



851

NEWS

IN BRIEF

844 News at a glance

IN DEPTH

847 ERADICATION GOAL SPLITS MALARIA COMMUNITY

A *Lancet* panel wants to end the disease by 2050. A WHO panel says that's not realistic *By M. Enserink*

848 ANCIENT SITE IN IDAHO IMPLIES FIRST AMERICANS CAME BY SEA

16,000-year-old occupation predates possible land route *By L. Wade*

► RESEARCH ARTICLE P. 891

849 MODIFIED CRISPR CUTS AND SPLICES WHOLE GENOMES

New tools bring editing to synthetic biology *By R. F. Service*

► REPORT P. 922

850 STUNNING SKULL SHAKES HUMAN FAMILY TREE

Researchers reveal the 4-million-year-old face of the most ancient australopithecine *By M. Price*

851 NO MICROBIOME IS AN ISLAND, SURVEY REVEALS

Sampling in Hawaiian valley shows wider environment shapes each organism's microbial community

By E. Pennisi

► PODCAST

852 WORLD'S OLDEST IMPACT CRATER DATED IN AUSTRALIAN OUTBACK

The 2.2-billion-year-old Yarrabubba impact came at the end of a planetwide deep freeze

By E. Hand

853 AMAZON FIRES CLEARLY LINKED TO DEFORESTATION, SCIENTISTS SAY

Brazilian government deflects blame for rise in fire activity

By H. Escobar

FEATURES

854 THE ALLURE OF MONKEYFLOWERS

A tough, diverse, colorful weed used in evolutionary studies is becoming a key model for plant biology

By E. Pennisi



INSIGHTS

POLICY FORUM

858 PROTECTING ELECTIONS FROM SOCIAL MEDIA MANIPULATION

Rigorous causal analysis could help harden democracy against future attacks *By S. Aral and D. Eckles*

PERSPECTIVES

862 THE IMMUNOLOGICAL CODE OF PREGNANCY

Maternal immune cells interact with the placenta and influence pregnancy complications

By F. Colucci

864 AI SURPASSES HUMANS AT SIX-PLAYER POKER

Self-learning Pluribus beats five humans in Texas hold'em showdown

By A. Blair and A. Saffidine

► RESEARCH ARTICLE P. 885

865 HOW HUMANS CHANGED THE FACE OF EARTH

Archaeological evidence shows that anthropogenic changes began earlier and spread faster than previously estimated *By N. Roberts*

► RESEARCH ARTICLE P. 897

866 THE MITSUNOBU REACTION, REIMAGINED

Catalytic nucleophilic substitution of alcohols makes organic synthesis greener *By L. Longwitz and T. Werner*

► REPORT P. 910

868 BACTERIA SEND MESSAGES TO COLONIZE PLANT ROOTS

Bacteria-derived RNA fragments target host plant genes to promote root colonization

By P. Baldrich and B. C. Meyers

► REPORT P. 919

869 HOW DO GENES AFFECT SAME-SEX BEHAVIOR?

Genetic loci linked with same-sex sexual behavior cannot predict orientation of individuals

By M. C. Mills

► RESEARCH ARTICLE P. 882

BOOKS ET AL.

871 LESSONS IN BLACK EXCELLENCE

Data and success stories reveal how to ensure that African American students thrive in the STEM classroom
By *D. Riley*

872 CHANGING CONCEPTION

A thought-provoking volume traces the medical, social, and political histories of in vitro fertilization
By *I. G. Cohen*

LETTERS

873 MAKING OLIVE OIL SUSTAINABLE

By *F. Moreira et al.*

873 WILL DNA BARCODING MEET TAXONOMIC NEEDS?

By *H. T. Pinheiro et al.*

874 TROPHY HUNTING BANS IMPERIL BIODIVERSITY

By *A. Dickman et al.*

RESEARCH

IN BRIEF

878 From *Science* and other journals

REVIEW

881 NEURODEVELOPMENT

Cell migration and axon guidance at the border between central and peripheral nervous system

T. A. C. S. Suter and A. Jaworski

REVIEW SUMMARY; FOR FULL TEXT:

[dx.doi.org/10.1126/science.aaw8231](https://doi.org/10.1126/science.aaw8231)

RESEARCH ARTICLES

882 HUMAN GENETICS

Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior
A. Ganna et al.

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:

[dx.doi.org/10.1126/science.aat7693](https://doi.org/10.1126/science.aat7693)

► PERSPECTIVE P. 869

883 IMMUNOLOGY

Identification of a T follicular helper cell subset that drives anaphylactic IgE
U. Gowthaman et al.

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:

[dx.doi.org/10.1126/science.aaw6433](https://doi.org/10.1126/science.aaw6433)

**884 MALARIA**

Validation of the protein kinase *PfCLK3* as a multistage cross-species malarial drug target
M. M. Alam et al.

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:

[dx.doi.org/10.1126/science.aau1682](https://doi.org/10.1126/science.aau1682)

885 COMPUTER SCIENCE

Superhuman AI for multiplayer poker
N. Brown and T. Sandholm

► PERSPECTIVE P. 864

891 ARCHAEOLOGY

Late Upper Paleolithic occupation at Cooper's Ferry, Idaho, USA, ~16,000 years ago
L. G. Davis et al.

► NEWS STORY P. 848

897 ARCHAEOLOGY

Archaeological assessment reveals Earth's early transformation through land use
ArchaeoGLOBE Project

► PERSPECTIVE P. 865; PODCAST

REPORTS

903 MANTLE CHEMISTRY

Deep magma ocean formation set the oxidation state of Earth's mantle
K. Armstrong et al.

906 SUPERCONDUCTIVITY

Dynamical charge density fluctuations pervading the phase diagram of a Cu-based high- T_c superconductor
R. Arpaia et al.

910 ORGANIC CHEMISTRY

Redox-neutral organocatalytic Mitsunobu reactions
R. H. Beddoe et al.

► PERSPECTIVE P. 866

914 MAGNETISM

Skyrmion lattice with a giant topological Hall effect in a frustrated triangular-lattice magnet
T. Kurumaji et al.

919 PLANT SCIENCE

Rhizobial tRNA-derived small RNAs are signal molecules regulating plant nodulation
B. Ren et al.

► PERSPECTIVE P. 868

922 SYNTHETIC BIOLOGY

Programmed chromosome fission and fusion enable precise large-scale genome rearrangement and assembly
K. Wang et al.

► NEWS STORY P. 849

926 ASTROCHRONOLOGY

Solar System chaos and the Paleocene-Eocene boundary age constrained by geology and astronomy

R. E. Zeebe and L. J. Lourens

929 SIGNAL TRANSDUCTION

Membrane-associated periodic skeleton is a signaling platform for RTK transactivation in neurons
R. Zhou et al.

DEPARTMENTS

843 EDITORIAL

Evidence lights the way
By *Adam Gamoran*

946 WORKING LIFE

Between two worlds
By *Luis Alexis Rodríguez-Cruz*

ON THE COVER



Many real-world settings involve interacting parties with private information. As the prototypical such setting, poker has been a grand challenge in game theory and artificial intelligence (AI) for seven decades. A new poker AI, *Pluribus*, has reached the key remaining milestone: superhuman performance when there are multiple opponents at the table. Prior superhuman game-playing milestones—even in perfect-information games—have been limited to two-player games. See pages 864 and 885. *Illustration: Jason Solo/The Jacky Winter Group*

Science Staff	842
AAAS News & Notes	875
New Products	935
Science Careers	936

SCIENCE (ISSN 0036-8075) is published weekly on Friday, except 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. 48446D) paid at Washington, DC, and additional mailing offices. Copyright © 2019 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership, including subscription (12 months): \$165 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$1971. Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery): \$98. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request. GST #R125488122. 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 20090-6178. Single-copy sales: \$15 each plus shipping and handling; bulk rate on request. Authorization to reproduce material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act can be obtained through the Copyright Clearance Center (CCC), www.copyright.com. The identification code for Science is 0036-8075. Science is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

Science

365 (6456)

Science **365** (6456), 843-946.

ARTICLE TOOLS

<http://science.sciencemag.org/content/365/6456>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.