

COVER

X-rays emerge with varying intensity (red/green wave) as an electron is pulled out of and then pushed back into a vibrating N_2O_4 molecule by an intense laser field. The pattern reveals real-time dynamic changes in electronic spatial configurations, or orbitals, at the compressed (left blue orbital) and stretched (right blue orbital) limits of the vibration cycle. See page 1207.

Image: Greg Kuebler, JILA/University of Colorado

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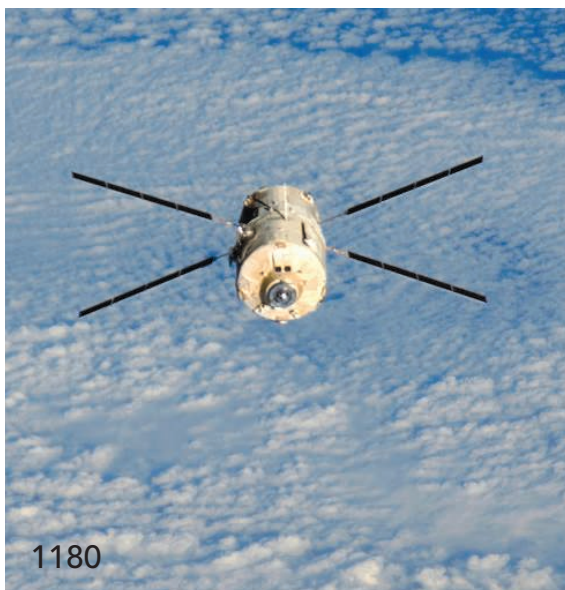
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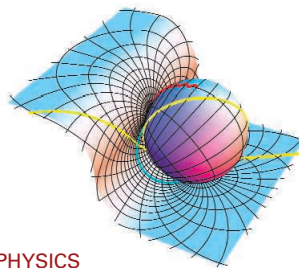
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SCIENCE EXPRESS

www.scienceexpress.org

SOCIOLOGY

The Spreading of Disorder

K. Keizer, S. Lindenberg, L. Steg

Upon observing signs of social disorder (such as littering or graffiti), individuals are more likely to disobey a variety of social rules, including prohibitions against theft.

>> *News story p. 1175*

10.1126/science.1161405

CELL BIOLOGY

Dynamic Proteomics of Individual Cancer Cells in Response to a Drug

A. A. Cohen et al.

Cells that escape death from a chemotherapy drug express a different array of proteins from genetically identical ones that died, which may help to inform cancer therapeutics.

>> *News story p. 1176*

10.1126/science.1160165

PHYSICS

Broadband Invisibility by Non-Euclidean Cloaking

U. Leonhardt and T. Tyc

In theory, materials with a negative refractive index deployed in a curved, non-Euclidean space can provide a route to cloaking and invisibility across a range of wavelengths.

10.1126/science.1166332

CHEMISTRY

Real-Time DNA Sequencing from Single Polymerase Molecules

J. Eid et al.

Arrays of narrow waveguides can record the action of a DNA polymerase stepping along a primer template, potentially providing a way to sequence DNA molecules.

>> *Science Podcast*

10.1126/science.1162986

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PSYCHOLOGY

The Psychology of Transcending the Here and Now 1201

N. Liberman and Y. Trope

BREVIA

ECOLOGY

Fossil Pollen as a Guide to Conservation in the Galápagos 1206

J. F. N. van Leeuwen et al.

Fossil pollen shows that six plant species in the Galápagos, presumed to be invasive, had actually been native to the islands for thousands of years before human colonization. >> *Science Podcast*

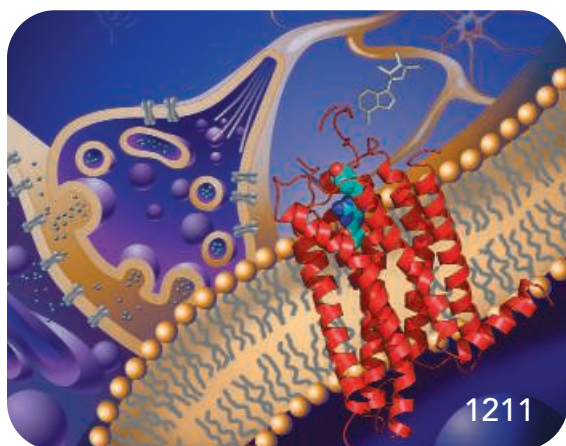
RESEARCH ARTICLES

CHEMISTRY

Time-Resolved Dynamics in N₂O₄ Probed Using High Harmonic Generation 1207

W. Li et al.

Electrons can be ejected from multiple orbitals of N₂O₄ by exploiting different stages in its excited vibrations, yielding an attosecond light probe of molecular dynamics. >> *Perspective p. 1194*



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BIOCHEMISTRY

The 2.6 Angstrom Crystal Structure of a Human A_{2A} 1211

Adenosine Receptor Bound to an Antagonist

V.-P. Jaakola et al.

The ligand binding pocket of the caffeine-binding human adenosine receptor has a different position and orientation than that of other G protein-linked receptors.

REPORTS

ASTRONOMY

The Fermi Gamma-Ray Space Telescope Discovers the Pulsar in the Young Galactic Supernova Remnant CTA 1 1218

A. A. Abdo et al.

The Fermi Space Telescope has detected a gamma-ray pulsar associated with a young supernova remnant, implying that such stars may be unidentified gamma-ray sources.

>> *Perspective p. 1193*

ASTRONOMY

Observation of Pulsed γ -Rays Above 25 GeV from the Crab Pulsar with MAGIC 1221

The MAGIC Collaboration

The MAGIC telescope has detected higher-energy, pulsed gamma rays from the Crab pulsar and a threshold suggesting that they are emitted from the outer magnetosphere.

>> *Perspective p. 1193*

PHYSICS

Ab Initio Determination of Light Hadron Masses 1224

S. Dürr et al.

A quantum electrodynamics model that includes a full representation of quarks and their electromagnetic interactions accurately determines the masses of neutrons and protons.

>> *Perspective p. 1198*

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PHYSICS

4D Imaging of Transient Structures and Morphologies in Ultrafast Electron Microscopy 1227

B. Barwick et al.

Imaging with single electrons can track structural dynamics of gold and graphite in real space with femtosecond temporal resolution and angstrom spatial resolution.

CHEMISTRY

High Harmonic Generation from Multiple Orbitals in N₂ 1232

B. K. McFarland et al.

Electron ejection from multiple N₂ orbitals, controlled by the molecule's orientation relative to a laser, produces attosecond light spectra that can reveal molecular dynamics.

>> *Perspective p. 1194*

PLANETARY SCIENCE

Radar Sounding Evidence for Buried Glaciers in the Southern Mid-Latitudes of Mars 1235

J. W. Holt et al.

Radar data from the Mars Reconnaissance Orbiter show that a series of lobate landforms at low latitudes are composed primarily of massive ice covered by debris.

EVOLUTION

Variation in Evolutionary Patterns Across the Geographic Range of a Fossil Bivalve 1238

M. Grey, J. W. Haggart, P. L. Smith

Within a fossil bivalve genus, evolution tended to occur as a random walk at the highest latitudes and to be in stasis mode in deep marine environments.

EVOLUTION

Selfish Genetic Elements Promote Polyandry in a Fly 1241

T. A. R. Price et al.

Genes that confer a deleterious sex ratio in *Drosophila* also decrease male fertility and promote repetitive mating in females, providing a possible explanation of polyandry.

CELL BIOLOGY

Regulation of Microtubule Dynamics by Reaction Cascades Around Chromosomes 1243

C. A. Athale et al.

A reaction-diffusion model involving regulatory molecules and a microtubule-stabilizing phosphoprotein predicts the spatial distribution of microtubules during cell division.



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DEVELOPMENTAL BIOLOGY

Canonical Wnt Signaling Regulates Organ-Specific Assembly and Differentiation of CNS Vasculature 1247

J. M. Stenman et al.

In mice, two specialized ligands for a key developmental signaling pathway are produced by neuroepithelial cells and direct endothelial cells to form the blood-brain barrier. >> *Perspective p. 1195*

MEDICINE

Regulation of Pancreatic β Cell Mass by Neuronal Signals from the Liver 1250

J. Imai et al.

In obese mice, fat tissue stimulates proliferation of insulin-producing pancreatic cells via a neural relay through the liver, contributing to symptoms of metabolic syndrome.

ECOLOGY

Control of Toxic Marine Dinoflagellate Blooms by Serial Parasitic Killers 1254

A. Chambouvet, P. Morin, D. Marie, L. Guillou

As successive populations of protists have caused summer red tides in France, each has been killed off by a distinct, persistent parasite, establishing a self-regulating ecosystem.

IMMUNOLOGY

Antimicrobial Defense and Persistent Infection in Insects 1257

E. R. Haine, Y. Moret, M. T. Siva-Jothy, J. Rolff

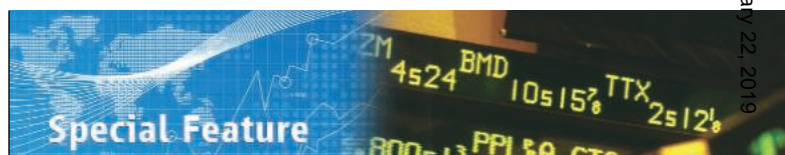
Flies fight some infections by quickly engulfing bacteria in phagocytic cells then deploying antimicrobial peptides, a system that avoids bacterial resistance. >> *Perspective p. 1199*

SOCIOLOGY

Multi-University Research Teams: Shifting Impact, Geography, and Stratification in Science 1259

B. F. Jones, S. Wuchty, B. Uzzi

Over the past 30 years, scientific papers have become increasingly likely to be written by teams of authors from more than one of a small number of elite universities.



Scientists as Financial Analysts

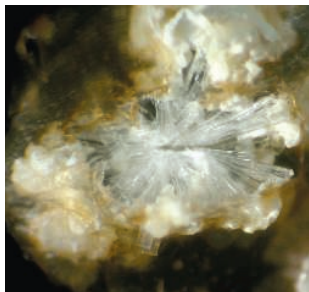
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>> See *Science Careers* section p. 1157or go to www.sciencecareers.org; *Science Podcast*

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A clue to the past.

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HIGHLIGHTS FROM OUR DAILY NEWS COVERAGE

Earth's Minerals Evolved, Too

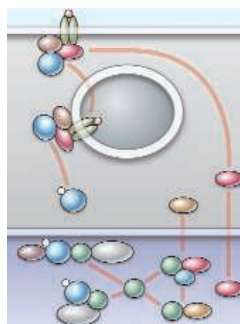
Life and rocks have changed in concert.

Tumor Secrets Written in Blood

Cancer cells release telltale traces into the bloodstream.

Prehistoric Family Values

Archaeologists find what may be the oldest examples of a nuclear family.



Regulating TGF- β signaling from the nucleus.

SCIENCE SIGNALING

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THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

EDITORIAL GUIDE: Focus Issue—An Expanding World for TGF- β Signaling

N. R. Gough

With new modes of regulation and new functions for members of the pathway, TGF- β breaks the canonical barrier.

PERSPECTIVE: Holding Their Own—The Noncanonical Roles of Smad Proteins

L. L. Hoover and S. W. Kubalak

There are TGF- β -independent regulatory mechanisms and functions of Smads.

PERSPECTIVE: PCTA—A New Player in TGF- β Signaling

F. Liu

The distribution of promyelocytic leukemia protein between the nucleus and cytoplasm controls Smad activation.

FORUM: Highlights from a TGF- β Workshop

N. R. Gough

In addition to talks emphasizing the role of TGF- β in cancer, many speakers shared memories of Anita Roberts, scientist mentor, colleague, and friend.

NETWATCH: Cell Biology Promotion

Find an array of images, animations, and slides for teaching cell biology and signal transduction; in Educator Sites.

NETWATCH: Pfam

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FREE CAREER RESOURCES FOR SCIENTISTS

Special Feature: Scientists as Financial Analysts

A. Kotok

Despite today's headlines, it might be a good time to plan for a career as a financial analyst.

Science Careers Podcast: Scientists as Quants

C. Wald

Financial systems executive Lee Maclin explains why scientists often succeed as quantitative analysts.

>> See *Scientists as Financial Analysts* feature p. 1264

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