A mosaic of visible to near-infrared images of the surface of Mercury, obtained by the MESSENGER spacecraft on 14 January 2008. The circular feature in the upper right is the Caloris impact basin, 1500 kilometers in diameter. Results from the flyby are discussed in a special section beginning on page 58.


**SPECIAL SECTION**

**MESSENGER**

**INTRODUCTION**

Mercury, Up-Close Again

**REPORTS**

Return to Mercury: A Global Perspective on MESSENGER’s First Mercury Flyby

S. C. Solomon et al.  >> Science Podcast

Spectroscopic Observations of Mercury’s Surface Reflectance During MESSENGER’s First Mercury Flyby

W. E. McClintock et al.

Reflectance and Color Variations on Mercury: Regolith Processes and Compositional Heterogeneity

M. S. Robinson et al.

Volcanism on Mercury: Evidence from the First MESSENGER Flyby

J. W. Head et al.

Geology of the Caloris Basin, Mercury: A View from MESSENGER

S. L. Murchie et al.

Laser Altimeter Observations from MESSENGER’s First Mercury Flyby

M. T. Zuber et al.

Mercury Cratering Record Viewed from MESSENGER’s First Flyby

R. G. Strom et al.

The Structure of Mercury’s Magnetic Field from MESSENGER’s First Flyby

B. J. Anderson et al.

Mercury’s Magnetosphere After MESSENGER’s First Flyby

J. A. Slavin et al.

MESSENGER Observations of the Composition of Mercury’s Ionized Exosphere and Plasma Environment

T. H. Zurbuchen et al.

Mercury’s Exosphere: Observations During MESSENGER’s First Mercury Flyby

W. E. McClintock et al.
MOLECULAR BIOLOGY

A Global View of Gene Activity and Alternative Splicing by Deep Sequencing of the Human Transcriptome

M. Sultan et al.

Shotgun sequencing of 27-base pair segments of messenger RNA from human kidney and immune cells identifies previously undescribed transcriptional units and splice junctions.

10.1126/science.1160342

BIOCHEMISTRY

The Crystal Structure of a Sodium Galactose Transporter Reveals Mechanistic Insights into Na+/Sugar Symport

S. Faham et al.

The structure of a sugar transporter suggests how these proteins may rearrange to permit the sugar to enter and leave the binding site on opposite sides of the membrane.

10.1126/science.1160406

PERSPECTIVES

A Unique Platform for Materials Design

T. P. Lodge

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Carbon Emissions and Acidification

R. E. Zeebe, J. C. Zachos, K. Caldeira, T. Tyrrell

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NEUROSCIENCE

Neuronal Diversity and Temporal Dynamics: The Unity of Hippocampal Circuit Operations

T. Klausberger and P. Somogyi

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EVOLUTION

Reduced Responses to Selection After Species Range Expansion

B. Pujol and J. R. Pannell

96

An annual spurge with a geographical range that expanded after the Ice Age shows decreased response to selection at the edges of its new range, as predicted by theory.

PALEONTOLOGY

Phanerozoic Trends in the Global Diversity of Marine Invertebrates

J. Alroy et al.

A compilation of more than 3 million specimens of fossil marine invertebrates shows that their diversity increased more in the Jurassic and less since then than an earlier study implied.

>> News story p. 24

APPLIED PHYSICS

Self-Sorted, Aligned Nanotube Networks for Thin-Film Transistors

M. C. LeMieux et al.

101

Treating silicon substrates with a silane layer allows them to absorb spin-coated, semiconducting carbon nanotubes, yielding aligned and densely packed nanotube films.
**REPORTS CONTINUED...**

**ASTRONOMY**

Relativistic Spin Precession in the Double Pulsar

*R. P. Breton et al.*

Four years of data track the spin precession of a pulsar orbiting a second pulsar, providing a positive test of general relativity in a strong gravitational field.

**MATERIALS SCIENCE**

Characterization of Step-Edge Barriers in Organic Thin-Film Growth

*G. Hlawacek et al.*

In contrast to the growth of inorganic films, bending of a rod-shaped organic molecule at step edges and its anisotropy leads to a change from growth of layers to terraced mounds.

**CLIMATE CHANGE**

Large and Rapid Melt-Induced Velocity Changes in the Ablation Zone of the Greenland Ice Sheet

*R. S. W. van de Wal et al.*

Measurements of ice velocity across western Greenland show that the ice sheet responds within days to excess meltwater, although annual flow has slowed a bit over 17 years.

**CHEMISTRY**

Mg/Al Ordering in Layered Double Hydroxides Revealed by Multinuclear NMR Spectroscopy

*P. J. Siders, U. G. Nielsen, Z. Gan, C. P. Grey*

Rapid sample spinning during nuclear magnetic resonance spectroscopy reveals a highly ordered cation distribution in layered materials.

**DEVELOPMENTAL BIOLOGY**

Autophagy Is Essential for Preimplantation Development of Mouse Embryos

*S. Tsukamoto et al.*

As fertilized mouse eggs develop into embryos and maternal proteins are eliminated, the degradative process of autophagy is required for proper growth.

**EVOLUTION**

Phylogenetic Signal in the Eukaryotic Tree of Life

*M. J. Sanderson*

A survey of sequences in GenBank, which represent about 10 percent of described species, shows that the patchy distribution of data is insufficient to build a eukaryotic tree of life.

**ECOLOGY**

Accelerated Human Population Growth at Protected Area Edges

*G. Wittemyer et al.*

Contrary to expectations, human populations living near protected areas in 45 countries in Africa and Latin America are increasing nearly twice as fast as other rural ones.

**CELL BIOLOGY**

Robust, Tunable Biological Oscillations from Interlinked Positive and Negative Feedback Loops

*T. Y.-C. Tsai et al.*

Analysis of known and theoretical oscillatory circuits in cells shows that those with both negative and positive feedback are more robust and allow frequency control independent of amplitude.

**MEDICINE**

Sporadic Autonomic Dysregulation and Death Associated with Excessive Serotonin Autoinhibition

*E. Audero et al.*

In young mice, expression of higher than normal levels of a type of serotonin receptor causes sporadic death with features reminiscent of sudden infant death syndrome. >> Science Podcast

**BIOCHEMISTRY**

Myosin I Can Act As a Molecular Force Sensor

*J. M. Laakso, J. H. Lewis, H. Shuman, E. M. Ostap*

Myosin I, a motor protein that plays a role in hearing, is a sensitive tension sensor, reacting to small loads (less than 2 picoNewtons) by binding for much longer times to actin.

**NEUROSCIENCE**

The Spread of Ras Activity Triggered by Activation of a Single Dendritic Spine

*C. D. Harvey, R. Yasuda, H. Zhong, K. Svoboda*

When strengthened, individual synapses on dendritic spines contain an activated small regulatory protein that spreads to nearby spines, possibly altering their sensitivity.

**NEUROSCIENCE**

Finite Scale of Spatial Representation in the Hippocampus

*K. B. Kjelstrup et al.*

The rat hippocampus provides a representation of the animal’s entire spatial environment, coding distances up to 1 meter away in the dorsal region and up to 15 meters at the ventral tip. >> Perspective p. 46
TIMP-dependent dephosphorylation.

SCIENCE SIGNALING

www.sciencesignaling.org

THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

REVIEW: Tissue Inhibitors of Metalloproteinases in Cell Signaling—Metalloproteinase-Independent Biological Activities

W. G. Stetler-Stevenson

TIMPs can act directly through cell surface receptors or indirectly through modulation of proteases.

PERSPECTIVE: The Cytoplasmic Tail of MUC1—A Very Busy Place

D. D. Carson

The cytoplasmic domain of mucin 1 (MUC1) plays numerous roles in intracellular signaling pathways.

Published by AAAS

www.sciencemag.org  SCIENCE  VOL 321  4 JULY 2008

Download the 4 July Science Podcast to hear about MESSENGER’s first Mercury flyby, possible clues to sudden infant death syndrome, preserving Iraqi antiquities, and more.

Separate individual or institutional subscriptions to these products may be required for full-text access.

Letting go.

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Why It’s Hard to Say Goodbye
Study links loss of a loved one to the brain’s pleasure center.

Don’t Judge a Plant by Its Species
An ant, an aphid, and a milkweed are changing thoughts about community ecology.

African Lion-Killer Had Help
Virus conspired with tick-borne parasites and extreme droughts.

Farewell, Micella.

SCIENCE CAREERS

www.sciencecareers.org/career_development

FREE CAREER RESOURCES FOR SCIENTISTS

Educated Woman, Postdoc Edition, Chapter 18: End of the Road

M. P. DeWhyse

Micella Phoenix DeWhyse celebrates her Independence Day—and we’re sad; with related podcast interview.

Taken for Granted: By the Numbers

B. L. Benderly

A committee calls for better government data collection about jobs for scientists.

In Person: Research in France

A. Bikfalvi

Understanding the French public research system is critical to foreign scientists coming into the country.

July 2008 Funding News

J. Fernández

Learn about the latest in research funding, scholarships, fellowships, and internships.

Don’t Judge a Plant by Its Species

An ant, an aphid, and a milkweed are changing thoughts about community ecology.

African Lion-Killer Had Help
Virus conspired with tick-borne parasites and extreme droughts.

Letting go.
Science 321 (5885), 12-144.