



FEATURES

288 UNTANGLING SPIDER BIOLOGY

Genomics begins to unravel the roots of spider diversity and the recipes of their silk and venom *By E. Pennisi*

► VIDEO

292 A SPINNER'S SECRETS

A living fiber factory *By V. Altounian, E. Pennisi, and R. F. Service*

293 SILKEN PROMISES

Spider silk products are finally edging into the market. But mass-produced, superstrong fibers remain out of reach *By R. F. Service*

ON THE COVER



Genomics data, including full sequences of the golden orb-weaver (*Nephila clavipes*) and other species, are revolutionizing our understanding of spider evolution.

These data are also revealing the molecular complexities of spider venom and their silk, which companies have long sought to commercialize—with little success so far. See pages 288 and 293. *Photo: Westend61 GmbH/Alamy Stock Photo*

NEWS

IN BRIEF

280 News at a glance

IN DEPTH

282 A SPACETIME TREMOR AND A CELESTIAL LIGHT SHOW

Unprecedented view of a neutron-star collision is a scientific gold mine *By A. Cho*

► PERSPECTIVE P. 301; VIDEO

283 ANALYSIS OF CHINA'S ONE-CHILD POLICY SPARKS UPROAR

Colleagues call demographer's findings flawed and irresponsible

By M. Hvistendahl

285 TRUMP TEAM RAISES PRICE TAG FOR 2020 CENSUS

Funding squeeze has hampered development of cost-saving technologies

By J. Mervis

286 EMAILS REVEAL PRESSURES ON NIH GUN RESEARCH

Agency staff wanted program on firearms violence to continue *By M. Wadman*

287 STORMS AWAIT WEATHER EXECUTIVE AT CLIMATE AGENCY

If confirmed as NOAA head, Barry Myers would face a wary staff and the fraught politics of climate change *By P. Voosen*

FEATURES

295 ORIGINAL SIN

Some artifacts have questionable origins, and its initial mission was religious. Can the Museum of the Bible win scholarly respect? *By L. Wade*

► PODCAST

INSIGHTS

POLICY FORUM

298 DIGITAL NATURE: ARE FIELD TRIPS A THING OF THE PAST?

Expand the reach of science education using games and simulations, but choose tools wisely *By D. J. McCauley*

PERSPECTIVES

301 A COSMIC MULTIMESSENGER GOLD RUSH

Merging neutron stars provide an electromagnetic counterpart to gravitational waves

By J. S. Bloom and S. Sigurdsson

► NEWS STORY P. 282

303 FLICKING THE SWITCH ON A MOLECULAR GATE

Electric fields change the permeability of a metal-organic framework membrane *By J. Gascon*

► REPORT P. 347

304 CONVERTING MOFS INTO AMINATION CATALYSTS

Pyrolysis of metal-organic frameworks creates graphitic carbon-coated cobalt nanoparticles *By L.-F. Chen and Q. Xu*

► RESEARCH ARTICLE P. 326

305 NERVES SWITCH ON ANGIOGENIC METABOLISM

Adrenergized blood vessels contribute to prostate cancer progression

By Y. Hayakawa and T. C. Wang

► RESEARCH ARTICLE P. 321

307 A BIOCHEMICAL SULFUR DELIVERY SERVICE

A steady supply of iron-sulfur clusters sustains biosynthesis of the lipoyl cofactor *By A. C. Rosenzweig*

► REPORT P. 373

308 INTESTINAL INFLAMMATION INDUCED BY ORAL BACTERIA

Colonization of intestine by oral bacteria can induce inflammatory disorders *By X. Cao*

► REPORT P. 359





BOOKS ET AL.

310 IN OVER OUR HEADS

An urgent treatise on rising sea levels predicts a wild and watery future
By J. Lamond

311 BREAKING BAD ALGORITHMS

Biased tech design prompts a writer to call for resistance
By A. L. Hoffmann

LETTERS

312 DEEP RISKS FROM OFFSHORE DEVELOPMENT

By A. F. Bernardino and P. Y. G. Sumida

312 CULTURALLY INCLUSIVE STEM EDUCATION

By A. J. Zellmer and A. Sherman

313 INCENTIVES FOR GALÁPAGOS PROTECTION

By L. R. Gerber and D. Quiroga

314 TECHNICAL COMMENT ABSTRACTS

314 ERRATA

RESEARCH

IN BRIEF

316 From *Science* and other journals

REVIEW

319 OPTICS

Ultraslow waves on the nanoscale
K. L. Tsakmakidis et al.

REVIEW SUMMARY; FOR FULL TEXT:
dx.doi.org/10.1126/science.aan5196



RESEARCH ARTICLES

320 INNATE IMMUNITY

Natural polyreactive IgA antibodies coat the intestinal microbiota
J. J. Bunker et al.
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:
dx.doi.org/10.1126/science.aan6619

321 CANCER

Adrenergic nerves activate an angiometabolic switch in prostate cancer
A. H. Zahalka et al.
► PERSPECTIVE P. 305

326 CATALYSIS

MOF-derived cobalt nanoparticles catalyze a general synthesis of amines
R. V. Jagadeesh et al.
► PERSPECTIVE P. 304

REPORTS

332 2D MATERIALS

A liquid metal reaction environment for the room-temperature synthesis of atomically thin metal oxides
A. Zavabeti et al.

336 CHEMICAL PHYSICS

Encoding of vinylidene isomerization in its anion photoelectron spectrum
J. A. DeVine et al.

340 MOLECULAR MACHINES

Rotary and linear molecular motors driven by pulses of a chemical fuel
S. Erbas-Cakmak et al.

344 NANOPHOTONICS

Chaos-assisted broadband momentum transformation in optical microresonators
X. Jiang et al.

347 FRAMEWORK COMPOUNDS

Defibrillation of soft porous metal-organic frameworks with electric fields
A. Knebel et al.
► PERSPECTIVE P. 303

352 POLYMERS

Single polymer growth dynamics
C. Liu et al.

356 CHEMICAL PHYSICS

Quantum control of molecular collisions at 1 kelvin
W. E. Perreault et al.

359 MICROBIOTA

Ectopic colonization of oral bacteria in the intestine drives T_H1 cell induction and inflammation
K. Atarashi et al.
► PERSPECTIVE P. 308

365 EVOLUTION

Recent natural selection causes adaptive evolution of an avian polygenic trait
M. Bosse et al.

369 NEUROSCIENCE

Learning-enhanced coupling between ripple oscillations in association cortices and hippocampus
D. Khodagholy et al.

373 ENZYMOLOGY

Destruction and reformation of an iron-sulfur cluster during catalysis by lipoyl synthase
E. L. McCarthy and S. J. Booker
► PERSPECTIVE P. 307

377 SIGNAL TRANSDUCTION

Crystal structure of the human lysosomal mTORC1 scaffold complex and its impact on signaling
M. E. G. de Araujo et al.

381 STRUCTURAL BIOLOGY

D₄ dopamine receptor high-resolution structures enable the discovery of selective agonists
S. Wang et al.

386 EVO-DEVO

Taxon-restricted genes at the origin of a novel trait allowing access to a new environment
M. E. Santos et al.

DEPARTMENTS

279 EDITORIAL

Brexit and European science
By Alex Halliday and Jörg Hacker

414 WORKING LIFE

From patients to partners
By Peter DelNero and Alexandra McGregor

Science Staff	278
New Products	394
Science Careers	395

SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 2017 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$165 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$1659. Foreign postage extra. Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$89. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request. GST #R1254 88122. Publications Mail Agreement Number 1069624. Printed in the U.S.A. Change of address: Allow 4 weeks, giving old and new addresses and 8-digit account number. Postmaster: Send change of address to AAAS, P.O. Box 96178, Washington, DC 20009-6178. Single-copy sales: \$23.00 current issue; \$28.00 back issue prepaid includes surface postage; bulk rates on request. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that \$35.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for Science is 0036-8075. Science is indexed in the Reader's Guide to Periodical Literature and in several specialized indexes.