

Science

30 September 2011 | \$10

MESSENGER Orbits Mercury

 AAAS

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COVER

Enhanced-color image of Mercury's surface showing a close-up of shallow, rimless depressions, or hollows (blue), inside the Raditladi impact basin (foreground ~12 kilometers across). These landforms were likely formed by the loss of volatile-containing material exposed by impacts and support the inference that Mercury's interior contains more volatile materials than predicted. Results from MESSENGER's orbital observations appear in a series of Reports beginning on page 1847.

Image: NASA/The Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

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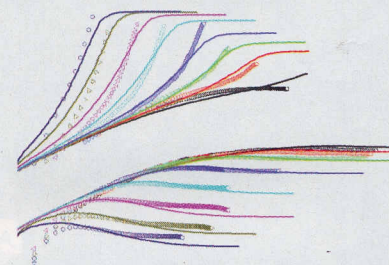
REPORTS

- 1847** The Major-Element Composition of Mercury's Surface from MESSENGER X-ray Spectrometry
L. R. Nittler et al.
Geochemical data show that the major rock-forming components of Mercury are characterized by high sulfur content.
- 1850** Radioactive Elements on Mercury's Surface from MESSENGER: Implications for the Planet's Formation and Evolution
P. N. Peplowski et al.
Gamma-ray emission from the surface of Mercury indicates that the planet accreted from relatively volatile-enriched material.
- 1853** Flood Volcanism in the Northern High Latitudes of Mercury Revealed by MESSENGER
J. W. Head et al.
Mercury's high northern latitudes have a contiguous area of smooth plains created by lava flows.
- 1856** Hollows on Mercury: MESSENGER Evidence for Geologically Recent Volatile-Related Activity
D. T. Blewett et al.
Rimless shallow depressions on Mercury may still be forming by outgassing, volcanism, sublimation, or space weathering.
- 1859** The Global Magnetic Field of Mercury from MESSENGER Orbital Observations
B. J. Anderson et al.
Displacement of Mercury's magnetic dipole implies that the surface field has a north-south asymmetry.
- 1862** MESSENGER Observations of the Spatial Distribution of Planetary Ions Near Mercury
T. H. Zurbuchen et al.
The polar regions of Mercury are important sources of material for its ionized exosphere.
- 1865** MESSENGER Observations of Transient Bursts of Energetic Electrons in Mercury's Magnetosphere
G. C. Ho et al.
Despite having an internal magnetic field, Mercury does not have a Van Allen-type radiation belt.
>> *News story p. 1812; Science Podcast*
- 1868** Evidence of Water Vapor in Excess of Saturation in the Atmosphere of Mars
L. Maltagliati et al.
An upper layer of the martian atmosphere is supersaturated with water vapor, probably because of inefficient condensation.
>> *Perspective p. 1832*
- 1871** Linking Models of Polymerization and Dynamics to Predict Branched Polymer Structure and Flow
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The complex flow behavior of a branched polymer can be predicted from its chemical structure.
>> *Perspective p. 1834*

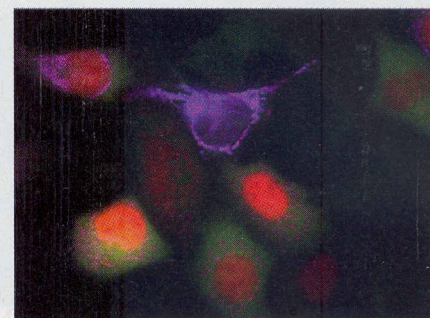
- 1875** Three-Dimensional Correlation of Steric and Electronic Free Energy Relationships Guides Asymmetric Propargylation
K. C. Harper and M. S. Sigman
An unexpected synergy between a ligand's steric bulk and its electronic structure improves a stereoselective catalyst.
>> *Perspective p. 1831*
- 1878** Diurnal and Seasonal Mood Vary with Work, Sleep, and Daylength Across Diverse Cultures
S. A. Golder and M. W. Macy
Across the world the collective mood heightens at breakfast time and during the weekend.
>> *News story p. 1814; Science Podcast*
- 1881** Histone Lysine Demethylase JARID1a Activates CLOCK-BMAL1 and Influences the Circadian Clock
L. DiTacchio et al.
Rhythmic chromatin modifications are aided by two proteins belonging to the JumonjiC family of regulators.
>> *Perspective p. 1833*
- 1885** Superfast Muscles Set Maximum Call Rate in Echolocating Bats
C. P. H. Elemans et al.
How bats can produce calls quickly and accurately process the returning echoes.
- 1888** An Expanded Palette of Genetically Encoded Ca^{2+} Indicators
Y. Zhao et al.
Directed protein evolution provides a series of fluorescent protein-based indicators for multicolor Ca^{2+} imaging.
- 1891** Unfolded Proteins Are Ire1-Activating Ligands That Directly Induce the Unfolded Protein Response
B. M. Gardner and P. Walter
Misfolded secretory proteins activate a quality control pathway by binding a sensor in the endoplasmic reticulum.
>> *Perspective p. 1830*
- 1895** Chromosome Segregation Errors as a Cause of DNA Damage and Structural Chromosome Aberrations
A. Janssen et al.
Changes in whole-chromosome number in cancer cells increase structural damage to chromatin.
- 1898** GRK2-Dependent S1PR1 Desensitization Is Required for Lymphocytes to Overcome Their Attraction to Blood
T. I. Arnon et al.
Desensitization to a chemoattractant is essential for lymphocyte migration from blood into lymph nodes.
- 1903** Glutamatergic and Dopaminergic Neurons Mediate Anxiogenic and Anxiolytic Effects of CRHR1
D. Refojo et al.
Imbalance in the bidirectional role of corticotropin-releasing hormone receptor 1 in anxiety might lead to emotional disorders.



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Bidirectional Control of Social Hierarchy by Synaptic Efficacy in Medial Prefrontal Cortex
F. Wang et al.

Manipulation of the neural circuit determining social status allows subordinate mice to move up the hierarchy and dominant mice to go down.
10.1126/science.1209951

Late Interleukin-6 Escalates T Follicular Helper Cell Responses and Controls a Chronic Viral Infection

J. A. Harker et al.

A persisting wave of the cytokine interleukin-6 allows control of chronic viral infections.
10.1126/science.1208421

Ionic Liquid-Mediated Selective Conversion of CO₂ to CO at Low Overpotentials

B. A. Rosen et al.

CO₂ reduction reactions, a key step in creating fuels from this gas, can be achieved in an ionic liquid.
10.1126/science.1209786

Wireless Solar Water Splitting Using Silicon-Based Semiconductors and Earth-Abundant Catalysts

S. Y. Reece et al.

An artificial water-splitting system was built using abundant materials and sunlight.
10.1126/science.1209816

Anthropogenic Aerosols and the Weakening of the South Asian Summer Monsoon

M. A. Bollasina et al.

Changes in monsoon rainfall are caused by human-produced aerosols slowing the tropical atmospheric circulation.
10.1126/science.1204994

TECHNICALCOMMENTS

Comment on "The Response of Vegetation on the Andean Flank in Western Amazonia to Pleistocene Climate Change"

S. W. Punyasena et al.

Full text at www.sciencemag.org/cgi/content/full/333/6051/1825-b

Response to Comment on "The Response of Vegetation on the Andean Flank in Western Amazonia to Pleistocene Climate Change"

M. L. Cárdenas et al.

Full text at www.sciencemag.org/cgi/content/full/333/6051/1825-c

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Highlights From Our Daily News Coverage

A Different Kind of Secret Code

Glowing bacteria encode messages that only the intended receiver can decipher.

<http://scim.ag/colicode>

Tick Tock, Modeling Emissions From Trees Around the Clock

A circadian clock controls isoprene emissions by trees and could lead to better ozone modeling.
<http://scim.ag/emissionsclock>

Calculating the Language of Babel

Researchers teach "alien languages" to discover the origins of our own.

<http://scim.ag/babellanguage>

SCIENCE SIGNALING

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The Signal Transduction Knowledge Environment
27 September issue: <http://scim.ag/ss092711>

RESEARCH ARTICLE: Akt Determines Cell Fate Through Inhibition of the PERK-eIF2 α Phosphorylation Pathway

Z. Mounir et al.

Inhibition of a stress-response pathway increases the chances of tumor cell death.

RESEARCH ARTICLE: Time-Dependent Quantitative Multicomponent Control of the G₁-S Network by the Stress-Activated Protein Kinase Hog1 upon Osmostress

M. Adrover et al.

The kinase Hog1 delays the cell cycle through two mechanisms.

RESEARCH ARTICLE: Tyrosine Phosphorylation of the G α -Interacting Protein GIV Promotes Activation of Phosphoinositide 3-Kinase During Cell Migration

C. Lin et al.

GIV links ligand stimulation of various receptors to downstream activation of a kinase involved in cell migration.

TEACHING RESOURCES: Six Lectures for a Systems Biology Course

K. D. Costa et al.; E. A. Sobie; S. R. Neves; F. Hayot; and L. Sirovich

Lecture notes and problem sets provide materials for teaching systems biology.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

28 September issue: <http://scim.ag/stm092811>

FOCUS: Creating the Future Biomedical Research Workforce

F. J. Meyers and C. Pomeroy

Translational scientists in the U.S. can contribute vital views on training, mentorship, and new career paths.

COMMENTARY: Disclosure of Clinical Trial Results When Product Development Is Abandoned

M. A. Rogawski and H. J. Federoff

Researchers have an ethical obligation to publicly report clinical trial results for all products.

MEETING REPORTS

D. C. Javitt et al. and M. J. Kas et al.

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RESEARCH ARTICLE: Dendritic Cells Regulate Natural Killer Cell Activation and Epithelial Injury in Experimental Biliary Atresia

V. Saxena et al.

Elucidation of the cellular triggers of bile duct injury has implications for blocking liver disease progression.

RESEARCH ARTICLE: Computationally Generated Cardiac Biomarkers for Risk Stratification After Acute Coronary Syndrome

Z. Syed et al.

Biomarkers extracted from electrocardiograms help identify high-risk patients after coronary events.

RESEARCH ARTICLE: Reversible Cardiac Conduction Block and Defibrillation with High-Frequency Electric Field

H. Tandri et al.

PODCAST

R. Berger and M. Frisk

High-frequency alternating current can be used to stop life-threatening ventricular fibrillation.

SCIENCE CAREERS

www.sciencereers.org/career_magazine

Free Career Resources for Scientists

Are African Americans Surging in Computer Science?

M. Price

A report suggests a big jump in black/African-American enrollment in computer science graduate programs.

http://scim.ag/AA_in_CS

Modern Sherlock Holmes With a Business Twist
S. Louët

Scientists working in business intelligence analyze large data sets for business clients.

http://scim.ag/Data_Specialists

In Person: On Shaky Ground

Y. Alami

In the aftermath of an earthquake, a scientist ruminates on the uncertainties of working in science.

http://scim.ag/Shaky_Ground

SCIENCEPODCAST

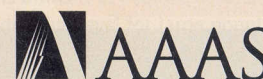
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Free Weekly Show

On the 30 September *Science* Podcast: MESSENGER's orbit of Mercury, tracking mood patterns through social media, computer games aiding the blind, and more.

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