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- 1124 Designing Cell-Compatible Hydrogels for Biomedical Applications  
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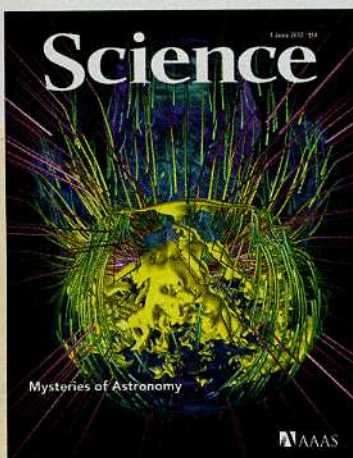
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## COVER

Three-dimensional computer models such as this one help researchers explore the mechanisms behind core-collapse supernovae, the violent death of short-lived massive stars. In the image, tubes represent paths of gas falling into a supernova, deflected by an accretion shockwave (horizontal width of 600 km); colors represent different velocities. The question of how stars explode is one of the "Mysteries of Astronomy" described in a special News package beginning on page 1090.

*Visualization: Hongfeng Yu and Kwan-Liu Ma, University of California-Davis and the SciDAC Institute for Ultra-Scale Visualization; Simulation: John Blondin, North Carolina State University*

## DEPARTMENTS

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## BREVIA

- 1129 **Structure of a 16-nm Cage Designed by Using Protein Oligomers**  
Y.-T. Lai et al.  
A general computational method allows the design of proteins that self-assemble into a desired symmetric architecture.

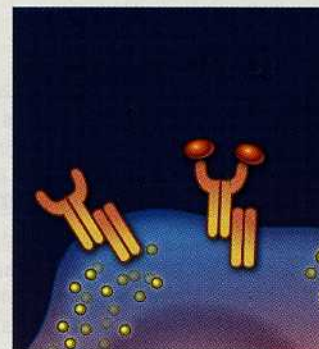
## RESEARCH ARTICLE

- 1130 **Quantum Algorithms for Quantum Field Theories**  
S. P. Jordan et al.  
A quantum computer may be able to efficiently simulate theories used to describe particle scattering in accelerators.  
>> *Perspective p. 1122; Science Podcast*

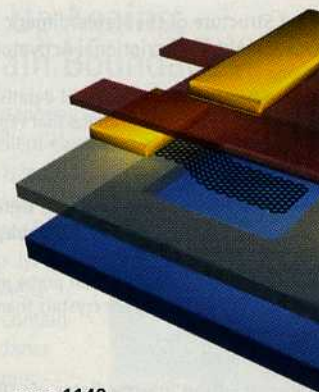
## REPORTS

- 1133 **The Detection and Characterization of a Nontransiting Planet by Transit Timing Variations**  
D. Nesvorný et al.  
Analysis of the deviations in the orbit of a transiting exoplanet revealed an outer planet in the same planetary system.  
>> *Perspective p. 1121*
- 1137 **Tracking Cooper Pairs in a Cuprate Superconductor by Ultrafast Angle-Resolved Photoemission**  
C. L. Smallwood et al.  
Time-resolved spectroscopy is used to probe the dynamics of electron pairing recovery in a high-temperature superconductor.
- 1140 **Graphene Barristor, a Triode Device with a Gate-Controlled Schottky Barrier**  
H. Yang et al.  
The absence of defects and surface oxides at a graphene-silicon interface enables voltage control of graphene devices.
- 1143 **Tailoring Electrical Transport Across Grain Boundaries in Polycrystalline Graphene**  
A. W. Tsen et al.  
Overlap between crystallites in vapor-grown graphene improves its electronic conductivity.
- 1147 **Theory Untangles the High-Resolution Infrared Spectrum of the *ortho*-H<sub>2</sub>-CO van der Waals Complex**  
P. Jankowski et al.  
High-level calculations assign the unusually complex spectrum of a molecular pair implicated in interstellar chemistry.
- 1150 **Secreted Kinase Phosphorylates Extracellular Proteins That Regulate Biomaterialization**  
V. S. Tagliabracchi et al.  
The elusive enzyme that modifies proteins involved in building bone and teeth has now been identified.

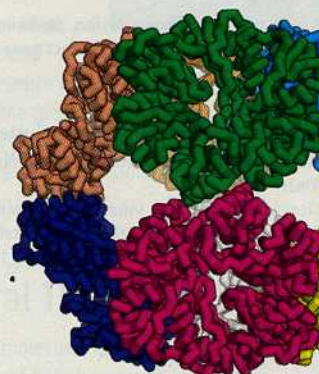
- 1154 **Evolution of a Vertebrate Social Decision-Making Network**  
L. A. O'Connell and H. A. Hofmann  
Across vertebrates, behaviorally relevant brain regions are remarkably conserved over 450 million years of evolution.
- 1157 **Evolutionary Trade-Offs, Pareto Optimality, and the Geometry of Phenotype Space**  
O. Shoval et al.  
The fitness of an organism can be modeled graphically to determine how phenotypic trade-offs are maximized.  
>> *Perspective p. 1114*
- 1160 **Chitin-Induced Dimerization Activates a Plant Immune Receptor**  
T. Liu et al.  
Structural analysis shows how fungus-derived chitin dimerizes its receptor on target plants and triggers defense responses.
- 1164 **Rocket Launcher Mechanism of Collaborative Actin Assembly Defined by Single-Molecule Imaging**  
D. Breitsprecher et al.  
Triple-color microscopy suggests two factors interact to initiate actin formation and then separate as the filament grows.
- 1168 **The Amyloid Precursor Protein Has a Flexible Transmembrane Domain and Binds Cholesterol**  
P. J. Barrett et al.  
The structure of the APP transmembrane domain allows processive cleavage and cholesterol binding that may enhance cleavage.
- 1171 **Computational Design of Self-Assembling Protein Nanomaterials with Atomic Level Accuracy**  
N. P. King et al.  
A general computational method is used to design protein building blocks that self-assemble into target architectures.
- 1175 **Generic Indicators for Loss of Resilience Before a Tipping Point Leading to Population Collapse**  
L. Dai et al.  
Experiments in yeast confirm that statistical indicators can signal the approach of population crashes.
- 1178 **B Cell Receptor Signal Transduction in the GC Is Short-Circuited by High Phosphatase Activity**  
A. M. Khalil et al.  
Restricted B cell signaling in the areas responsible for immune memory cell production promotes affinity maturation.  
>> *Perspective p. 1120*
- 1182 **Restoring Voluntary Control of Locomotion after Paralyzing Spinal Cord Injury**  
R. van den Brand et al.  
A rehabilitation program involving robotic neuroprosthetics restores previously paralyzed hindlimb function.  
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