preseismic velocity changes observed from active source monitoring at the Parkfield SAFOD drill site, *Nature 454,* 204-208, 2008.

6511 Noyes, R. W., G. Á. Bakos, G. Torres, A. Pál, G. Kovács, D. W. Latham, J. M. Fernández, D. A. Fischer, R. P. Butler, G. W. Marcy, B. Sipőcz, G. A. Esquerdo, G. Kovács, D. D. Sasselov, B. Sato, R. Stefanik, M. Holman, J. Lázár, I. Papp, and P. Sári, HAT-P-6b: a hot Jupiter transiting a bright F star, *Astrophys. J. (Lett.) 673,* L79-L82, 2008. ____

____ Olson, P., and D. Weeraratne, Experiments on metal-silicate plumes and core formation, *Phil. Trans. Roy. Soc. London A,* in press.

6566 O'Neil, J., R. W. Carlson, D. Francis, and R. K. Stevenson, Neodymium-142 evidence for Hadean mafic crust, *Science 321,* 1828-1831, 2008.

6474 Ou, S., J. Ji, L. Liu, and X. Peng, Disk-planet interaction simulations. I. Baroclinic generation of vortensity and nonaxisymmetric Rossby wave instability, *Astrophys. J. 667,* 1220-1228, 2007.

6541 Pál, A., G. Á. Bakos, G. Torres, R. W. Noyes, D. W. Latham, G. Kovács, G. W. Marcy, D. A. Fischer, R. P. Butler, D. D. Sasselov, B. Sipőcz, G. A. Esquerdo, G. Kovács, R. Stefanik, J. Lázár, I. Papp, and P. Sári, HAT-P-7b: an extremely hot massive planet transiting a bright star in the *Kepler* field, *Astrophys. J. 680,* 1450-1456, 2008.

____ Prato, L., and A. J. Weinberger, Disks around young binary stars, in *Planets in Binary Star Systems,* N. Haghighipour, ed., Springer, in press.

____ Rehfeldt, T., S. F. Foley, D. E. Jacob, R. W. Carlson, and D. Lowry, Contrasting types of metasomatism in dunite, wehrlite, and websterite xenoliths from Kimberley, South Africa, *Geochim. Cosmochim. Acta,* in press.

6525 Richardson, S. H., and S. B. Shirey, Continental mantle signature of Bushveld magmas and coeval diamonds, *Nature 453,* 910-913, 2008.

6505 Roberge, A., and A. J. Weinberger, Debris disks around nearby stars with circumstellar gas, *Astrophys. J. 676,* 509-517, 2008.

6532 Robinson, M. S., S. L. Murchie, D. T. Blewett, D. L. Domingue, S. E. Hawkins III, J. W. Head, G. M. Holsclaw, W. E. McClintock, T. J. McCoy, R. L. McNutt, Jr., L. M. Prockter, S. C. Solomon, and T. R. Watters, Reflectance and color variations on Mercury: regolith processes and compositional heterogeneity, *Science 321,* 66-69, 2008.

6482 Robinson, S. E., G. Laughlin, S. S. Vogt, D. A. Fischer, R. P. Butler, G. W. Marcy, G. W. Henry, P. Driscoll, G. Takeda, and J. A. Johnson, Two Jovian-mass planets in Earthlike orbits, *Astrophys. J. 670,* 1391-1400, 2007.

6573 Roeloffs, E. A., and A. T. Linde, Borehole observations of continuous strain and fluid pressure, in *Volcano Deformation: Geodetic Monitoring Techniques,* D. Dzurisin, ed., pp. 305-322, Springer, Berlin, 2007.

6562 Roth, J. B., M. J. Fouch, D. E. James, and R. W. Carlson, Three-dimensional seismic velocity structure of the northwestern United States, *Geophys. Res. Lett. 35,* L15304, 10.1029/2008GL034669, 2008.

6528 Rotundi, A., G. A. Baratta, J. Borg, J. R. Brucato, H. Busemann, L. Colangeli, L. D'Hendecort, Z. Djouadi, G. Ferrini, I. A. Franchi, M. Fries, F. Grossemy, L. P. Keller, V. Mennella, K. Nakamura, L. R. Nittler, M. E. Palumbo, S. A. Sandford, A. Steele, and B. Wopenka, Combined micro-Raman, micro-infrared, and field emission scanning electron microscope analyses of Comet 81P/Wild 2 particles collected by Stardust, *Meteoritics Planet. Sci. 43,* 367-397, 2008.

6495 Ruedas, T., and H. Schmeling, Kinematic models for the thickness of oceanic crust at and near mid-oceanic spreading centers, *J. Geophys. Res. 113,* B01402, 10.1029/2006JB004746, 2008.

6542 Saal, A. E., E. H. Hauri, M. Lo Cascio, J. A. Van Orman, M. C. Rutherford, and R. F. Cooper, Volatile content of lunar volcanic glasses and the presence of water in the Moon's interior, *Nature 454,* 192-195, 2008.

6569 Savage, B., and P. G. Silver, Evidence for a compositional boundary within the lithospheric mantle beneath the Kalahari craton from S receiver functions, *Earth Planet. Sci. Lett. 272,* 600-609, 2008.

6473 Savov, I. P., J. G. Ryan, M. D'Antonio, and P. Fryer, Shallow slab fluid release across and along the Mariana arc-basin system: insights from geochemistry of serpentinized peridotites from the Mariana fore arc, *J. Geophys. Res. 112,* B09205, 10.1029/2006JB004749, 2007.

6521 Schenk, P., I. Matsuyama, and F. Nimmo, True polar wander on Europa from global-scale small-circle depressions, *Nature 453,* 368-371, 2008.

6516 Schilling, M. E., R. W. Carlson, R. V. Conceição, C. Dantas, G. W. Bertotto, and E. Koester, Re-Os isotope constraints on subcontinental lithospheric mantle evolution of southern South America, *Earth Planet. Sci. Lett. 268,* 89-101, 2008.

6502 Schmid, C., S. van der Lee, J. C. VanDecar, E. R. Engdahl, and D. Giardini, Three-dimensional *S* velocity of the mantle in the Africa-Eurasia plate boundary region from phase arrival times and regional waveforms, *J. Geophys. Res. 113,* B03306, 10.1029/2005JB004193, 2008.

____ Schönbächler, M., R. W. Carlson, M. F. Horan, T. D. Mock, and E. H. Hauri, Silver isotope variations in chondrites: volatile depletion and the initial ^{107}Pd abundance of the solar system, *Geochim. Cosmochim. Acta,* in press.

6510 Schröder, C., D. S. Rodionov, T. J. McCoy, B. L. Joliff, R. Gellert, L. R. Nittler, W. H. Farrand, J. R. Johnson, S. W. Ruff, J. W. Ashley, D. W. Mittlefehldt, K. E. Herkenhoff, I. Fleisher, A. F. C. Haldemann, G. Klingelhöfer, D. W. Ming, R. V. Morris, P. A. de Souza, Jr., S. W. Squyres, C. Weitz, A. S. Yen, J. Zipfel, and T. Economou, Meteorites on Mars observed with the Mars Exploration Rovers, *J. Geophys. Res. 113,* E06S22, 10.1029/2007JE002990, 2008.

6467 Seager, S., M. Kuchner, C. A. Hier-Majumder, and B. Militzer, Mass-radius relationships for solid exoplanets, *Astrophys. J. 669,* 1279-1297, 2007.

____ Shaw, A. M., E. H. Hauri, D. R. Fischer, and K. A. Kelley, Hydrogen isotopes in Mariana arc melt inclusions: implications for subduction dehydration and the deep-Earth water cycle, *Earth Planet. Sci. Lett.,* in press.

____ Sheppard, S. S., and M. C. Cushing, An infrared high proper motion survey using 2MASS and SDSS: discovery of M, L, and T dwarfs, *Astron. J.,* in press.

6550 Sheppard, S. S., P. Lacerda, and J. L. Ortiz, Photometric lightcurves of transneptunian objects and Centaurs: rotations, shapes, and densities, in *The Solar System beyond Neptune,* M. A. Barucci et al., eds., pp. 129-142, University of Arizona Press, Tucson, 2008.

6572 Shirey, S. B., B. S. Kamber, M. J. Whitehouse, P. A. Mueller, and A. R. Basu, A review of the isotopic and trace element evidence for mantle and crustal processes in the Hadean and Archean: implications for the onset of plate tectonic subduction, in *When Did Plate Tectonics Begin on Planet Earth?* K. C. Condie and V. Pease, eds., pp. 1-29, Special Paper 440, Geological Society of America, Boulder, Colo., 2008.

6490 Silver, P. G., and M. D. Behn, Intermittent plate tectonics? *Science 319,* 85-88, 2008.

6524 Silver, P. G., and M. D. Behn, Response to comment on "Intermittent plate tectonics?" *Science 320,* 1291b, 2008.

6478 Sing, D. K., E. M. Green, S. B. Howell, J. B. Holberg, M. López-Morales, J. S. Shaw, and G. D. Schmidt, Discovery of a bright eclipsing cataclysmic variable, *Astron. Astrophys. 474,* 951-960, 2007.

6538 Slavin, J. A., M. H. Acuña, B. J. Anderson, D. N. Baker, M. Benna, G. Gloeckler, R. E. Gold, G. C. Ho, R. M. Killen, H. Korth, S. M. Krimigis, R. L. McNutt, Jr., L. R. Nittler, J. M. Raines, D. Schriver, S. C. Solomon, R. D. Starr, P. Trávníček, and T. H. Zurbuchen, Mercury's magnetosphere after MESSENGER's first flyby, *Science 321,* 85-89, 2008.

____ Slavin, J. A., B. J. Anderson, T. H. Zurbuchen, D. N. Baker, S. M. Krimigis, M. H. Acuña, M. Benna, S. A. Boardsen, G. Gloeckler, R. E. Gold, G. C. Ho, H. Korth, R. L. McNutt, Jr., J. M. Raines, M. Sarantos, D. Schriver, S. C. Solomon, and P. Trávníček, MESSENGER observations of Mercury's magnetosphere during northward IMF, *Geophys. Res. Lett.,* in press.

6489 Slavin, J. A., S. M. Krimigis, M. H. Acuña, B. J. Anderson, D. N. Baker, P. L. Koehn, H. Korth, S. Livi, B. H. Mauk, S. C. Solomon, and T. H. Zurbuchen, MESSENGER: exploring Mercury's magnetosphere, *Space Sci. Rev. 131,* 133-160, 2007.

____ Solomon, S. C., and R. L. McNutt, Jr., MESSENGER mission, in *McGraw-Hill Yearbook of Science and Technology 2009,* McGraw-Hill, New York, in press.

6486 Solomon, S. C., R. L. McNutt, Jr., R. E. Gold, and D. L. Domingue, MESSENGER mission overview, *Space Sci. Rev. 131,* 3-39, 2007.

6530 Solomon, S. C., R. L. McNutt, Jr., T. R. Watters, D. J. Lawrence, W. C. Feldman, J. W. Head, S. M. Krimigis, S. L. Murchie, R. J. Phillips, J. A. Slavin, and M. T. Zuber, Return to Mercury: a global perspective on MESSENGER's first Mercury flyby, *Science 321,* 59-62, 2008.

6576 Sozzetti, A., D. W. Latham, G. Torres, B. W. Carney, J. B. Laird, R. P. Stefanik, A. P. Boss, D. Charbonneau, F. T. O'Donovan, M. J. Holman, and J. N. Winn, Observational tests of planet formation models, in *Exoplanets: Detection, Formation, and Dynamics,* Y.-S. Sun, S. Ferraz-Mello, and J.-L. Zhou, eds., pp. 261-262, International Astronomical Union Symposium 249, Cambridge University Press, New York, 2008.

6536 Strom, R. G., C. R. Chapman, W. J. Merline, S. C. Solomon, and J. W. Head III, Mercury cratering record viewed from MESSENGER's first flyby, *Science 321,* 79-81, 2008.

6503 Taira, T., P. G. Silver, F. Niu, and R. M. Nadeau, Detecting seismogenic stress evolution and constraining fault zone rheology in the San Andreas Fault following the 2004 Parkfield earthquake, *J. Geophys. Res. 113,* B03303, 10.1029/2007JB005151, 2008.

6504 Tomascak, P. B., C. H. Langmuir, P. J. le Roux, and S. B. Shirey, Lithium isotopes in global mid-ocean ridge basalts, *Geochim. Cosmochim. Acta 72,* 1626-1637, 2008.

6544 Turnbull, M. C., Searching for signs of life in the reflected light from exoplanets: a catalog of nearby target stars, *Space Sci. Rev. 135,* 335-343, 2008.

____ Uno, H., C. L. Johnson, B. J. Anderson, H. Korth, and S. C. Solomon, Modeling Mercury's internal magnetic field with smooth inversions, *Earth Planet. Sci. Lett.,* in press.

6551 von Braun, K., G. T. van Belle, D. Ciardi, M. López-Morales, D. W. Hoard, and S. Wachter, The *Spitzer* 24 μm photometric light curve of the eclipsing M-dwarf binary GU Boötis, in *14th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun,* G. T. van Belle, ed., pp. 233-239, Conference Series, Vol. 384, Astronomical Society of the Pacific, San Francisco, 2008.

6589 von Braun, K., G. T. van Belle, D. R. Ciardi, M. López-Morales, D. W. Hoard, and S. Wachter, *Spitzer* 24 μm time series observations of the eclipsing M dwarf binary GU Boötis, *Astrophys. J. 677,* 545-555, 2008.

____ Wade, J. A., T. Plank, E. H. Hauri, K. A. Kelley, K. Roggensack, and M. Zimmer, Prediction of magmatic water contents via measurement of H_2O in clinopyroxene phenocrysts, *Geology,* in press.

6522 Wang, C.-Y., L. M. Flesch, P. G. Silver, L.-J. Chang, and W. W. Chan, Evidence for mechanically coupled lithosphere in central Asia and resulting implications, *Geology 36,* 363-366, 2008.

6496 Warren, L. M., M. A. Langstaff, and P. G. Silver, Fault plane orientations of intermediate-depth earthquakes in the Middle America Trench, *J. Geophys. Res. 113,* B01304, 10.1029/2007JB005028, 2008.

6571 Warren, L. M., J. A. Snoke, and D. E. James, S-wave velocity structure beneath the High Lava Plains, Oregon, from Rayleigh-wave dispersion inversion, *Earth Planet. Sci. Lett. 274,* 121-131, 2008.

____ Watters, T. R., S. C. Solomon, M. S. Robinson, J. W. Head, S. L. André, S. A. Hauck II, and S. L. Murchie, The tectonics of Mercury: the view after MESSENGER's first flyby, *Earth Planet. Sci. Lett.,* in press.

6529 Weinberger, A. J., On the binary nature of dust-encircled BD +20 307, *Astrophys. J. (Lett.) 679,* L41-L44, 2008.

____ Weinberger, A. J., Building planets in disks of chaos, *Sky & Telescope,* in press.

6558 Winn, J. N., J. A. Johnson, N. Narita, Y. Suto, E. L. Turner, D.A. Fischer, R. P. Butler, S. S. Vogt, F. T. O'Donovan, and B. S. Gaudi, The prograde orbit of exoplanet TrES-2b, *Astrophys. J. 682,* 1283-1288, 2008.

6564 Wright, J. T., G. W. Marcy, R. P. Butler, S. S. Vogt, G. W. Henry, H. Isaacson, and A. W. Howard, The Jupiter twin HD 154345b, *Astrophys. J. (Lett.) 683,* L63-L66, 2008.

6471 Zega, T. J., L. R. Nittler, H. Busemann, P. Hoppe, and R. M. Stroud, Coordinated isotopic and mineralogic analyses of planetary materials enabled by in situ lift-out with a focused ion beam scanning electron microscope, *Meteoritics Planet. Sci. 42,* 1373-1386, 2007.

6477 Zinner, E., S. Amari, R. Guinness, C. Jennings, A. F. Mertz, A. N. Nguyen, R. Gallino, P. Hoppe, M. Lugaro, L. R. Nittler, and R. S. Lewis, NanoSIMS isotopic analysis of small presolar grains: search for Si_3N_4 grains from AGB stars and Al and Ti isotopic compositions of rare presolar SiC grains, *Geochim. Cosmochim. Acta 71,* 4786-4813, 2007.

6488 Zuber, M. T., O. Aharonson, J. M. Aurnou, A. F. Cheng, S. A. Hauck II, M. H. Heimpel, G. A. Neumann, S. J. Peale, R. J. Phillips, D. E. Smith, S. C. Solomon, and S. Stanley, The geophysics of Mercury: current status and anticipated insights from the MESSENGER mission, *Space Sci. Rev. 131,* 105-132, 2007.

6535 Zuber, M. T., D. E. Smith, S. C. Solomon, R. J. Phillips, S. J. Peale, J. W. Head III, S. A. Hauck II, R. L. McNutt, J. Oberst, G. A. Neumann, F. G. Lemoine, X. Sun, O. Barnouin-Jha, and J. K. Harmon, Laser altimeter observations from MESSENGER's first Mercury flyby, *Science 321,* 77-79, 2008.

6563 Zuckerman, B., C. Melis, I. Song, D. S. Meier, M. D. Perrin, B. Macintosh, C. Marois, A. J. Weinberger, J. H. Rhee, J. R. Graham, J. H. Kastner, P. Palmer, T. Forveille, E. E. Becklin, D. J. Wilner, T. S. Barman, G. W. Marcy, and M. S. Bessell, Gas and dust associated with the strange, isolated star BP Piscium, *Astrophys. J. 683,* 1085-1103, 2008.

6539 Zurbuchen, T. H., J. M. Raines, G. Gloeckler, S. M. Krimigis, J. A. Slavin, P. L. Koehn, R. M. Killen, A. L. Sprague, R. L. McNutt, Jr., and S. C. Solomon, MESSENGER observations of the composition of Mercury's ionized exosphere and plasma environment, *Science 321,* 90-92, 2008.

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