**COMPUTER SCIENCE**

**reCAPTCHA: Human-Based Character Recognition via Web Security Measures**
L. von Ahn, B. Maurer, C. McMillen, D. Abraham, M. Blum

A security system that relies on the superior performance of humans in comparison to computers in reading distorted text can be harnessed for digitized scanned documents. 10.1126/science.1160379

**MATERIALS SCIENCE**

**Polymer Pen Lithography**
F. Huo et al.

An array that can support millions of thin, flexible polymer pens can be used to deposit tiny molecular ink dots of variable size over large areas. 10.1126/science.1162193

**PHYSICS**

**Transient Electronic Structure and Melting of a Charge Density Wave in TbTe₃**
F. Schmitt et al.

Photoemission spectroscopy is extended to reveal the dynamics of correlated electronic phase transitions, showing how ordered electrons “melt” upon heating of TbTe₃.

10.1126/science.1160778

**TECHNICAL COMMENT ABSTRACTS**

**COMMENT ON** “100% Accuracy in Automatic Face Recognition”
W. Deng, J. Guo, J. Hu, H. Zhang

Response to Comment on “100% Accuracy in Automatic Face Recognition”
R. Jenkins and A. M. Burton

**REVIEW**

**ECOLOGY**

Spreading Dead Zones and Consequences for Marine Ecosystems
R. J. Diaz and R. Rosenberg

**APPLIED PHYSICS**

Optical Negative Refraction in Bulk Metamaterials
J. Yao et al.

An array of silver nanowires placed in a porous alumina matrix forms a three-dimensional material that negatively refracts visible light.

**RESEARCH ARTICLE**

**ATMOSPHERIC SCIENCE**

Tail Reconnection Triggering Substorm Onset
V. Angelopoulos et al.

Satellite and ground-based data show that reconnection of magnetic field lines in Earth’s magnetotail precedes dramatic aurora displays and is the source of magnetic substorms. >> Perspective p. 920

**REPORTS**

**MATERIALS SCIENCE**

Density Multiplication and Improved Lithography by Directed Block Copolymer Assembly
R. Ruiz et al.

An appropriate substrate pattern can direct an even finer pattern of a block copolymer, improving the resolution for lithography by a factor of four, beyond the usual limits.

>> Perspective p. 919

**MATERIALS SCIENCE**

Graphoepitaxy of Self-Assembled Block Copolymers on Two-Dimensional Periodic Patterned Templates
I. Bita et al.

A substrate patterned with a sparse array of nanoscale posts can direct the self-assembly of block copolymers to create a finely ordered lithographic array, even over a large area.

>> Perspective p. 919
mounts a microRNA-mediated innate immune defense, which is inhibited by proteins of the bacteria, allowing other infections.

Upon bacterial infection, L. Navarro, F. Jay, K. Nomura, S. Y. He, O. Voinnet

Effector Proteins

Suppression of the MicroRNA Pathway by Bacterial MOLECULAR BIOLOGY


Some bacterial genomes contain remnant sequences from previous viral infections, which are transcribed into RNA to guide inactivation of the virus in subsequent infections.

Plant Immunity Requires Conformational Charges of NPR1 via S-Nitrosylation and Thioredoxins Y. Tada et al.

After a pathogen invades a plant, a protein, usually kept in a multimeric state by S-nitrosylation, is dissociated by thioredoxin, freeing the monomers for defense responses.


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


Some bacterial genomes contain remnant sequences from previous viral infections, which are transcribed into RNA to guide inactivation of the virus in subsequent infections.


Upon bacterial infection, Arabidopsis mounts a microRNA-mediated innate immune defense, which is inhibited by proteins of the bacteria, allowing other infections.
NADP-binding produces an asymmetric dimer.

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PERSPECTIVE: Dinucleotide-Sensing Proteins—Linking Signaling Networks and Regulating Transcription
H. K. Lamb, D. K. Stammers, A. R. Hawkins
Proteins that bind NAD(H) or NADP(H) may couple cellular redox state to transcription or other signaling pathways.

PERSPECTIVE: Great Times for Small Molecules—c-di-AMP, a Second Messenger Candidate in Bacteria and Archaea
U. Römling
The bacterial checkpoint protein DisA has diadenylate cyclase activity, suggesting that c-di-cAMP acts as a second messenger.