The porous deposit of candle soot can be used as a template for a super oil- and water-repellent coating. The soot is coated with a thin silica shell to form a replica and is then removed by calcination. The silica is treated with a fluorosilane, yielding a transparent, stable coating. This cheap and easily upscalable approach may inspire the design of anti-fingerprint coatings, which are desirable for touchscreens or glasses. See page 67.

Photo illustration: Bricelyn Strauch and Yana Hammond/Science; candle image: Fotosearch
RESEARCH ARTICLE
53 The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: The Pivotal Role of Electricity
J. H. Williams et al.
Reducing greenhouse gas emissions to 80% below 1990 levels by 2050 requires widespread electrification of transportation and other sectors.

REPORTS
59 Subparticle Ultrafast Spectrum Imaging in 4D Electron Microscopy
A. Yurtsever et al.
A specially constructed electron microscope can probe plasmon fields created by optically exciting metal nanoparticles.

64 Ohm’s Law Survives to the Atomic Scale
B. Weber et al.
Nanowires created by embedding phosphorus atoms within silicon exhibit a low, diameter-independent resistivity.

67 Candle Soot as a Template for a Transparent Robust Superamphiphobic Coating
X. Deng et al.
Coatings that are highly resistant to water and to hydrocarbons can be made starting from candle soot.

70 Capturing Ultrasmall EMT Zeolite from Template-Free Systems
E.-P. Ng et al.
Control of the early stages of nucleation favors the synthesis of large-pore zeolite crystals ~10 nanometers in size.

73 An Exhumation History of Continents over Billion-Year Time Scales
T. J. Blackburn et al.
Thermochronology indicates a balance between low erosion rates and slow thermal cooling in old continental crust.

76 Multiyear Prediction of Monthly Mean Atlantic Meridional Overturning Circulation at 26.5°N
D. Matei et al.
The strength of an ocean current that transports heat to Europe can be predicted up to 4 years in advance.

79 Ancestral Developmental Potential Facilitates Parallel Evolution in Ants
R. Rajakumar et al.
The potential for developing “supersoldiers” has remained dormant in the ant genus Pheidole for at least 30 million years.

82 Fitness Trade-Offs and Environmentally Induced Mutation Buffering in Isogenic C. elegans
M. O. Casanueva et al.
Stochastic variation in a cellular stress response pathway can predict the outcome of mutations in individuals.

85 Molecular Mimicry Regulates ABA Signaling by SnRK2 Kinases and PP2C Phosphatases
F.-F. Soon et al.
Two players and one chair regulate this plant hormone signaling cascade.

89 Equilibrative Nucleoside Transporter 3 Deficiency Perturbs Lysosome Function and Macrophage Homeostasis
C.-L. Hsu et al.
Lack of the transporter critical for recycling of nucleosides after phagocytosis results in a fatal expansion of macrophages.

93 Dystroglycan Function Requires Xylosyl- and Glucuronyltransferase Activities of LARGE
K. Inamori et al.
A bifunctional enzyme adds a heteropolysaccharide to an extracellular matrix receptor, enabling it to bind laminin.

96 RNA Elimination Machinery Targeting Meiotic mRNAs Promotes Facultative Heterochromatin Formation
M. Zofall et al.
RNA processing factors regulate the assembly of heterochromatin at individual gene loci in fission yeast.

100 Asymmetry and Aging of Mycobacterial Cells Lead to Variable Growth and Antibiotic Susceptibility
B. B. Aldridge et al.
The growing pole of the tuberculosis-causing bacterium is inherited by only one offspring, which can then elongate faster.

104 Langerhans Cells Facilitate Epithelial DNA Damage and Squamous Cell Carcinoma
B. G. Modi et al.
A specialized immune cell population in the skin promotes tumorigenesis by metabolizing environmental carcinogens.

108 Stop Signals Provide Cross Inhibition in Collective Decision-Making by Honeybee Swarms
T. D. Seeley et al.
Scout bees bring about nest-site decisions by targeting stop signals at bees with other candidate sites.

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Activation-Induced B Cell Fates Are Selected by Intracellular Stochastic Competition
K. R. Duffy et al.
Cell-fate decisions in activated B lymphocytes are determined by stochastic competition. 10.1126/science.1213230

Centrosome Loss in the Evolution of Planarians
J. Astmazd et al.
Analysis of centriole assembly in planaria gives insight into the evolution and function of the centrosome in animal cells. 10.1126/science.1214457

RNA Editing Underlies Temperature Adaptation in K+ Channels from Polar Octopuses
S. Garrett and J. J. C. Rosenthal
Octopus potassium channels function efficiently at different temperatures due to RNA editing and not genetic differences. 10.1126/science.1212795

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Comment on “Nonreciprocal Light Propagation in a Silicon Photonic Circuit”
S. Fan et al.
Full text at www.sciencemag.org/cgi/content/full/335/6064/38-b
Response to Comment on “Nonreciprocal Light Propagation in a Silicon Photonic Circuit”
L. Feng et al.
Full text at www.sciencemag.org/cgi/content/full/335/6064/38-c

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http://scim.ag/Sixth-Toe

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The Signal Transduction Knowledge Environment
3 January issue: http://scim.ag/ss01032012

EDITORIAL GUIDE: 2011—Signaling Breakthroughs of the Year
E. M. Adler
This year’s breakthroughs include structural insights, imaging advances, and new ways to control gene expression.

RESEARCH ARTICLE: Inhibition of PP1 Phosphatase Activity by HBx—A Mechanism for the Activation of Hepatitis B Virus Transcription
D. Coupel et al.
A virus prolongs the activity of a host transcription factor to promote expression of viral genes.

RESEARCH ARTICLE: Incoherent Feedforward Control Governs Adaptation of Activated Ras in a Eukaryotic Chemotaxis Pathway
K. Takeda et al.
Rapid adaptation to changes in chemoaffectant concentration involves an incoherent feedforward structure of the underlying signaling network.

LETTERS: Comment and Response on “Load-Induced Modulation of Signal Transduction Networks”—Reconciling Ultrasensitivity with Bifunctionality?
R. Straube (Comment) and P. Jiang (Response)
Complex biochemical and regulatory properties of a bifunctional enzyme mean that its activity cannot be modeled as a simple bifunctional system with distinct and reciprocally regulated states.

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RESEARCH ARTICLE: Vaccine Vectors Derived from a Large Collection of Simian Adenoviruses Induce Potent Cellular Immunity Across Multiple Species
S. Colloca et al.
Simian adenoviruses screened from wild-derived candidates can prime T cell responses in man and may serve as new vaccine vector candidates.

RESEARCH ARTICLE: Novel Adenovirus-Based Vaccines Induce Broad and Sustained T Cell Responses to HCV In Man
E. Barnes et al.
An adenoviral HCV vector induces antiviral T cell responses in human volunteers.

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M. Houghton
A hepatitis C virus vaccine delivered by a chimpzee-derived adenovirus vector produces strong cellular immune responses in healthy human volunteers.

PODCAST
S. Colloca and A. Colmone
A conversation with Alfredo Nicosia about the discovery of new adenoviruses that will help to make better vaccines to treat human diseases.