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## ON THE WEB THIS WEEK

- >> Science Podcast**  
Listen to stories on a new brain database, the 100th anniversary of Bohr's atomic theory, the fate of U.S. research powerhouses, and more.
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Check out Science Express, our podcast, videos, daily news, our research journals, and Science Careers [www.sciencemag.org](http://www.sciencemag.org).



## COVER

View of Beijing and Tianjin, China, from the International Space Station. Though cities have different sizes and characteristics, mathematical theory can relate size and population density to social, spatial, and infrastructural properties. Such modeling provides a view of the nature of cities and may help urban planners determine how cities evolve and whether they have reached their full potential. See pages 1418 and 1438.

*Image: Image Science and Analysis Laboratory, NASA-Johnson Space Center*

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*J. Brigham-Grette et al.*

A sediment core from Lake El'gygytyn, in northeast Russia, provides a high-latitude climate record of the late Pliocene.

## REPORTS

- 1427 Massive Dirac Fermions and Hofstadter Butterfly in a van der Waals Heterostructure

*B. Hunt et al.*

A band gap is observed in a monolayer graphene–hexagonal boron nitride heterostructure.

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- 1431 Engineering Coherence Among Excited States in Synthetic Heterodimer Systems

*D. Hayes et al.*

Small molecules comprising bridged chromophores manifest a quantum mechanical effect observed in light-harvesting proteins.

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- 1434 Direct Imaging of Covalent Bond Structure in Single-Molecule Chemical Reactions

*D. G. de Oteyza et al.*

Noncontact atomic force microscopy imaged the bond structure of an adsorbed organic reactant and its cyclization products.

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- 1438 The Origins of Scaling in Cities

*L. M. A. Bettencourt*

Cities of all sizes can be modeled as interdependent networks of interactions and infrastructure.

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- 1442 Topology of Feather Melanocyte Progenitor Niche Allows Complex Pigment Patterns to Emerge

*S. J. Lin et al.*

The patterns of colors in feathers are produced via temporal and spatial regulation of melanocyte stem cells.

- 1445 Protein Equilibration Through Somatic Ring Canals in *Drosophila*

*P. F. McLean and L. Cooley*

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- 1448 Quantum Coherent Energy Transfer over Varying Pathways in Single Light-Harvesting Complexes

*R. Hildner et al.*

A phase relation observed in ensemble measurements of photosynthetic proteins is borne out at the single-molecule level.

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- 1451 Structure of Parkin Reveals Mechanisms for Ubiquitin Ligase Activation

*J.-F. Trempe et al.*

The complete structure of a protein linked to Parkinson's disease suggests how to activate it.

- 1456 GPR15-Mediated Homing Controls Immune Homeostasis in the Large Intestine Mucosa

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A G protein–coupled receptor helps to localize regulatory T cells in the large intestine.

- 1459 H5N1 Hybrid Viruses Bearing 2009/H1N1 Virus Genes Transmit in Guinea Pigs by Respiratory Droplet

*Y. Zhang et al.*

Some reassortants between H5N1 and H1N1 influenza viruses are transmissible by respiratory droplet among mammals.

- 1463 An Airborne Transmissible Avian Influenza H5 Hemagglutinin Seen at the Atomic Level

*W. Zhang et al.*

Mutations in avian H5N1 influenza virus cause conformational changes that increase binding affinity to mammalian receptors.

- 1467 GWAS of 126,559 Individuals Identifies Genetic Variants Associated with Educational Attainment

*C. A. Rietveld et al.*

Three genetic loci are found to explain variation associated with educational achievement.

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- 1472 BigBrain: An Ultrahigh-Resolution 3D Human Brain Model

*K. Amunts et al.*

A freely available microscopic model of human brain architecture with a spatial resolution of 20 micrometers is presented.

>> *Science Podcast*

- 1475 Compartmentalized Calcium Transients Trigger Dendrite Pruning in *Drosophila* Sensory Neurons

*T. Kanamori et al.*

During fruit fly metamorphosis, dendritic calcium signaling defines the branches to be eliminated in sensory neurons.



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