CONTENTS

SPECIAL SECTION
Speciation

INTRODUCTION
727  Happy Birthday, Mr. Darwin

REVIEWS
728  The Red Queen and the Court Jester: Species Diversity and the Role of Biotic and Abiotic Factors Through Time
M. J. Benton
732  Adaptive Radiation: Contrasting Theory with Data
S. Gavrilets and J. B. Losos
737  Evidence for Ecological Speciation and Its Alternative
D. Schluter
741  The Bacterial Species Challenge: Making Sense of Genetic and Ecological Diversity
C. Fraser et al.

746  Is Genetic Evolution Predictable?
D. L. Stern and V. Orgogozo

>> For a list of all related content, see p. 727 or go to www.sciencemag.org/darwin/

EDITORIAL
687  Species Uncertainties
Robert M. May and Paul H. Harvey

>> Speciation section p. 727

NEWS OF THE WEEK
696  Agencies Sweat the Details of Spending Billions More on Science
697  New Ph.D.s to Teach Harvard Undergrads
698  California Researchers Chilled by Sudden Freeze on Bond Funds
Stern Cell Institute Looks for New Ways to Raise Cash

699  Life Scientists Cautious About Dual-Use Research, Study Finds

NEWS FOCUS
702  Polio: Looking for a Little Luck
Rethinking the Polio Endgame

706  Evolutionary Biology: Agreeing to Disagree
>> Speciation section p. 727

709  ORIGINS
On the Origin of Art and Symbolism
>> Speciation section p. 727; Science Podcast

LETTERS
713  Keeping Raw Data in Context
I. Sim et al.
The IRB Is Key
W. R. Lovallo
Response
J. A. List
Implications of Ancient Ice
S. Zimov
Response
D. G. Froese et al.

714  CORRECTIONS AND CLARIFICATIONS

714  TECHNICAL COMMENT ABSTRACTS

BOOKS ET AL.
716  Why Evolution Is True
J. A. Coyne, reviewed by M. Pigliucci
717  Perspectives in Animal Phylogeny and Evolution
A. Minelli, reviewed by W. Arthur

POLICY FORUM
718  Biologically Reversible Exploration
C. P. McKay

PERSPECTIVES
719  Forming Massive Stars
B. Whitney

>> Report p. 754
720  Time’s Stamp on Modern Biogeography
J. A. Crame

>> Report p. 767
721  Computational Social Science
D. Lazer et al.

723  Moonlighting in Mitochondria
M. G. Myers Jr.

>> Report p. 793
724  Heavy Metals or Punk Rocks?
R. J. Bodnar

>> Report p. 764
725  Confined Polymers Crystallize
P. J. Lemstra

CONTENTS continued >>

COVER
Charles Darwin’s abiding interest in the classification of barnacles, illustrated here, was one of the inspirations for his investigations into the origins and diversification of species. Science marks Darwin’s 200th birthday with a special section on speciation beginning on page 727.

Image: Illustrations by George Sowerby, reproduced with permission from The Complete Work of Charles Darwin Online, John van Wyhe, Ed. (http://darwin-online.org.uk); background: iStockphoto.com

DEPARTMENTS
683  This Week in Science
688  Editors’ Choice
690  Science Staff
693  Random Samples
695  Newsmakers
807  Information for Contributors
809  New Products
810  Science Careers

www.sciencemag.org  SCIENCE  VOL 323  6 FEBRUARY 2009
Published by AAAS
BREVIA

753 The Sea-Level Fingerprint of West Antarctic Collapse
J. X. Mitrovica et al.
An uneven pattern of local sea-level rise would result from the collapse of the West Antarctic Ice Sheet.

REPORTS

754 The Formation of Massive Star Systems by Accretion
M. R. Krumholz et al.
Numerical simulations show that instabilities can channel gas into growing massive stars despite their high radiation pressure.

757 Confined Crystallization of Polyethylene Oxide in Nanolayer Assemblies
H. Wang et al.
Squeezing ultrathin polymer layers can induce crystallization and decrease their gas permeability.

760 Nitrogen-Doped Carbon Nanotube Arrays with High Electrocatalytic Activity for Oxygen Reduction
K. Gong et al.
Carbon atoms in nanotubes are activated by nitrogen doping and catalyze oxygen reduction at high pH.

764 Anomalously Metal-Rich Fluids Form Hydrothermal Ore Deposits
J. J. Wilkinson et al.
The metal contents of the fluid inclusions that create lead-zinc ores have been drastically underestimated.

767 Signature of the End-Cretaceous Mass Extinction in the Modern Biota
A. Z. Krug et al.
Increased rates of marine bivalve speciation after the Cretaceous-Tertiary extinction were most marked in the tropics.

771 A Great-Appendage Arthropod with a Radial Mouth from the Lower Devonian Hunsrück Slate, Germany
G. Kühl et al.
Fossil evidence for the great-appendage arthropods extends to more recent periods by about 100 million years.

773 Two Thresholds, Three Male Forms Result in Facultative Male Trichromism in Beetles
J. M. Rowland and D. J. Emlen
A clade of dung beetles can alter their reproductive tactics by switching between three male forms.

776 Sequential Sympatric Speciation Across Trophic Levels
A. A. Forbes et al.
A host shift by a fly is causing its wasp parasite to undergo changes leading to speciation.

779 Evolution of the Drosophila Nuclear Pore Complex Results in Multiple Hybrid Incompatibilities
S. Tang and D. C. Presgraves
Nuclear pore complex proteins are involved in lethal gene interactions in Drosophila melanogaster–D. simulans species hybrids.

782 Queen Ants Make Distinctive Sounds That Are Mimicked by a Butterfly Social Parasite
F. Barbero et al.
Sounds made by queen ants denoting rank are copied by the larvae and pupae of a parasitic butterfly, facilitating their infiltration into ant colonies.

785 Stability Predicts Genetic Diversity in the Brazilian Atlantic Forest Hotspot
A. C. Carnaval et al.
Modeling ecological niches under past climates establishes a method to improve prediction and protection of tropical biodiversity hotspots.

789 Orc1 Controls Centriole and Centrosome Copy Number in Human Cells
A. S. Hemerly et al.
A DNA replication factor ensures that only two centrioles are formed during cell division in animal cells.

793 Function of Mitochondrial Stat3 in Cellular Respiration
J. Wegryn et al.
A protein that has a nuclear function as a transcription factor also functions to support respiration in the mitochondria.

797 Platelets Kill Intraerythrocytic Malarial Parasites and Mediate Survival to Infection
B. J. McMorran et al.
Mouse and human platelets bind malarial-infected red cells and kill the parasite within.

800 Changes in Cortical Dopamine D1 Receptor Binding Associated with Cognitive Training
F. McNab et al.
Training of working memory alters brain biochemistry by changing the density of cortical dopamine receptors.

802 Axon Regeneration Requires a Conserved MAP Kinase Pathway
M. Hammarlund et al.
Axon regeneration in adult nematode worms has distinct signals that are independent of earlier developmental programs.
SCIENCE ONLINE

SCIENCEEXPRESS
www.sciencexpress.org

Molecular and Evolutionary History of Melanism in North American Gray Wolves
T. M. Anderson et al.
Black coat color in wolves derives from a mutation that originated in domestic dogs.
10.1126/science.1165448
>> Science Podcast

Blue or Red? Exploring the Effect of Color on Cognitive Task Performances
R. Mehta and R. Zhu
Blue favors creativity in humans, whereas red improves attention to detail.
10.1126/science.1169144

Dynamic Order-Disorder in Atomistic Models of Structural Glass Formers
L. O. Hedges et al.
The liquid-to-glass transition of a simple mixture is controlled by parameters that drive the system away from equilibrium.
10.1126/science.1166665

Implications of a VLBI Distance to the Double Pulsar J0737-3039A/B
A. T. Deller et al.
Tests of gravity theories that use this double pulsar, now recognized as being more distant, will be more precise.
10.1126/science.1167969

TECHNICAL COMMENTS

Comment on “Human-Specific Gain of Function in a Developmental Enhancer”
L. Duret and N. Galtier
full text at www.sciencemag.org/cgi/content/full/323/5915/714c

Response to Comment on “Human-Specific Gain of Function in a Developmental Enhancer”
S. Prabhakar et al.
full text at www.sciencemag.org/cgi/content/full/323/5915/714d

SCIENCE NOW
www.sciencenow.org

Highlights From Our Daily News Coverage

Test Tube Babies Shed Light on Nature Versus Nurture
Children born to genetically unrelated mothers provide clues to origins of antisocial behavior.

Turtles Island-Hopped Their Way Across a Warm Arctic
Widespread volcanism and tropical temperatures helped ancient turtles migrate to America.

Titan’s Methane Mystery
Scientists suspect liquid hydrocarbon reservoirs lurk beneath the Moon’s surface.

SCIENCE SIGNALING
www.sciencesignaling.org
The Signal Transduction Knowledge Environment

PERSPECTIVE: Extracellular ATP in the Immune System—More Than Just a “Danger Signal”
A. Trautmann
Extracellular ATP is an important modulator of immune responses.

PERSPECTIVE: Bistable Switches for Synaptic Plasticity
H. Ogasawara and M. Kawato
Nearly a decade intervened between theoretical predictions and experimental verification of the mechanisms underlying synaptic plasticity.

PODCAST
P. P. Pandolfi and A. M. Van Hook
Inactivating mTOR signaling in the adult mouse prostate decreases the incidence of cancer.

E-LETTER: Microarrays Need Phylogenetics
M. Abu-Abid
Interpreting microarray experiments might benefit from evolution-compatible analytical tools.

SCIENCE CAREERS
www.sciencemag.org/career_magazine
Free Career Resources for Scientists

February 2009 Funding News
J. Fernández
Learn about the latest in research funding, scholarships, fellowships, and internships.

Darwin’s Legacy 1: Rich Collections, Deep Expertise
S. Carpenter
Natural history museums have reasserted their scientific relevance in recent years.

Darwin’s Legacy 2: Keeping Order
K. Travis
London entomology curator Erica McAlister is responsible for everything from museum collections to fieldwork.

Darwin’s Legacy: Resources
Science Careers Staff
Here is a collection of resources related to careers in the H.M.S. Beagle’s wake.

SCIENCEPODCAST
www.sciencemag.org/multimedia/podcast
Free Weekly Show

Download the 6 February Science Podcast to hear about the biochemistry behind better short-term memory, the genetics of wolf coat color, the origin of art, and more.