Like a cauliflower, the quantum critical regime has the same appearance irrespective of viewing distance. Fluctuations prevent a stable phase from developing; instead a patchwork of mixed phases arises. See the special section on quantum matter beginning on page 1201.

Image: Getty Images

SPECIAL SECTION

Quantum Matter

INTRODUCTION
Quantum Wonderland 1201

PERSPECTIVES
Quantum Gases
I. Bloch 1202
Quantum Liquids
A. J. Leggett 1203
Quantum Critical Electron Systems: The Uncharted Sign Worlds
J. Zaanen 1205
Supersolidity
M. H. W. Chan 1207
Quantum Information Matters
S. Lloyd 1209
Looking to the Future of Quantum Optics
I. A. Walmsley 1211

>> News Focus article p. 1180

NEWS OF THE WEEK
Florida Standards Support Evolution—With a Twist 1168
NIH Urged to Focus on New Ideas, New Applicants 1169
New Prize Sends Old Hands on Flights of Lunar Discovery 1170
Chemist Found Responsible for Ethical Breaches 1170

SCIENCESCOPE
Annette Schavan Interview: German Science Takes an International View 1172
Philip Morris Pulls the Plug on Controversial Research Program 1173

NEWS FOCUS
War of the Worlds? 1174
Are Epigeneticists Ready for Big Science? 1177
Flu Virus Research Yields Results but No Magic Bullet for Pandemic 1178
Insights Flow From Ultracold Atoms That Mimic Superconductors 1180
Rocking the Cradle of Humanity 1182

CONTENTS continued >>
CLIMATE CHANGE
Covariant Glacial-Interglacial Dust Fluxes in the Equatorial Pacific and Antarctica
G. Winckler, R. F. Anderson, M. Q. Fleisher, D. McGee, N. Mahowald
A 500,000-year record shows that more dust, which provides iron and other nutrients, was blown into the equatorial Pacific during glacial periods than during warm periods.
10.1126/science.1150595

GEOCHEMISTRY
Graphite Whiskers in CV3 Meteorites
M. Fries and A. Steele
Graphite whiskers, a naturally occurring allotrope of carbon, have been found in primitive grains in several meteorites and may explain spectral features of supernovae.
10.1126/science.1153578

MEDICINE
TDP-43 Mutations in Familial and Sporadic Amyotrophic Lateral Sclerosis
J. Sreedharan et al.
Mutations in a gene that encodes a protein that aggregates in several neurodegenerative disorders are linked to amyotrophic lateral sclerosis (Lou Gehrig’s disease).
10.1126/science.1154584

NEUROSCIENCE
Protein Synthesis and Neurotrophin-Dependent Structural Plasticity of Single Dendritic Spines
J. Tanaka et al.
Pairing of stimuli in hippocampal cells induces secretion of the growth factor BDNF, causing enlargement of individual spines and strengthening of synapses.
10.1126/science.1152864

COMPLEXITY IN FUSION PLASMAS
P. A. Norreys
>> Report p. 1223

AN ENLIGHTENING STRUCTURE-FUNCTION RELATIONSHIP
B. A. Armitage and P. B. Berger
>> Report p. 1232

RECONSTRUCTION OF THE GENOMES
D. Endy
>> Research Article p. 1215

GETTING SPECIFIC ABOUT SPECIFIC ION EFFECTS
D. J. Tobias and J. C. Hemminger

Bruce Alberts, Science’s New Editor
M. Kirschner
>> Editorial p. 1161

UBIQUITY OF BIOLOGICAL ICE NUCLEATORS IN SNOWFALL
B. C. Christner et al.
Biogenic aerosols are ubiquitous in nuclei of ice particles that grow and form snowflakes, and thus may influence the precipitation cycle.

COMPLETE CHEMICAL SYNTHESIS, ASSEMBLY, AND CLONING OF A MYCOPLASMA GENITALIUM GENOME
D. G. Gibson et al.
A complete bacterial genome is synthesized, assembled, and cloned, providing a method that will be useful for generating large DNA molecules de novo.
>> Perspective p. 1196

ASPERHICITY IN SUPERNOVA EXPLOSIONS FROM LATE-TIME SPECTROSCOPY
K. Maeda et al.
Spectroscopic signatures show that supernova explosions of stars that have lost their hydrogen envelopes are strongly aspherical and may be jetlike.
Ceramide Triggers Budding of Exosome Vesicles

CELL BIOLOGY

Membrane Proteins of the Endoplasmic Reticulum Induce High-Curvature Tubules

J. Hu et al.

Integral membrane proteins from the endoplasmic reticulum induce the development of tubular structures in vitro by forming oligomers in the plane of the membrane.

PHYSIOLOGY

Leading-Edge Vortex Improves Lift in Slow-Flying Bats

F. T. Muijres et al.

Flying bats generate high lift forces similar to those used by insects, creating a vortex of air that stays attached to the wing on the downward stroke.

NEUROSCIENCE

Synaptic Protein Degradation Underlies Destabilization of Retrieved Fear Memory

S.-H. Lee et al.

Upon recollection, mouse memories of fearful situations become labile, as postsynaptic proteins are degraded by proteosomes and are then reconsolidated via protein synthesis.

NEUROSCIENCE

Hybrid Neurons in a MicroRNA Mutant Are Putative Evolutionary Intermediates in Insect CO₂ Sensory Systems

P. Cayirlioglu et al.

Loss of a microRNA in Drosophila leads to misexpression of CO₂-sensing neurons in the mouthparts, creating a possible evolutionary hybrid between the fruit fly and mosquito.

NEUROSCIENCE

Transgenic Inhibition of Synaptic Transmission Reveals Role of CA3 Output in Hippocampal Learning

T. Nakashiba et al.

Blockade of neural activity in the CA3 region of the hippocampus with a reversible, inducible transgenic method inhibits rapid learning but spares certain spatial tasks.

PSYCHOLOGY

BOLD Responses Reflecting Dopaminergic Signals in the Human Ventral Tegmental Area

K. D’Ardenne, S. M. McClure, L. E. Nystrom, J. D. Cohen

In humans, activity measurements in a small midbrain region show rewards in a learning task.

NEUROSCIENCE

Evolutionary Intermediates in Insect CO₂ Sensory Systems

S.-H. Lee et al.

Evolutionary hybrid between the fruit fly and mosquito.

PHYSIOLOGY

Membrane Proteins of the Endoplasmic Reticulum Induce High-Curvature Tubules

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Integral membrane proteins from the endoplasmic reticulum induce the development of tubular structures in vitro by forming oligomers in the plane of the membrane.

PHYSICAL REVIEW

Proton Radiography of Inertial Fusion Implosions

J. R. Rygg et al.

Beams of protons used to map laser fusion targets as they implode reveal the generation of long plasma filaments and a strong radial electric field.

PHYSICS

Long-Range Order in Electronic Transport Through Disordered Metal Films

S. Aigner et al.

At ultracold temperatures, magnetometry suggests that defects in a gold wire produce organized, long-range electron deflections oriented at 45° to the direction of current flow.

MATERIALS SCIENCE

Chemically Derived, Ultrasmooth Graphene Nanoribbon Semiconductors

X. Li, X. Wang, L. Zhang, S. Lee, H. Dai

Unlike nanotubes, 10-nanometer-wide graphene nanoribbons have smooth edges and can act as semiconductors.

CHEMISTRY

Deeply Inverted Electron-Hole Recombination in a Luminescent Antibody-Stilbene Complex

E. W. Debler et al.

The bright blue emission from a stilbene-antibody complex, a versatile biosensor, is not fluorescence, but arises from charge recombination between a stilbene anion and a cationic side chain.

CLIMATE CHANGE

Land Clearing and the Biofuel Carbon Debt

J. Fargione, J. Hill, D. Tilman, S. Polasky, P. Hawthorne

Use of U. S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change

T. Searchinger et al.

Converting forests and grasslands to biofuels crop production results in a net carbon flux to the atmosphere for decades despite any displacement of fossil fuel use.

CELL BIOLOGY

Local Positive Feedback Regulation Determines Cell Shape in Root Hair Cells

S. Takeda, C. Gapper, H. Kaya, E. Bell, K. Kuchitsu, L. Dolan

Accumulation of an oxidase enzyme at one end of Arabidopsis root hair cells generates reactive oxygen species, which in turn trigger calcium entry and directional growth.

CELL BIOLOGY

Ceramide Triggers Budding of Exosome Vesicles into Multivesicular Endosomes

K. Trajkovic et al.

Endosomes, membrane-bound vesicles later released from cells, are filled by a lipid-controlled budding of certain membrane regions into the lumen.
Meeting Report: cGMP Matters
B. Kemp-Harper and R. Feil
Emerging therapies for treating cardiovascular disorders target the cGMP signaling system.

Teaching Resource: Using Web-Based Discussion Forums as a Model of the Peer-Review Process and a Tool for Assessment
Asynchronous discussion forums have several advantages over in-class journal club discussions.