

***NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH  
(ICMR-NIOH)***

***CURRENT CONTENT***

***November, 2019***

***Dr. S. K. Chatterjee Library***

***Ahmedabad***

## **Contents**

<b>Sl. No.</b>	<b>Journal Name</b>
1.	American Journal of Epidemiology
2.	Annals of work exposure & health
3.	Bulletin of Environmental Contamination and Toxicology
4.	Bulletin of the World Health Organization
5.	Current Science
6.	Human & Experimental Toxicology
7.	Indian Journal of Experimental Biology
8.	Journal of Occupational and Environmental Medicine
9.	Nature
10.	Occupational & Environmental Medicine
11.	Science
12.	Science Reporter
13.	The Lancet
14.	The New England Journal of Medicine

# American Journal of Epidemiology

Volume 188 Number 11 November 2019

[academic.oup.com/aje](http://academic.oup.com/aje)

## STUDY DESIGN

- 1871 Venous Blood-Based Biomarkers in the China Health and Retirement Longitudinal Study: Rationale, Design, and Results From the 2015 Wave.** *Xinxin Chen, Eileen Crimmins, Peifeng (Perry) Hu, Jung Ki Kim, Qinqin Meng, John Strauss, Yafeng Wang, Junxia Zeng, Yuan Zhang, and Yaohui Zhao*

## ORIGINAL CONTRIBUTIONS

### MATERNAL AND CHILD HEALTH

- 1878 Mediation by Placental DNA Methylation of the Association of Prenatal Maternal Smoking and Birth Weight.** *Andres Cardenas, Sharon M. Lutz, Todd M. Everson, Patrice Perron, Luigi Bouchard, and Marie-France Hivert*
- 1887 Invited Commentary: Is DNA Methylation an Actionable Mediator of Prenatal Exposure Effects on Child Health?** *Christine Ladd-Acosta and M. Daniele Fallin*
- 1890 Cardenas et al. Reply to “DNA Methylation and Prenatal Exposures”.** *Andres Cardenas, Sharon M. Lutz, Todd M. Everson, and Marie-France Hivert*

- 1892 The Impact of Technology on the Diagnosis of Congenital Malformations.** *Loreen Straub, Krista F. Huybrechts, Brian T. Bateman, Helen Mogun, Kathryn J. Gray, Lewis B. Holmes, and Sonia Hernandez-Diaz*

- 1902 Estimating the Strength of Associations Between Prenatal Diet Quality and Child Developmental Outcomes: Results From a Large Prospective Pregnancy Cohort Study.** *Tiril Cecilie Borge, Anne Lise Brantsæter, Ida Henriette Caspersen, Helle Margrete Meltzer, Ragnhild Eek Brandlistuen, Heidi Aase, and Guido Biele*

### LIFE-COURSE EPIDEMIOLOGY

- 1913 Early-Life Predictors of Systolic Blood Pressure Trajectories From Infancy to Adolescence: Findings From Project Viva.** *Izzuddin M. Aris, Sheryl L. Rifas-Shiman, Ling-Jun Li, Mandy B. Belfort, Marie-France Hivert, and Emily Oken*
- 1923 Antibiotic Exposure in the First Year of Life and the Risk of Attention-Deficit/Hyperactivity Disorder: A Population-Based Cohort Study.** *Amani F. Hamad, Silvia Alessi-Severini, Salaheddin M. Mahmud, Marni Brownell, and I fan Kuo*

Continued on Inside Front Cover

## Contents Continued From Front Cover

### METABOLOMICS

- 1932** Metabolome-Wide Association Study of the Relationship Between Habitual Physical Activity and Plasma Metabolite Levels. *Ming Ding, Oana A. Zeleznik, Marta Guasch-Ferre, Jie Hu, Jessica Lasky-Su, I-Min Lee, Rebecca D. Jackson, Aladdin H. Shadyab, Michael J. LaMonte, Clary Clish, A. Heather Eliassen, Frank Sacks, Walter C. Willett, Frank B. Hu, Kathryn M. Rexrode, and Peter Kraft*

### MENTAL HEALTH

- 1944** The Roles of Physical Activity and Inflammation in Mortality, Cognition, and Depressive Symptoms Among Older Mexican Americans. *I-Fan Shih, Mary N. Haan, Kimberly C. Paul, Yu Yu, Janet S. Sinsheimer, and Beate Ritz*

### GLOBAL HEALTH

- 1953** Do Deviations From Historical Precipitation Trends Influence Child Nutrition? An Analysis From Uganda. *Adrienne Epstein, Jacqueline M. Torres, M. Maria Glymour, David López-Carr, and Sheri D. Weiser*

### CHRONIC DISEASE

- 1961** Assessing the Role of Selection Bias in the Protective Relationship Between Caregiving and Mortality: The Caregiver-Study of Osteoporotic Fractures. *Meghan L. Smith, Timothy C. Heeren, Lysie R. Ranker, and Lisa Fredman*
- 1970** Association Between Transient Opioid Use and Short-Term Respiratory Exacerbation Among Adults With Chronic Obstructive Pulmonary Disease: A Case-Crossover Study. *Yiran Rong, John P. Bentley, Gerald McGwin, Yi Yang, Benjamin F. Banahan, Sara L. Noble, Terri Kirby, and Sujith Ramachandran*
- 1977** Investigation of the Obesity Paradox in Chronic Obstructive Pulmonary Disease, According to Smoking Status, in the United States. *Tianshi David Wu, Chinedu O. Ejike, Robert A. Wise, Meredith C. McCormack, and Emily P. Brigham*

### CANCER

- 1984** Exposure to Welding Fumes, Hexavalent Chromium, or Nickel and Risk of Lung Cancer. *Beate Pesch, Benjamin Kendzia, Hermann Pohlabein, Wolfgang Ahrens, Heinz-Erich Wichmann, Jack Siemiatycki, Dirk Taeger, Wolfgang Zschesche, Thomas Behrens, Karl-Heinz Jöckel, and Thomas Brüning*

### AIDS

- 1994** Inflammation and Risk of Depression in HIV: Prospective Findings From the Multicenter AIDS Cohort Study. *Haidong Lu, Pamela J. Surkan, Michael R. Irwin, Glenn J. Treisman, Elizabeth C. Breen, Ned Sacktor, Ron Stall, Steven M. Wolinsky, Lisa P. Jacobson, and Alison G. Abraham*

### CAUSE-SPECIFIC MORTALITY

- 2004** Reversal of Upward Trends in Mortality During the Great Recession by Employment Status at Baseline in a National Longitudinal Study. *Enrique Regidor, Elena Ronda, José A. Tapia Granados, José Pulido, Luis de la Fuente, and Gregorio Barrio*

### PRACTICE OF EPIDEMIOLOGY

- 2013** Case-Only Analysis of Gene-Environment Interactions Using Polygenic Risk Scores. *Allison Meisner, Prosenjit Kundu, and Nilanjan Chatterjee*
- 2021** Methods for Dealing With Missing Covariate Data in Epigenome-Wide Association Studies. *Harriet L. Mills, Jon Heron, Caroline Relton, Matt Suderman, and Kate Tilling*
- 2031** A Bayesian Sensitivity Analysis to Partition Body Mass Index Into Components of Body Composition: An Application to Head and Neck Cancer Survival. *Patrick T. Bradshaw, Jose P. Zevallos, Kathy Wisniewski, and Andrew F. Olshan*

### BOOK REVIEW

- 2040** *The CDC Field Epidemiology Manual*. *Susanna L. Trost and Anne Spaulding*

Contents Continued From Front Cover

**ERRATA**

- 2041** Re: “Scaling Up Hepatitis C Prevention and Treatment Interventions for Achieving Elimination in the United States: A Rural and Urban Comparison”.
- 2041** Re: “Association Between Maternal Iodine Intake in Pregnancy and Childhood Neurodevelopment at Age 18 Months”.

Instructions to Authors can be found on the following website: <https://academic.oup.com/aje>

Online collections of our Primers on -Omic Technologies and Study Design articles are available on our website.

# ANNALS OF WORK EXPOSURES AND HEALTH

Volume 63 Number 9 2019

## ORIGINAL ARTICLES

- 965 **JAKOB HJORT BØNLØKKE, CAROLINE DUCHAINE, VIVI SCHLÜNSSEN, TORBEN SIGSGAARD, MARC VEILLETTE, IOANNIS BASINAS**  
Archaea and Bacteria Exposure in Danish Livestock Farmers
- 975 **XIAOMIN LIU, STEVEN J. BOWE, ALLISON MILNER, LIN LI, LAY SAN TOO, ANTHONY D. LAMONTAGNE**  
Differential Exposure to Job Stressors: A Comparative Analysis Between Migrant and Australia-Born Workers
- 990 **STACEY M. BENSON, JOSHUA R. MASKREY, MELANIE D. NEMBARD, KENNETH M. UNICE, MARK A. SHIRLEY, JULIE M. PANKO**  
Evaluation of Personal Exposure to Surgical Smoke Generated from Electrocautery Instruments: A Pilot Study
- 1004 **LINDA SCHENK, MAAIKE J. VISSER, NICOLE G.M. PALMEN**  
Industry Derived Occupational Exposure Limits: A Survey of Professionals on the Dutch System of Exposure Guidelines
- 1013 **LUCILE MIGAULT, JOSEPH D. BOWMAN, HANS KROMHOUT, JORDI FIGUEROLA, ISABELLE BALDI, GHISLAINE BOUVIER, MICHELLE C. TURNER, ELISABETH CARDIS, JAVIER VILA**  
Development of a Job-Exposure Matrix for Assessment of Occupational Exposure to High-Frequency Electromagnetic Fields (3 kHz–300 GHz)
- 1029 **NEERAJ SHANDILYA, EELCO KUIJPERS, ILSE TUINMAN, WOUTER FRANSMAN**  
Powder Intrinsic Properties as Dustiness Predictor for an Efficient Exposure Assessment?
- 1046 **ALEXANDRA L. COX, RODNEY G. HANDY, MATTHEW S. THIESE, DARRAH K. SLEETH**  
Development of an Empirical Formula for Describing Human Inhalability of Airborne Particles at Low Wind Speeds and Calm Air
- 1061 **YVONNE GIESEN, FRANZISKA NÜRNBERGER, KRISTA GUSBETH, ANN-KATHRIN MÜHLBERG, NILS LAMM, GREGORIA SCHWAB, DIETMAR BREUER**  
Piezoelectric Micro-dosing System for Spiking Quality Samples in Occupational Hygiene Laboratories
- 1070 **PETER STACEY, ANDREW SIMPSON, SUSAN HAMBLING**  
The Measurement of Wood in Construction Dust Samples: A Furnace Based Thermal Gravimetric Approach

## LETTERS TO THE EDITOR

- 1081 **DAVID BASKETTER, PATRICK FOX, MERETE SIMONSEN**  
Evidence-Informed Occupational Exposure Limits for Enzymes
- 1083 **DICK HEEDERIK**  
Response to Basketter *et al.* on 'Towards Evidence-Informed Occupational Exposure Limits for Enzymes'

Cover image:  
Photo courtesy of Aarhus  
University, Denmark - Image by  
Ioannis Basinas.



# Bulletin of Environmental Contamination and Toxicology

Volume 103, Issue 5, November 2019

1.	Focused Review <b>Environmental DNA: An Emerging Tool in Ecological Assessment</b> Pengyuan Wang, Zhenguang Yan, Suwen Yang...Pages 651-656
2.	OriginalPaper <b>Prediction of Mercury Elimination Rate Coefficients of Fish is Improved by Incorporating Fish Temperature Classification into Models</b> Shifeng Yao, Ken G. Drouillard ...Pages 657-662
3.	OriginalPaper <b>Variable Background Flow on Aquatic Toxicant Exposure Alters Foraging Patterns on Crayfish</b> Fatima Alacantara, Kristi K. Weighman...Pages 663-669
4.	OriginalPaper <b>Heavy Metal Accumulation in the Intestinal Tapeworm <i>Proteocephalus macrophallus</i> Infecting the Butterfly Peacock Bass (<i>Cichla ocellaris</i>), from Southeastern Brazil</b> Lucas A. R. Leite, Felipe F. Januário...Pages 670-675
5.	OriginalPaper <b>Effects of Atmospheric Fallout on Lead Contamination of Wheat Tissues Based on Stable Isotope Ratios</b> Chuang Ma, Fuyong Liu, Kai Jin, Bin Hu...Pages 676-682
6.	OriginalPaper <b>Ecotoxicological Effects of Fungicides Azoxystrobin and Pyraclostrobin on Freshwater Aquatic Bacterial Communities</b> Tao Lu, Zhigao Zhou, Qi Zhang, Zhenyan Zhang...Pages 683-688
7.	OriginalPaper <b>Bioaccumulation of TBT and Its Cellular Toxic Effects on the Freshwater Prawn <i>Macrobrachium rosenbergii</i></b> Peranandam Revathi, Palanisamy Iyapparaj...Pages 689-696
8.	OriginalPaper <b>Mineral Content in Honeybee Wax Combs as a Measurement of the Impact of Environmental Factors</b> Ivana Tlak Gajger, Marina Kosanović...Pages 697-703
9.	OriginalPaper <b>The Characterization of Dissolved Organic Matter in Reclaimed Water and Its Influence on Copper Toxicity</b> JinXing Zuo, Jia Pei, Shu Liu, Xiaomin Li...Pages 704-709
10.	

OriginalPaper

### Aquatic Phytotoxicity to *Lemna minor* of Three Commonly Used Drugs of Addiction in Australia

Meena K. Yadav, Anu Kumar, Michael D. Short...Pages 710-716

11.

OriginalPaper

### Effects of the Neonicotinoid Insecticide Clothianidin on Southern Leopard Frog (*Rana sphenocephala*) Tadpole Behavior

Jordan N. Holtswarth, Freya E. Rowland...Pages 717-722

12.

OriginalPaper

### Chronic Toxicological Effects of Carbamazepine on *Daphnia magna* Straus: Effects on Reproduction Traits, Body Length, and Intrinsic Growth

Yu Tian, Xiaoming Xia, Jinhua Wang...Pages 723-728

13.

OriginalPaper

### Accumulation and Depuration of Nonylphenol and Its Effect on the Expressions of Vitellogenin and Vitellogenin Receptor in Freshwater Prawn *Macrobrachium rosenbergii*

Hui Guo, Luan-luan Chen, Guang-li Li...Pages 729-733

14.

OriginalPaper

### Endocrine Disrupting Compounds (EDCs) in Surface Waters of the KimNguu River, Vietnam

To Xuan Quynh, Vu Duc Toan....Pages 734-738

15.

OriginalPaper

### Investigation of Heavy Metal Levels in Blood Samples of Three Cattle Breeds in Turkey

Yasar Aluc, Hüsamettin Ekici...Pages 739-744

16.

OriginalPaper

### Formaldehyde Adsorption–Desorption of Poplar Bark

Zoltán Pásztor, Katalin Halász...Pages 745-749

17.

OriginalPaper

### An Investigation into the Accumulation of Air Borne Trace Metals in the Lungs of Common Myna *Acridotheres tristis* and Bank Myna *Acridotheres ginginianus* Captured from Urban and Semi Urban Areas of Lahore and Pattoki, Pakistan

Nida Irshad, Safdar Sidra, Arshad Javid...Pages 750-755

18.

OriginalPaper

### In-Situ Immobilization of Cd-Contaminated Soils Using Ferronickel Slag as Potential Soil Amendment

Pingfeng Fu, Huifen Yang, Ge Zhang, Peng Fu...Pages 756-762



# Bulletin of the World Health Organization

Volume 97, Number 11, November 2019, 729-788

## IN THIS MONTH'S BULLETIN

In this month's Bulletin

<http://dx.doi.org/10.2471/BLT.19.001119>

## EDITORIALS

Monitoring adverse drug reactions in the community settings

— Ab Fatah Ab Rahman

<http://dx.doi.org/10.2471/BLT.19.245019>

## NEWS

Public health round-up

<http://dx.doi.org/10.2471/BLT.19.011119>

Gun violence in Colombia

<http://dx.doi.org/10.2471/BLT.19.021119>

Balram Bhargava: catalysing innovation

<http://dx.doi.org/10.2471/BLT.19.031119>

## RESEARCH

Variations in tuberculosis prevalence, Russian Federation: a multivariate approach

— Ivan Meshkov, Tatyana Petrenko, Olivia Keiser, Janne Estill, Olga Revyakina, Irina Felker, Mario C Raviglione, Vladimir Krasnov & Yakov Schwartz

<http://dx.doi.org/10.2471/BLT.19.229997>

International corporate tax avoidance and domestic government health expenditure

— Bernadette Ann-Marie O'Hare

<http://dx.doi.org/10.2471/BLT.18.220897>

Triangulation of measles vaccination data in the United Kingdom of Great Britain and Northern Ireland

— Michael Edelstein, Joanne White, Antoaneta Bukasa, Vanessa Saliba & Mary Ramsay

<http://dx.doi.org/10.2471/BLT.18.229138>

HIV self-testing services for female sex workers, Malawi and Zimbabwe

— Sue Napierala, Nicola Ann Desmond, Moses K Kumwenda, Mary Tumushime, Euphemia L Sibanda, Pitchaya Indravudh, Karin Hatzold, Cheryl Case Johnson, Rachel C Baggaley, Liz Corbett & Frances M Cowan

<http://dx.doi.org/10.2471/BLT.18.223560>

## POLICY & PRACTICE

Youth cardiorespiratory fitness: evidence, myths and misconceptions

— Neil Armstrong & Jo Welsman

<http://dx.doi.org/10.2471/BLT.18.227546>

## **LESSONS FROM THE FIELD**

Task sharing for family planning services, Burkina Faso

— Tieba Millogo, Séni Kouanda, Nguyen Toan Tran, Boezemwendé Kaboré, Namoudou Keita, Leopold Ouedraogo, Fatim Tall, James Kiarie, Nandita Thatte, Mario Festin & Asa Cuzin-Kihl

<http://dx.doi.org/10.2471/BLT.19.230276>

# CURRENT SCIENCE

Volume 117 Number 10

25 November 2019

---

## 1550 In this issue

### EDITORIAL

- 1551 **Remote sensing is a powerful tool, but not a panacea in itself**  
Ranganath Navalgund

### CORRESPONDENCE

- 1553 **Flaws in UGC assessment of recognition of journals**, V. Venkateswara Sarma  
 ■ 1553 **On chaining the epigenetics blocks**, Partha Pratim Ray and Poulami Majumder  
 ■ 1554 **Space weather and pandemic warnings?**, N. C. Wickramasinghe, D. T. Wickramasinghe, S. Senanayake, J. Qu, G. Tokoro, R. Temple and E. J. Steele  
 ■ 1555 ***Enset glaucum* (Roxb.) – a wild progenitor species of banana and its little known presence in North East India**, J. J. Rajappa, E. M. Sangma and B. Karmakar  
 ■ 1556 **Genetically modified organisms**, Aruna Rodrigues

### NEWS

- 1557 **Science Last Fortnight** ■ 1561 **2019 Subrahmanyan Chandrasekhar Prize of Plasma Physics**, Sameen Ahmed Khan  
 ■ 1562 **India's Scientific Social Responsibility Policy**, Abhay S. D. Rajput  
 ■ 1563 **Empowering stakeholders for monitoring biodiversity in the Indian Himalayan region**, Dibyajyoti Ghosh, Sheikh Sajjan, Paromit Chatterjee, Basudev Tripathy and Kailash Chandra  
 ■ 1563 **Risk-Benefit Assessment for alien fishes**, K. D. Joshi, Aditya Kumar, V. S. Basheer, Neeraj Sood, P. K. Pradhan, Kuldeep K. Lal, Suresh Babu and Nitin Kaushal

### RESEARCH NEWS

- 1566 **Bird nests and forensic geology**, Dimitrios Papoulis and Eleni Gianni

### OPINION

- 1568 **Cropland greening and forest browning in India – an alarm to strengthen conservation measures**, P. Ragavan and T. S. Rana

### COMMENTARY

- 1569 **Wildlife farming to conserve nature's elusive wealth in North East India**  
Nazimur Rahman Talukdar and Parthankar Choudhury
- 1571 **Scientific temper and education: virtues of science in the early 20th century India**  
Abhijeet Bardapurkar
- 1573 **Errata: Diverse behaviour of C-3 enolates derived from configurationally isomeric trimethyl 1-methylcyclohexane-1,2,3-tricarboxylates**, S. N. Balasubrahmanyam [*Curr. Sci.*, 2019, 116(12), 1975–1986] ■ **Chanchal Uberoi (1939–2019)**, S. N. Balasubrahmanyam [*Curr. Sci.*, 2019, 117(8), 1381]
- 1573 **Addendum: Applications of geospatial technology in the management of cultural heritage sites – potentials and challenges for the Indian region**, Krupa Rajangam and M. B. Rajani [*Curr. Sci.*, 2017, 113(10), 1948–1960]

### GENERAL ARTICLES

- 1574 **Scientometric analyses and visualization of scientific outcome on Nipah virus**  
Nirmal Singh, R. S. Brar, Shankar B. Chavan and Jaswant Singh



- 1585 **A cascaded pushing displacement estimation approach for hydraulic powered roof support based on multi-segmental Kalman filter**  
Lin Zhang, Shang Feng, Minzhou Luo and Aimin Ji

---

**REVIEW ARTICLE**

- 1598 **Targeting transcription factors for plant disease resistance: shifting paradigm**  
Anirudha Chattopadhyay, Jyotika Purohit, Kapil K. Tiwari and Rupesh Deshmukh

---

**SPECIAL SECTION: SHIPWRECKS**

- 1608 **Preface**  
Ravi Korisettar and Sila Tripathi
- 1612 **Living museums in the sea: the past, present and future of underwater cultural heritage preservation**  
Kirsten Hawley, Charles D. Beeker, Samuel Haskell and Matthew Maus
- 1617 **Dendroarchaeology of shipwrecks and ships in the eastern Mediterranean**  
Nili Liphshitz



- 1623 **Vulnerability of shipwreck sites in Indonesian waters**  
Nia Naelul Hasanah Ridwan
- 1629 **Metal detection: an essential aid in maritime archaeology**  
M. McCarthy
- 1635 **Recent underwater investigations at Takashima: searching for the lost fleet of the Mongol Empire**  
Ikeda Yoshifumi, Randy Sasaki and Jun Kimura



- 1640 **The *Bakau* or Maranei shipwreck: a Chinese smuggling vessel and its context**  
John N. Miksic
- 1647 **Long distance Arab shipping in the 9th century Indian Ocean: recent shipwreck evidence from Southeast Asia**  
John Guy



- 1654 **Sister ships: three early 12th century CE shipwrecks in Southeast Asia**  
Michael Flecker
- 1664 **Recently discovered shipwrecks in Sri Lankan waters**  
Rasika Muthucumarana
- 1673 **Shipwrecks in the off shore waters of the Indian peninsula – a review**  
Sila Tripathi and Ravi Korisettar



- 1679 **Searching for *Haarlem* (1647 CE): a ship that made history**  
Bruno E. J. S. Werz
- 1683 **Six pre-colonial Portuguese shipwrecks identified on the South African coast: the legacy of Bartolomeu Dias**  
Malcolm Turner

- 1687 **Non-European shipwrecks of the western Indian Ocean**  
Caesar Bitá



- 1690 **Shipwrecks off the Bushehr port in the Persian Gulf**  
Hossein Tofighian

---

**RESEARCH ARTICLES**

- 1693 **Assessment of airborne microbial community in Indian cities during the Middle East dust storm**  
Vikas C. Ghattargi, Mani Garg, Sudeeksha Raina, Jovita D. Silva, Shrikant P. Pawar, Praveen Rahi and Yogesh S. Shouche

- 1701 **Can Pigouvian taxation internalize the social cost of platinum-group element emissions?**  
Danuse Nerudova, Marian Dobranschi and Vojtech Adam
- 

**RESEARCH COMMUNICATIONS**

- 1710 **Mapping shallow subsurface to identify sinkhole formation in urban areas using ground penetration radar: a case study from Hyderabad, India**  
Anand K. Pandey, Jonti Gogoi and Prabha Pandey
- 1716 **Effects of inclusion compounds of 1-methylcyclopropene/ $\alpha$ -cyclodextrin or 1-methyl-3-(2-methylcyclopropyl)-1-cyclopropene/Cu- $\beta$ -cyclodextrin on the preservation of sweet cherry (*Prunus avium* L.)**  
Zhu Jinwei, Feng Jiangtao and Yan Wei
- 1722 **High-protein rice in high-yielding background, cv. Naveen**  
Krishnendu Chattopadhyay, Srigopal Sharma, Torit Baran Bagchi, Bimal Mohanty, Sushree Sibanee Sardar, Sutapa Sarkar and Onkar Nath Singh
- 1727 **Utilization of mahua resources: traditional knowledge as a tool for sustainable management**  
H. T. Hegde, R. P. Gunaga, N. S. Thakur, J. B. Bhusara and R. L. Soundarva
- 

**BOOK REVIEWS**

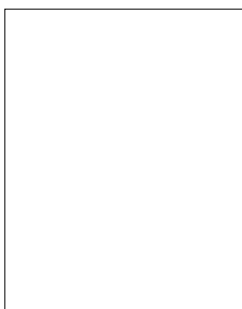
- 1731 **Prehistoric River Saraswati, Western India: Geological Appraisal and Social Aspects.** K. S. Valdiya; *reviewed by* Ravi Korisettar
- 1734 **Bonsai Culture.** Major Gen C. S. Bewli; *reviewed by* R. N. Kharwar and R. Raghuvanshi
- 1736 **Ethics in Science Education, Research and Governance.** K. Muralidhar, Amit Ghosh and A. K. Singhvi (eds); *reviewed by* Deepika Bhaskar
- 

**PERSONAL NEWS**

- 1738 **Coluthur Gopalan (1918–2019)**  
Mahtab S. Bamji, Kamala Krishnaswamy and Soumya Swaminathan
- 1740 **B. V. Sreekantan (1925–2019)**  
Palahalli R. Vishwanath
- 

**HISTORICAL NOTES**

- 1744 **Observational records of stars in Indian astronomical texts – IV (Cancer and Leo)**  
B. S. Shylaja and R. Venketeswara Pai
- 



- ◀ COVER. Large clay jar/storage jar on Godawaya shipwreck site (Rasika Muthucumarana). See page 1664.

The editor thanks Dr Ravi Korisettar (Department of History and Archaeology, Karnatak University, Dharwad) and Dr Sila Tripathi (National Institute of Oceanography, Dona Paula, Goa) for agreeing to be Guest Editors for special section.

Indexed in CURRENT CONTENTS/GEODATA/CHEMICAL ABSTRACTS/IndMED/SCOPUS/  
WEB OF SCIENCE

## Contents

### Articles

- Thiol-disulfide homeostasis and ischemia-modified albumin levels as indicators of oxidative stress in welders' lung disease 1227  
*M Karataş, TN Özış, M Büyükşekerçi, M Gündüzöz, OG Özakıncı, G Gök, S Neşelioğlu and Ö Erel*
- Evaluation of oxidative stress and antioxidant parameters in children with carbon monoxide poisoning 1235  
*O Teksam, S Sabuncuoğlu, G Girgin and H Özgüneş*
- Evaluation of screening for drug use using postmortem prolactin levels in serum and cerebrospinal fluid 1244  
*N Tani, T Ikeda, Y Aoki, A Shida, S Oritani and T Ishikawa*
- Hepatorenal protective effects of protocatechuic acid in rats administered with anticancer drug methotrexate 1254  
*SE Owumi, IJ Ajijola and OM Agbeti*
- Mitochondrial and lysosomal protective agents ameliorate cytotoxicity and oxidative stress induced by cyclophosphamide and methotrexate in human blood lymphocytes 1266  
*A Salimi, R Pirhadi, Z Jamali, M Ramazani, BS Yousefsani and J Pourahmad*
- Effects of infliximab against carbon tetrachloride-induced intestinal injury via lipid peroxidation and apoptosis 1275  
*A Pergel, L Tümkeya, MK Çolakoğlu, G Demiral, S Kalcan, A Özdemir, T Mercantepe and A Yılmaz*
- Effects of quercetin and rosuvastatin each alone or in combination on cyclophosphamide-induced premature ovarian failure in female albino mice 1283  
*MA Elkady, S Shalaby, F Fathi and S El-Mandouh*
- Tannic acid exhibits anti-inflammatory effects on formalin-induced paw edema model of inflammation in rats 1296  
*A Soyocak, H Kurt, D Turgut Cosan, F Saydam, IU Calis, UK Kolac, Z Ozdemir Koroglu, I Degirmenci, F Sahin Mutlu and HV Gunes*
- Testicular toxicity of gentamicin in adult rats: Ameliorative effect of lycopene 1302  
*HAA Aly*
- In vitro biocompatibility study approaches to evaluate the safety profile of electrolyzed water for skin and eye 1314  
*H Sipahi, R Reis, O Dinc, T Kavaz, A Dimoglo and A Aydın*

# Indian Journal of Experimental Biology

<http://www.niscair.res.in>; <http://nopr.niscair.res.in>

**VOLUME 57**

**NUMBER 11**

**November 2019**

CODEN: IJEB (A6) 57 (11) 781-886 (2019)

ISSN: 0019-5189 (Print); 0975-1009 (Online)

## CONTENTS

### Special Issue On

#### “Biotechnological Research and Innovation for Sustainable Development (BioSID 2019)”

#### Papers

- Immunological alterations in tuberculosis associated immune reconstitution inflammatory syndrome in HIV infected patients 786  
Chaitenya Verma\*, Surendra K Sharma\*, Krishnamurthi Natarajan, Vishnu Sreenivas, Vishwanath Upadhyay\*, Sanjeev Sinha, Sanjay Ranjan, Narinder K. Mehra, Gurvinder Kaur & Smriti Hari
- Induction of systemic acquired resistance in *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg. by an endophytic bacterium antagonistic to *Phytophthora meadii* McRae 796  
Amith Abraham, Shaji Philip, Sunilkumar P Narayanan, Kuruvilla C Jacob, Raveendran Sindhu, Ashok Pandey, Byoung-In Sang & Kochupurackal Jayachandran\*
- A novel microwave mediated disinfection method for hospital linen 806  
Krishna Gautam, Marhaba, Ashutosh Kumar Pandey, Vivek Kumar Morya & Monish Bhandari\*
- Evaluation of pullulan production by a newly isolated *Micrococcus luteus* 813  
Bishwambhar Mishra\* & Sunita Varjani
- Bioconversion of D-xylose to D-xylonic acid by *Pseudoduganella danionis* 821  
Lekshmi Sundar MS, Susmitha A, Soumya MP, Keerthi Sasikumar & Madhavan Nampoothiri K\*
- Probiotic potential of lactic acid bacteria from fresh vegetables: Application in food preservation 825  
Manisha Junnarkar, Sarika Pawar, Swapnil Gaikwad, Abul Mandal, Jana Jass & Neelu Nawani\*
- Production of phytase from a strain of *Lactobacillus paracasei* and its probiotic profile 839  
Deepali Bhagat, Parvez Singh Slathia, Neelu Raina & Preeti Sharma\*
- Alkaline pretreatment optimization for *Pinus roxburghii* needle biomass employing response surface methodology for bioethanol production by separate hydrolysis and cofermentation 852  
Parvez Singh Slathia\*, Neelu Raina, Deepali Bhagat, Vinaik Raina, Nisha Sharma & Preeti Sharma

Cont.

Fingerprinting hydrocarbons in a crude oil contaminated agricultural soil and its bioremediation employing bacterial consortium 863

Sunita Varjani\* & Vivek N Upasani

Performance evaluation and kinetic study of fluorene biodegradation in continuous bioreactor using polyurethane foam as packing media 870

Ravi Kumar Sonwani, Balendu Shekhar Giri, Shivesh Sabbarwal, Ram Sharan Singh & Birendra Nath Rai\*

Indoor potted plant based biofilter: performance evaluation and kinetics study 879

BS Giri\*, Asmita Sarowgi, Yeshaswi Kaushik, Anugunj Pal, Abhishek Jaiswal, Sangeeta Kumari, Harinder Singh, Ravi Sonwani, V Thivaharan & RS Singh\*

\*Author(s) for correspondence





**NATIONAL LIVER DISEASE BIOBANK**  
(only liver disease biobank in India established by government of India to facilitate clinical and basic research )

**Please contact us for :**

- \* *High quality biosamples*
- \* *Project assistance*
- \* *Biobank consultancy*
- \* *Pathological services*
- \* *Analytical work (NGS, MS, FACS)*
- \* *For further details please visit our website [www.nldb.in](http://www.nldb.in)*










# **Journal of Occupational and Environmental Medicine**

**November 2019 - Volume 61 - Issue 11**

## **Defining a Culture of Health in the Workplace**

Safeer, Richard; Allen, Judd

**Journal of Occupational and Environmental Medicine.** 61(11):863-867, November 2019.

## **Literature Review of Policy Implications From Findings of the Center for Work, Health, and Well-being**

Gómez, María Andrée López; Sparer-Fine, Emily; Sorensen, Glorian; More

**Journal of Occupational and Environmental Medicine.** 61(11):868-876, November 2019.

## **Direct and Indirect Cost of Obesity Among the Privately Insured in the United States: A Focus on the Impact by Type of Industry**

Ramasamy, Abhilasha; Laliberté, François; Aktavoukian, Shoghag A.; More

**Journal of Occupational and Environmental Medicine.** 61(11):877-886, November 2019.

## Current Issue Highlights

---

### ORIGINAL ARTICLES

#### **Defining a Culture of Health in the Workplace**

Safeer, Richard; Allen, Judd

**Journal of Occupational and Environmental Medicine.** 61(11):863-867, November 2019.

#### **Literature Review of Policy Implications From Findings of the Center for Work, Health, and Well-being**

Gómez, María Andrée López; Sparer-Fine, Emily; Sorensen, Glorian; More

**Journal of Occupational and Environmental Medicine.** 61(11):868-876, November 2019.

### BOOK REVIEW

#### **Christoph Scherrer, Katja Radon (Eds.): Occupational Safety and Health Challenges in Southern Agriculture**

Laestadius, Jasminka Goldoni

**Journal of Occupational and Environmental Medicine.** 61(11):e459, November 2019.

## PEOPLE AND EVENTS

### *News Highlights*

**Journal of Occupational and Environmental Medicine.** 61(11):e460, November 2019.

### *Calendar of Meetings*

**Journal of Occupational and Environmental Medicine.** 61(11):e460, November 2019.

# Nature

Volume 575 Issue 7781, 7 November 2019

## This Week

### Editorial

- Editorial | 06 November 2019  
[Nature at 150: evidence in pursuit of truth](#)

A century and a half has seen momentous changes in science. But evidence and transparency are more important than ever before.

## Research

### News & Views

- News & Views | 09 October 2019  
[The structure of DNA](#)

In the early 1950s, the identity of genetic material was still a matter of debate. The discovery of the helical structure of double-stranded DNA settled the matter — and changed biology forever.

- Georgina Ferry
- News & Views | 04 November 2019

### [Detection of a strange particle](#)

In 1947, scientists found a previously unseen particle, which is now called a neutral kaon. This work led to the discovery of elementary particles known as quarks, and ultimately to the establishment of the standard model of particle physics.

- Taku Yamanaka
- News & Views | 22 October 2019

### [A breakthrough method that became vital to neuroscience](#)

Originally developed to record currents of ions flowing through channel proteins in the membranes of cells, the patch-clamp technique has become a true stalwart of the neuroscience toolbox.

- Alexander D. Reyes
- News & Views | 15 October 2019

#### **Birth of a class of nanomaterial**

Nearly 30 years ago, a simple chemical principle was reported that enabled the synthesis of a plethora of porous materials — some of which might enable applications ranging from biomedicine to petrochemical processing.

- Ryong Ryoo
- News & Views | 29 October 2019

#### **How *Australopithecus* provided insight into human evolution**

In 1925, a *Nature* paper reported an African fossil of a previously unknown genus called *Australopithecus*. This finding revolutionized ideas about early human evolution after human ancestors and apes split on the evolutionary tree.

- Dean Falk
- News & Views | 08 October 2019

#### **First exoplanet found around a Sun-like star**

In 1995, astronomers detected a blisteringly hot Jupiter-mass planet orbiting closer to its host star than Mercury is to the Sun. This discovery recast our thinking of how planets form and led to a new era of exoplanetary exploration.

- Eliza Kempton
- News & Views | 14 October 2019

#### **Cell identity reprogrammed**

The discovery that cell differentiation can be reversed challenged theories of how cell identity is determined, laying the foundations for modern methods of reprogramming cell identity and promising new regenerative therapies.

- Samantha A. Morris
- News & Views | 23 October 2019

#### **The discovery of the Antarctic ozone hole**

The unexpected discovery of a hole in the atmospheric ozone layer over the Antarctic revolutionized science — and helped to establish one of the most successful global environmental policies of the twentieth century.

- Susan Solomon

- News & Views | 04 November 2019

**[The advent and rise of monoclonal antibodies](#)**

A 1975 *Nature* paper reported how cell lines could be made that produce an antibody of known specificity. This discovery led to major biological insights and clinical successes in treating autoimmunity and cancer.

- Klaus Rajewsky
- News & Views | 28 October 2019

**[The nano-revolution spawned by carbon](#)**

In 1985, scientists reported the discovery of the cage-like carbon molecule C<sub>60</sub>. The finding paved the way for materials such as graphene and carbon nanotubes, and was a landmark in the emergence of nanotechnology.

- Pulickel M. Ajayan
- News & Views | 04 November 2019

**[From the archive](#)**

Aphorisms by Goethe — the opening article of the first issue of *Nature*, 4 November 1869.

## Articles

- Article | 06 November 2019

**[A small proton charge radius from an electron–proton scattering experiment](#)**

A magnetic-spectrometer-free method for electron–proton scattering data reveals a proton charge radius 2.7 standard deviations smaller than the currently accepted value from electron–proton scattering, yet consistent with other recent experiments.

- W. Xiong, A. Gasparian & Z. W. Zhao
- Article | 07 October 2019

**[Carrier-resolved photo-Hall effect](#)**

A carrier-resolved photo-Hall technique is developed to extract properties of both majority and minority carriers simultaneously and determine the critical parameters of semiconductor materials under light illumination.

- Oki Gunawan, Seong Ryul Pae & Byungha Shin

- Article | 30 October 2019

**[High-temperature superconductivity in monolayer  \$\text{Bi}\_2\text{Sr}\_2\text{CaCu}\_2\text{O}\_{8+\delta}\$](#)**

Transport and scanning tunnelling microscopy studies of freestanding monolayers of an unconventional layered copper oxide establish that the superconducting properties of copper oxides are not changed in the 2D limit.

- Yijun Yu, Liguang Ma & Yuanbo Zhang

- Article | 06 November 2019

**[Nanomagnetic encoding of shape-morphing micromachines](#)**

A micromachine less than 100 micrometres across, made of arrays of nanomagnets on hinged panels, is encoded with multiple shape transformations and actuated with a magnetic field.

- Jizhai Cui, Tian-Yun Huang & Laura J. Heyderman

- Article | 30 October 2019

**[Dry double-sided tape for adhesion of wet tissues and devices](#)**

A new strong, biocompatible and biodegradable double-sided tape can adhere to wet tissues and devices through a mechanism involving rapid water removal from the surface, swift hydrogen and electrostatic interactions, and covalent bonding.

- Hyunwoo Yuk, Claudia E. Varela & Xuanhe Zhao

- Article | 28 October 2019

**[Seeing mesoatomic distortions in soft-matter crystals of a double-gyroid block copolymer](#)**

Slice-and-view scanning electron microscopy tomography is used to characterize a double-gyroid block copolymer, finding mesoatomic distortions that break the symmetry of these soft-matter crystals across multiple scales.

- Xueyan Feng, Christopher J. Burke & Edwin L. Thomas

- Article | 06 November 2019

#### **California's methane super-emitters**

Emission of methane from 'point sources'—small surface features or infrastructure components—is monitored with an airborne spectrometer, identifying possible targets for mitigation efforts.

- Riley M. Duren, Andrew K. Thorpe & Charles E. Miller
- Article | 28 October 2019

#### **Human origins in a southern African palaeo-wetland and first migrations**

Analyses of mitochondrial genomes from populations in southern Africa provide evidence of a southern African origin of anatomically modern humans and a sustained occupation of the homeland before the first migrations of people appear to be driven by regional climate shifts.

- Eva K. F. Chan, Axel Timmermann & Vanessa M. Hayes
- Article | 30 October 2019

#### **Quantifying the dynamics of failure across science, startups and security**

A model demonstrates that people who eventually succeed and those who do not may initially appear similar, but are characterized by fundamentally distinct failure dynamics in terms of the efficiency and quality of each subsequent attempt to succeed.

- Yian Yin, Yang Wang & Dashun Wang
- Article | 30 October 2019

#### **Hierarchical organization of cortical and thalamic connectivity**

Using mouse lines in which subsets of neurons are genetically labelled, the authors provide generalized anatomical rules for connections within and between the cortex and thalamus.

- Julie A. Harris, Stefan Mihalas & Hongkui Zeng
- Article | 30 October 2019

#### **Allele-selective lowering of mutant HTT protein by HTT-LC3 linker compounds**

Compounds that interact with mutant huntingtin and an autophagosomal protein are able to reduce cellular levels of mutant huntingtin by targeting it

for autophagic degradation, demonstrating an approach that may have potential for treating proteopathies.

- Zhaoyang Li, Cen Wang & Boxun Lu
- Article | 23 October 2019 | Open Access

#### **Pan-cancer whole-genome analyses of metastatic solid tumours**

The mutational landscape of metastatic cancer genomes is analysed in a large-scale, pan-cancer study of metastatic solid tumours that includes whole-genome sequencing of 2,520 tumour–normal tissue pairs.

- Peter Priestley, Jonathan Baber & Edwin Cuppen
- Article | 30 October 2019

#### **The clinical KRAS(G12C) inhibitor AMG 510 drives anti-tumour immunity**

Treatment of *KRAS*<sup>G12C</sup>-mutant cancer cells with the KRAS(G12C) inhibitor AMG 510 leads to durable response in mice, and anti-tumour activity in patients suggests that AMG 510 could be effective in patients for whom treatments are currently lacking.

- Jude Canon, Karen Rex & J. Russell Lipford
- Article | 30 October 2019

#### **Human gut bacteria contain acquired interbacterial defence systems**

An interbacterial defence strategy, involving clusters of immunity genes against toxins released by the type VI secretion system of the same or different species, is widespread among *Bacteroides* species, and transfer of these gene clusters confers resistance to toxins in vitro and in the mammalian gut.

- Benjamin D. Ross, Adrian J. Verster & Joseph D. Mougous
- Article | 16 October 2019

#### **Altered chromosomal topology drives oncogenic programs in SDH-deficient GISTs**

Gastrointestinal stromal tumours can be initiated by gain-of-function mutations of the *KIT* or *PDGFRA* oncogenes but also by loss of the metabolic complex succinate dehydrogenase (SDH), which leads to DNA hypermethylation; this study shows that in SDH-deficient tumours, displacement of CTCF insulators by DNA methylation activates oncogene expression, illustrating how epigenetic alterations can drive oncogenic signalling in the absence of kinase mutations.



- William A. Flavahan, Yotam Drier & Bradley E. Bernstein
- Article | 30 October 2019

#### [Structure of the Fanconi anaemia monoubiquitin ligase complex](#)

The structure of the multiprotein Fanconi anaemia core complex, determined using cryo-electron microscopy and mass spectrometry, shows that the complex adopts an extended asymmetric structure and highlights the structural and functional asymmetry of the RING finger domains.

- Shabih Shakeel, Eeson Rajendra & Lori A. Passmore

## Volume 575 Issue 7782, 14 November 2019

### This Week

#### Editorial

- Editorial | 08 November 2019

#### [Cold-war lessons for European science](#)

The fall of the Berlin Wall 30 years ago united Europe's scientists. But continuing fractures in East–West collaboration must be healed.

- Editorial | 13 November 2019

#### [The mental health of PhD researchers demands urgent attention](#)

Anxiety and depression in graduate students is worsening. The health of the next generation of researchers needs systemic change to research cultures.

- Editorial | 12 November 2019

#### [Global lessons from South Africa's rooibos compensation agreement](#)

Indigenous communities must be compensated for their knowledge and treated as equals in research.

### Research

#### News & Views

- News & Views | 13 November 2019

### **How to print multi-material devices in one go**

A multi-nozzle system has been devised that allows the 3D printing of objects using several viscous materials, thereby allowing control over the material properties of objects at the submillimetre scale.

- Johannes T. B. Overvelde
- News & Views | 11 November 2019

### **A genetically tailored education for birds**

The ability of birds to learn a song depends not on their genes alone, but also on whether their genetic make-up is well matched to that of their singing teacher. This discovery sheds light on how gene–environment interactions affect learning.

- Ofer Tchernichovski & Dalton Conley
- News & Views | 30 October 2019

### **One ring to rule them all**

Distant DNA regions are juxtaposed and joined to form diverse immune-system genes encoding antibodies and T-cell receptors. It seems that both types of gene form by relying on DNA extrusion through a protein ring called cohesin.

- Ferenc Livak & André Nussenzweig
- News & Views | 13 November 2019

### **Link between antimatter and dark matter probed**

Ultrasensitive experiments on trapped antiprotons provide a window onto possible differences between matter and antimatter. Now they could also shed light on the identity of dark matter — the ‘missing’ mass in the Universe.

- Gianpaolo Carosi
- News & Views | 08 November 2019

### **Small molecule combats cancer-causing KRAS protein at last**

A molecule has now been characterized that acts to inhibit a cancer-causing form of KRAS protein and stimulate the immune system. The inhibitor is one of the first of its kind to show anticancer activity in the clinic.

- Roy S. Herbst & Joseph Schlessinger
- News & Views | 30 October 2019

**[Metabolic vulnerability in tumours illuminated](#)**

A tracer molecule has been used to analyse tumours *in vivo* in mice and to group cancers according to their metabolic characteristics. Such information could have implications for determining how different malignancies are treated.

- Aparna D. Rao & Ralph J. DeBerardinis

## Articles

- Article | 13 November 2019

**[Direct limits on the interaction of antiprotons with axion-like dark matter](#)**

Spin-flip resonance data are used to place direct constraints on the interaction of ultralight axion-like particles with antiprotons, improving the sensitivity to the corresponding coupling coefficient by five orders of magnitude.

- C. Smorra, Y. V. Stadnik & S. Ulmer

- Article | 07 October 2019

**[Axionic charge-density wave in the Weyl semimetal \(TaSe<sub>4</sub>\)<sub>2</sub>I](#)**

In the charge-density-wave Weyl semimetal (TaSe<sub>4</sub>)<sub>2</sub>I, an axion is observed and identified as a sliding mode in the charge-density-wave phase characterized by anomalous magnetoelectric transport effects.

- J. Gooth, B. Bradlyn & C. Felser

- Article | 13 November 2019

**[A volumetric display for visual, tactile and audio presentation using acoustic trapping](#)**

A volumetric display that can simultaneously deliver visual, tactile and auditory content is demonstrated.

- Ryuji Hirayama, Diego Martinez Plasencia & Sriram Subramanian

- Article | 04 November 2019

### [Controlled flight of a microrobot powered by soft artificial muscles](#)

Heavier-than-air insect-scale aerial robots powered by soft artificial muscles can hover and also recover from in-flight collisions, illustrating the potential for developing next-generation agile soft robots.

- Yufeng Chen, Huichan Zhao & Robert J. Wood
- Article | 13 November 2019

### [Voxelated soft matter via multimaterial multinozzle 3D printing](#)

Voxelated soft matter is designed and fabricated using multimaterial multinozzle three-dimensional printing, which switches between different viscoelastic inks along the same print filament to print multiple materials simultaneously.

- Mark A. Skylar-Scott, Jochen Mueller & Jennifer A. Lewis
- Article | 30 September 2019

### [Metal-free directed \$sp^2\$ -C–H borylation](#)

A method for the site-selective C–H borylation of arenes and heteroarenes is described, in which  $BBr_3$  acts as both a reagent and a catalyst.

- Jiahang Lv, Xiangyang Chen & Zhuangzhi Shi
- Article | 13 November 2019

### [Large hydropower and water-storage potential in future glacier-free basins](#)

Glacierized regions that are projected to become ice-free in this century could provide substantial water storage and hydroelectric power, according to this worldwide theoretical assessment.

- Daniel Farinotti, Vanessa Round & Harry Zekollari
- Article | 13 November 2019

### [Heterogeneity in banker culture and its influence on dishonesty](#)

In contrast to a previous study in which only bankers showed increased dishonesty when reminded of their profession, this study found that such reminders induced some dishonesty in bankers, although the effect was not significant, and that this effect was not unique to bankers.

- Zoe Rahwan, Erez Yoeli & Barbara Fasolo

- Article | 30 October 2019

**[Grandmaster level in StarCraft II using multi-agent reinforcement learning](#)**

AlphaStar uses a multi-agent reinforcement learning algorithm and has reached Grandmaster level, ranking among the top 0.2% of human players for the real-time strategy game StarCraft II.

- Oriol Vinyals, Igor Babuschkin & David Silver

- Article | 06 November 2019

**[Dynamic lineage priming is driven via direct enhancer regulation by ERK](#)**

ERK reversibly regulates embryonic stem cell transcription via selective redistribution of co-factors and RNA polymerase from pluripotency to early differentiation enhancers, while leaving transcription factors bound to their enhancers, thus preserving plasticity.

- William B. Hamilton, Yaron Mosesson & Joshua M. Brickman

- Article | 06 November 2019

**[Lipid signalling drives proteolytic rewiring of mitochondria by YME1L](#)**

Under conditions such as hypoxia or starvation, an mTORC1-lipid signalling pathway initiates mitochondrial proteolysis by YME1L.

- Thomas MacVicar, Yohsuke Ohba & Thomas Langer

- Article | 23 September 2019

**[UNC93B1 recruits syntenin-1 to dampen TLR7 signalling and prevent autoimmunity](#)**

The interaction of UNC93B1 with syntenin-1 facilitates the sorting of TLR7–UNC93B1 complexes into intraluminal vesicles of multivesicular bodies, and mutations in UNC93B1 that disrupt such interactions lead to enhanced TLR7 signalling and autoimmunity.

- Olivia Majer, Bo Liu & Gregory M. Barton

- Article | 23 September 2019

**[Release from UNC93B1 reinforces the compartmentalized activation of select TLRs](#)**

The Toll-like receptor TLR9 is activated only after regulated release from its trafficking chaperone UNC93B1, which occurs within endosomes and is required for ligand binding and signal transduction.

- Olivia Majer, Bo Liu & Gregory M. Barton

- Article | 16 October 2019

**[The ADP/ATP translocase drives mitophagy independent of nucleotide exchange](#)**

A CRISPR–Cas9 genetic screen shows that the adenine nucleotide translocator is required for mitophagy and that this role is independent of its nucleotide translocase activity.

- Atsushi Hoshino, Wei-jia Wang & Zoltan Arany

- Article | 30 October 2019

**[In vivo imaging of mitochondrial membrane potential in non-small-cell lung cancer](#)**

A positron emission tomography imaging tracer is developed to image mitochondrial function in vivo, and application of this tracer to a mouse model of lung cancer identifies distinct functional mitochondrial heterogeneity between tumour cells.

- Milica Momcilovic, Anthony Jones & David B. Shackelford

- Article | 30 October 2019

**[Fundamental roles of chromatin loop extrusion in antibody class switching](#)**

Chromatin loop extrusion has fundamental mechanistic roles in immunoglobulin heavy chain class switch recombination.

- Xuefei Zhang, Yu Zhang & Frederick W. Alt

- Article | 16 October 2019

**[HP1 reshapes nucleosome core to promote phase separation of heterochromatin](#)**

The *S. pombe* HP1 protein Swi6 couples chromatin compaction to phase separation by dynamically exposing buried histone residues within nucleosomes.

- S. Sanulli, M. J. Trnka & G. J. Narlikar

- Article | 10 October 2019

**[Structure of the mitochondrial import gate reveals distinct preprotein paths](#)**

The high-resolution cryo-electron microscopy structure of the yeast translocase of the outer mitochondrial membrane reveals key features of mitochondrial protein import that are conserved in all eukaryotes.

- Yuhei Araiso, Akihisa Tsutsumi & Toshiya Endo

## Volume 575 Issue 7783, 21 November 2019

### This Week

#### Editorial

- Editorial | 20 November 2019  
**[Researchers must unite against US environment agency's attack on scientific evidence](#)**  
The Environmental Protection Agency must desist from a course that could harm both human and planetary health.
- Editorial | 20 November 2019  
**[Human germline editing needs one message](#)**  
Science academies and the World Health Organization must act in unison.
- Editorial | 19 November 2019  
**[How California can use its research muscle to keep the lights on](#)**  
The state's universities can help to design and build a clean and resilient power grid.

#### Research Highlights

- Research Highlight | 13 November 2019  
**[The meal plan that hinders the gut's recovery from antibiotics](#)**  
Experiments in mice show that a regimen of low-fibre foods keeps the gut microbiome from bouncing back.
- Research Highlight | 11 November 2019  
**[Viscous water holds the secret to an ice skater's smooth glide](#)**  
Ice owes its trademark slipperiness to a layer of melt water with surprising properties.
- Research Highlight | 15 November 2019  
**['Bubble wrap' cushions a cell's nucleus on the move](#)**  
A network of protein fibres helps to prevent the all-important organelle from being bent out of shape.

- Research Highlight | 07 November 2019

**[The most extreme rains of today are set to become more commonplace](#)**

For every 1 °C of global warming, the frequency of the heaviest rainfalls will nearly double.

- Research Highlight | 11 November 2019

**[A lethal avalanche's fury is captured in unprecedented detail](#)**

Waterlogged ground contributed to the gargantuan debris flow in the Swiss Alps.

- Research Highlight | 14 November 2019

**[A spy plane's declassified snapshots reveal an ancient city's size](#)**

The city of Ur, located in modern-day Iraq, might at some points have covered more than eight times as much ground as previously estimated.

- Research Highlight | 11 November 2019

**[Move aside, plastic: 3D printing conquers glass](#)**

Technique produces an array of transparent objects, including a glass leaf with delicate veins.

## **Articles**

- Article | 20 November 2019

**[Teraelectronvolt emission from the  \$\gamma\$ -ray burst GRB 190114C](#)**

Observations of teraelectronvolt-energy  $\gamma$ -rays starting about one minute after the  $\gamma$ -ray burst GRB 190114C reveal a distinct component of the afterglow emission with power comparable to the synchrotron emission.

- V. A. Acciari, S. Ansoldi & L. Nava

- Article | 20 November 2019

**[Observation of inverse Compton emission from a long  \$\gamma\$ -ray burst](#)**

A multi-frequency observing campaign of the  $\gamma$ -ray burst GRB 190114C reveals a broadband double-peaked spectral energy distribution, and the teraelectronvolt emission could be attributed to inverse Compton scattering.

- V. A. Acciari, S. Ansoldi & D. R. Young

- Article | 20 November 2019

**[A very-high-energy component deep in the  \$\gamma\$ -ray burst afterglow](#)**

Very-high-energy  $\gamma$ -rays observed ten hours after the prompt emission of the  $\gamma$ -ray burst 180720B can be attributed to either an inverse Compton or an extreme synchrotron process.



- H. Abdalla, R. Adam & O. J. Roberts

- Article | 09 October 2019

**[Large electrocaloric effects in oxide multilayer capacitors over a wide temperature range](#)**

High-quality multilayer capacitors of a perovskite oxide show that large electric-field-driven caloric effects could improve solid-state refrigeration technology and challenge today's standard (based on magnetocaloric effects in gadolinium).

- B. Nair, T. Usui & N. D. Mathur

- Article | 20 November 2019

**[Skin-integrated wireless haptic interfaces for virtual and augmented reality](#)**

Interfaces for epidermal virtual reality technology are demonstrated that can communicate by programmable patterns of localized mechanical vibrations.

- Xinge Yu, Zhaoqian Xie & John A. Rogers

- Article | 14 October 2019

**[Real-space charge-density imaging with sub-ångström resolution by four-dimensional electron microscopy](#)**

A real-space imaging technique that combines scanning transmission electron microscopy with an angle-resolved pixellated fast-electron detector is used to image the charge distribution in SrTiO<sub>3</sub>, BiFeO<sub>3</sub> and the junction between them.

- Wenpei Gao, Christopher Addiego & Xiaoqing Pan

- Article | 20 November 2019

**[Geochemical evidence for high volatile fluxes from the mantle at the end of the Archaean](#)**

Depletion of Archaean atmospheric xenon in <sup>129</sup>Xe relative to the modern atmosphere might indicate that a short burst of mantle activity took place around 2.6 to 2.2 billion years ago.

- Bernard Marty, David V. Bekaert & Claude Jaupart

- Article | 06 November 2019

### [A new Miocene ape and locomotion in the ancestor of great apes and humans](#)

*Danuvius guggenmosi* moved using extended limb clambering, thus combining adaptations of bipeds and suspensory apes and providing evidence of the evolution of bipedalism and suspension climbing in the common ancestor of great apes and humans.

- Madelaine Böhme, Nikolai Spassov & David R. Begun
- Article | 13 November 2019

### [High-resolution lineage tracking reveals travelling wave of adaptation in laboratory yeast](#)

A renewable barcoding system reveals the evolutionary dynamics of laboratory budding yeast, showing that fitness changes over time in a travelling wave of adaptation that can fluctuate owing to leapfrogging events.

- Alex N. Nguyen Ba, Ivana Cvijović & Michael M. Desai
- Article | 13 November 2019

### [Marine Proteobacteria metabolize glycolate via the \$\beta\$ -hydroxyaspartate cycle](#)

Marine Proteobacteria use the  $\beta$ -hydroxyaspartate cycle to assimilate glycolate, which is secreted by algae on a petagram scale, providing evidence of a previously undescribed trophic interaction between autotrophic phytoplankton and heterotrophic bacterioplankton.

- Lennart Schada von Borzyskowski, Francesca Severi & Tobias J. Erb
- Article | 13 November 2019

### [Bacteriophage targeting of gut bacterium attenuates alcoholic liver disease](#)

In patients with alcoholic hepatitis, cytolysin-positive *Enterococcus faecalis* strains are correlated with liver disease severity and increased mortality, and in mouse models these strains can be specifically targeted by bacteriophages.

- Yi Duan, Cristina Llorente & Bernd Schnabl
- Article | 09 October 2019

### [Resolving the fibrotic niche of human liver cirrhosis at single-cell level](#)

Single-cell RNA sequencing is used to characterize and compare the functional diversity of cells from liver biopsies of human scarred and normal

liver, and identifies markers for scar-associated macrophages and endothelial cells.

- P. Ramachandran, R. Dobie & N. C. Henderson
- Article | 30 October 2019

**[Immunity to commensal papillomaviruses protects against skin cancer](#)**

A mouse model of papillomavirus infection reveals that skin colonization with commensal papillomaviruses protects the immunocompetent host against chemical- and UV-induced skin cancer through CD8<sup>+</sup> T cell immunity.

- John D. Strickley, Jonathan L. Messerschmidt & Shadmehr Demehri
- Article | 13 November 2019

**[CDK phosphorylation of TRF2 controls t-loop dynamics during the cell cycle](#)**

A phospho-switch is identified in the shelterin subunit TRF2 that regulates transient recruitment of the RTEL1 helicase to, and release from, telomeres, and provides a narrow window during which RTEL1 can unwind t-loops to facilitate telomere replication.

- Grzegorz Sarek, Panagiotis Kotsantis & Simon J. Boulton
- Article | 13 November 2019

**[Quantifying secondary transport at single-molecule resolution](#)**

Imaging of substrate transport by individual MhsT transporters, members of the neurotransmitter:sodium symporter family of secondary transporters, at single- and multi-turnover resolution reveals that the rate-limiting step varies with the identity of the transported substrate.

- Gabriel A. Fitzgerald, Daniel S. Terry & Scott C. Blanchard
- Article | 13 November 2019

**[Cryo-EM structure of the spinach cytochrome \*b<sub>6</sub>f\* complex at 3.6 Å resolution](#)**

A 3.6 Å resolution cryo-electron microscopy structure of the dimeric cytochrome *b<sub>6</sub>f* complex from spinach reveals the structural basis for operation of the quinol cycle and its redox-sensing function.

- Lorna A. Malone, Pu Qian & Matthew P. Johnson
- Article | 13 November 2019

### Structures of a RAG-like transposase during cut-and-paste transposition

Analysis of multiple structures of the *Helicoverpa zea* DNA transposase Transib, determined by X-ray crystallography and cryo-electron microscopy, reveals the detailed pathway of the transposition reaction and sheds light on the evolution of the RAG recombinase.

- Chang Liu, Yang Yang & David G. Schatz
- Article | 03 October 2019

### Architecture of autoinhibited and active BRAF–MEK1–14-3-3 complexes

The autoinhibited and active states of full-length BRAF in complexes with its substrate MEK1 and the 14-3-3 protein are determined by cryo-electron microscopy.

- Eunyoung Park, Shaun Rawson & Michael J. Eck

## Volume 575 Issue 7784, 28 November 2019

### This Week

#### Editorial

- Editorial | 27 November 2019

#### **Protect Italy's new funding agency**

Lawmakers must ensure that a much-needed funding agency is independent and autonomous.

- Editorial | 26 November 2019

#### **Egypt stands to benefit from sharing its latest discoveries with all Egyptologists**

When the time is right, the country should consider inviting researchers from around the world to study the latest finds from its ancient past.

- Editorial | 27 November 2019

#### **Academics should not need to live in fear for the pursuit of their science**

Attacks on scholars are on the rise at the same time as universities find themselves at the centre of student protests.

## Research

### News & Views

- News & Views | 21 October 2019

#### **A powerful cell-protection system prevents cell death by ferroptosis**

The discovery of a mechanism that guards against a type of cell death called ferroptosis reveals a system that regenerates a ubiquitous protective component of biological membranes, and might offer a target for anticancer drugs.

- Brent R. Stockwell

- News & Views | 27 November 2019

#### **Molecular catalyst converts carbon dioxide to methanol**

A molecular catalyst dispersed on carbon nanotubes has been found to catalyse the electrochemical conversion of carbon dioxide to methanol — a liquid fuel and industrially useful bulk chemical.

- Xin-Ming Hu & Kim Daasbjerg

- News & Views | 06 November 2019

#### **Toxin discovery reveals fresh ammunition for bacterial warfare**

A previously unknown bacterial toxin has now been characterized. The protein is secreted into neighbouring cells, depleting them of essential energy-carrying molecules and so leading to the cells' demise.

- Brent W. Anderson & Jue D. Wang

- News & Views | 18 November 2019

#### **Temperature-dependent polarization in a non-polar crystal**

A crystal's surface has been found to behave as a distinct material that has temperature-dependent electrical polarization — despite the rest of the crystal being non-polar.

- Gustau Catalan & Beatriz Noheda

- News & Views | 06 November 2019

#### **[A rule from bacteria to balance growth and expansion](#)**

Bacteria move along gradients of chemical attractants. Two studies find that, in nutrient-rich environments, bacteria can grow rapidly by following a non-nutritious attractant — but expanding too fast leaves them vulnerable.

- Henry Mattingly & Thierry Emonet
- News & Views | 27 November 2019

#### **[Quantum dots realize their potential](#)**

Scientists have engineered semiconducting nanocrystals called quantum dots that lack toxic heavy metals and are highly efficient light emitters. These nanostructures might be used in displays, solar cells and light-emitting diodes.

- Alexander L. Efros

### **Articles**

- Article | 27 November 2019

#### **[A wide star–black-hole binary system from radial-velocity measurements](#)**

Radial-velocity measurements of a Galactic B-type star show a dark companion that seems to be a black hole of about 68 solar masses, in a widely spaced binary system.

- Jifeng Liu, Haotong Zhang & Xiangqun Cui
- Article | 21 October 2019

#### **[A gated quantum dot strongly coupled to an optical microcavity](#)**

Strong coupling between a gated semiconductor quantum dot and an optical microcavity is observed in an ultralow-loss frequency-tunable microcavity device.

- Daniel Najer, Immo Söllner & Richard J. Warburton
- Article | 21 October 2019

#### **[Imaging work and dissipation in the quantum Hall state in graphene](#)**

Imaging studies show that topological protection in the quantum Hall state in graphene is undermined by edge reconstruction with a dissipation

mechanism that comprises two distinct and spatially separated processes—work generation and entropy generation.

- A. Marguerite, J. Birkbeck & E. Zeldov
- Article | 27 November 2019

#### **Highly efficient and stable InP/ZnSe/ZnS quantum dot light-emitting diodes**

A method of engineering efficient and stable InP/ZnSe/ZnS quantum dot light-emitting diodes (QD-LEDs) has improved their performance to the level of state-of-the-art cadmium-containing QD-LEDs, removing the problem of the toxicity of cadmium in large-panel displays.

- Yu-Ho Won, Oul Cho & Eunjoo Jang
- Article | 27 November 2019

#### **Domino electroreduction of CO<sub>2</sub> to methanol on a molecular catalyst**

Individual cobalt phthalocyanine derivative molecules immobilized on carbon nanotubes effectively catalyse the electroreduction of CO<sub>2</sub> to methanol via a domino process with high activity and selectivity and stable performance.

- Yueshen Wu, Zhan Jiang & Hailiang Wang
- Article | 16 October 2019

#### **Concise asymmetric synthesis of (–)-bilobalide**

A synthetic route to the *Ginkgo biloba* metabolite (–)-bilobalide is described.

- Meghan A. Baker, Robert M. Demoret & Ryan A. Shenvi
- Article | 27 November 2019

#### **Twofold expansion of the Indo-Pacific warm pool warps the MJO life cycle**

Since the 1980s, rapid warming of the Indo-Pacific warm pool has altered global rainfall pattern by changing the residence time of the Madden–Julian Oscillation, decreasing it by 3–4 days over the Indian Ocean and increasing it over the Indo-Pacific by 5–6 days.

- M. K. Roxy, Panini Dasgupta & Daehyun Kim

- Article | 20 November 2019

**[Genetic predisposition to mosaic Y chromosome loss in blood](#)**

A genome-wide association study of mosaic loss of chromosome Y (LOY) in UK Biobank participants identifies 156 genetic determinants of LOY, showing that LOY is associated with cancer and non-haematological health outcomes.

- Deborah J. Thompson, Giulio Genovese & John R. B. Perry

- Article | 06 November 2019

**[Chemotaxis as a navigation strategy to boost range expansion](#)**

Pioneering bacterial cells use chemotaxis along self-generated attractant gradients to facilitate rapid colonization of nutrient-replete environments.

- Jonas Cremer, Tomoya Honda & Terence Hwa

- Article | 06 November 2019

**[An evolutionarily stable strategy to colonize spatially extended habitats](#)**

To successfully colonize a habitat in the presence of competing chemotactic bacterial populations, the winner is required to expand its range at a speed given by the habitat size and the population doubling time.

- Weirong Liu, Jonas Cremer & Chenli Liu

- Article | 20 November 2019

**[NLRP3 inflammasome activation drives tau pathology](#)**

The authors show that NLRP3 inflammasome is activated in microglia of patients with fronto-temporal dementia and in a mouse model of tau pathology, and that the loss of NLRP3 inflammasome function decreases tau pathology and improves cognition in mice.

- Christina Ising, Carmen Venegas & Michael T. Heneka

- Article | 06 November 2019

**[An interbacterial toxin inhibits target cell growth by synthesizing \(p\)ppApp](#)**

The bacterium *Pseudomonas aeruginosa* attacks competing bacteria using the toxin Tas1, which pyrophosphorylates adenosine nucleotides to generate (p)ppApp, thereby depleting ATP and disrupting multiple cellular functions.



- Shehryar Ahmad, Boyuan Wang & John C. Whitney
- Article | 13 November 2019

**[Activity of caspase-8 determines plasticity between cell death pathways](#)**

Alternative cell death pathways are revealed in the absence of caspase-8-dependent apoptosis and MLKL-dependent necroptosis.

- Kim Newton, Katherine E. Wickliffe & Vishva M. Dixit
- Article | 20 November 2019

**[Caspase-8 is the molecular switch for apoptosis, necroptosis and pyroptosis](#)**

The enzymatic activity of caspase-8 controls apoptosis, necroptosis and pyroptosis, and prevents tissue damage during embryonic development and adulthood in mice.

- Melanie Fritsch, Saskia D. Günther & Hamid Kashkar
- Article | 21 October 2019

**[The CoQ oxidoreductase FSP1 acts parallel to GPX4 to inhibit ferroptosis](#)**

A synthetic lethal CRISPR–Cas9 screen identifies ferroptosis suppressor protein 1 as a key ferroptosis-resistance factor, the expression of which correlates with ferroptosis resistance in hundreds of cancer cell lines.

- Kirill Bersuker, Joseph M. Hendricks & James A. Olzmann
- Article | 21 October 2019

**[FSP1 is a glutathione-independent ferroptosis suppressor](#)**

In the absence of GPX4, FSP1 regenerates ubiquinol from the oxidized form, ubiquinone, using NAD(P)H and suppresses phospholipid peroxidation and ferroptosis in cells.

- Sebastian Doll, Florencio Porto Freitas & Marcus Conrad
- Article | 20 November 2019

**[Circular ecDNA promotes accessible chromatin and high oncogene expression](#)**

Imaging and sequencing approaches are combined to show that extrachromosomal DNA (ecDNA) in cancer is circular and has unique chromatin structure that amplifies oncogene output.

- Sihan Wu, Kristen M. Turner & Paul S. Mischel
- Article | 20 November 2019

**Mechanism of head-to-head MCM double-hexamer formation revealed by cryo-EM**

Time-resolved electron microscopy reveals the mechanism by which the origin recognition complex loads pairs of MCM helicases around DNA prior to bidirectional replication.

- Thomas C. R. Miller, Julia Locke & Alessandro Costa



## Contents

### Editorial

- 783** Into ploughshares: forging effective surveillance for work-related lung disease  
*C J Reynolds, P Blanc*

### Original research Workplace

- 785** Multicohort study of change in job strain, poor mental health and incident cardiometabolic disease  
*L L Magnusson Hanson, N H Rod, J Vahtera, P Peristera, J Pentti, R Rugulies, I E H Madsen, A D LaMontagne, A Milner, T Lange, S Suominen, S Stenholm, T Xu, M Kivimäki, H Westerlund*

- 793** Physical and psychosocial work exposures as risk factors for disability retirement due to a shoulder lesion  
*M Sirén, E Viikari-Juntura, J Arokoski, S Solovieva*

- 801** Changes in the gut microbiota during and after commercial helium–oxygen saturation diving in China  
*Y Yuan, G Zhao, H Ji, B Peng, Z Huang, W Jin, X Chen, H Guan, G Tang, H Zhang, Z Jiang*

- 809** Parental occupational exposure to diesel engine exhaust in relation to childhood leukaemia and central nervous system cancers: a register-based nested case-control study in Denmark 1968–2016  
*J Volk, J E Heck, K Schmiegelow, J Hansen*

- 818** Workload and cross-harvest kidney injury in a Nicaraguan sugarcane worker cohort  
*E Hansson, J Glaser, I Weiss, U Ekström, J Apelqvist, C Hogstedt, S Peraza, R Lucas, K Jakobsson, C Wesseling, D H Wegman*

- 827** Animal farming and the risk of lymphohaematopoietic cancers: a meta-analysis of three cohort studies within the AGRICOH consortium  
*S El-Zaemey, L H Schinasi, G Ferro, S Tual, P Lebailly, I Baldi, K-C Nordby, K Kjørheim, J Schüz, A Monnereau, M Brouwer, S Koutros, J Hofmann, P Kristensen, H Kromhout, M E Leon, L E Beane Freeman*

## November 2019 Volume 76 Issue 11

- 838** Impact of depressive symptoms on worklife expectancy: a longitudinal study on Danish employees  
*J Pedersen, S V Thorsen, M F Andersen, T N Hanvold, V Schlüssens, U Bültmann*

- 845** Association between occupational exposure and Dupuytren's contracture using a job-exposure matrix and self-reported exposure in the CONSTANCES cohort  
*M Fadel, A Leclerc, B Evanoff, A-M Dale, L Ngabirano, Y Roquelaure, A Descatha*

### Exposure assessment

- 849** Declining blood lead levels among small-scale miners participating in a safer mining pilot programme in Nigeria  
*P Gottesfeld, G Meltzer, S Costello, J Greig, N Thurtle, K Bil, B J Mwangombe, M M Nota*

### Environment


- 854** Risk factors for head and neck cancer in the World Trade Center Health Program General Responder Cohort: results from a nested case-control study  
*M T Bover Manderski, K Black, I G Udasin, A R Giuliano, M B Steinberg, P Ohman Strickland, T M Black, C R Dasaro, M Crane, D Harrison, J Moline, B J Luft, M R Passannante, R G Lucchini, A C Todd, J M Graber*


### Systematic review

- 861** Exposure to asbestos and the risk of colorectal cancer mortality: a systematic review and meta-analysis  
*K Kwak, D Paek, K E Zoh*

### Miscellaneous

- 872** Correction: Novel clinical scores for occupational asthma due to exposure to high-molecular-weight agents

 This article has been chosen by the Editor to be of special interest or importance and is freely available online.

 This article has been made freely available online under the BMJ Journals open access scheme. See <https://authors.bmj.com/open-access/>

 This journal is a member of and subscribes to the principles of the Committee on Publication Ethics  
Member since 2008 <http://publicationethics.org/>  
JM00018

 equator network

 recycle  
When you have finished with this magazine please recycle it.

## Stay a step ahead with Online First

We publish all our original articles online before they appear in a print issue.

This means that the latest clinical research papers go straight from acceptance to your browser, keeping you at the cutting edge of medicine.

Follow the Online First link on the homepage and read the latest research.

[oem.bmj.com](http://oem.bmj.com)



## ARTICLES/SHORT FEATURES

**Chandrayaan-2 – What Went Wrong With The Lander** .....Pg 20  
Anand Kumar Sharma

**Protecting the Greater Adjutant Stork** .....Pg 24  
D.N. Choudhary



**The Case of the Missing...?** .....Pg 27  
Arati Karekatte

**Chemical Chaperones to Treat Protein Diseases** .....Pg 30  
M.K. Chattopadhyay, P. Varija & S. Kavya

**An Expedition to Lower Dibang Valley** .....Pg 32  
Arijit Ganguly

**“Dare to Shine” at FIFA Women’s World Cup 2019** .....Pg 36  
Gangan Prathap

**Chemistry of Fire** .....Pg 39  
Iqbal Abdul Dhalait

## COVER STORY

**Chandrayaan-2: India’s Daring Moon Mission**  
Biman Basu  
Pg 14



## Science Fiction

**Riruru — A Wonderful Creation** .....Pg 49  
Sreejita Sen

## REPORT

**A Felicitation Ceremony with a Unique Differentiator** .....Pg 42  
Shreeja Nambiar

**Stellar Science Communication at the Royal Society** .....Pg 44  
A.P. Jayaraman

## BOOK REVIEW

**The Systems View of Life – The Only Way Out of the Mess We Find Ourselves In** .....Pg 46  
G. Venkatesh

## DEPARTMENTS

REACTIONS ..... 8	READERSHIP SURVEY ..... 51	INNOVATIVE MINDS ..... 58
EDITORIAL ..... 9	PUZZLE CORNER ..... 52	NATURE’S MARVELS ..... 60
SPECTRUM ..... 10	WHAT’S NEW ..... 54	TEST YOUR KNOWLEDGE ..... 62
PHOTO FEATURE ..... 34	CURIOSITY CORNER ..... 56	CROSSWORD ..... 64

# CONTENTS

1 NOVEMBER 2019 • VOLUME 366 • ISSUE 6465

## 562

Geneticist Denis Rebrikov is open about his plans to correct a deafness mutation in babies, using the genome editor CRISPR.

## NEWS

### IN BRIEF

**552** News at a glance

### IN DEPTH

#### **555** Genetics lab accused of misusing African DNA

Sanger institute's aborted effort to commercialize gene chip could hinder research in Africa *By E. Stokstad*

#### **556** Mud in storied ice core hints at a thawed Greenland

Dirty base of Camp Century ice core warns of future ice sheet retreat *By P. Voosen*

#### **558** Alien comets may be common, analysis of 2I/Borisov suggests

A dozen interstellar objects may be passing near the Sun *By W. W. Gibbs*

#### **558** Gates and NIH join forces on HIV and sickle cell diseases

A unique marriage aims to speed development of simple DNA-based cures *By J. Cohen and J. Kaiser*

#### **559** DOE readies multibillion-dollar AI push

U.S. supercomputing leader is the latest big backer in a globally crowded field *By R. F. Service*

#### **560** How measles causes the body to 'forget' past infections

With cases rising around the world, studies underscore the importance of widespread vaccination *By E. Frederick*

RESEARCH ARTICLE P. 599; *SCI. IMMUNOL.*  
RESEARCH ARTICLE BY V. PETROVA ET AL.  
10.1126/SCIIMMUNOL.AAY6125; PODCAST

#### **561** After decades, progress against an 'undruggable' cancer target

New drugs appear to block KRAS tumor growth protein *By J. Kaiser*

### FEATURES

#### **562** Crossing the line

Inside Russia's debate about a scientist's plan to create gene-edited babies *By J. Cohen*

... **564** Parents weigh promise and risks of germline editing *By J. Cohen*

## INSIGHTS

### PERSPECTIVES

#### **566** Pesticide impacts through aquatic food webs

Effects of neonicotinoid insecticides ricochet all the way to fisheries yields *By O. P. Jensen*  
REPORT p. 620

#### **568** A layered defense against plant pathogens

Microbial consortia may be key to robust protection of roots from disease *By S. G. Tringe*  
RESEARCH ARTICLE p. 606

#### **569** Toward synthetic cells

Frog egg cytoplasm self-organizes into cell-like units by microtubule aster assembly and partition *By T. J. Mitchison and C. M. Field*  
REPORT p. 631

#### **570** Mapping footprints of past genetic exchange

Widespread mating between species creates mosaic genomes in *Heliconius* butterflies *By L. H. Rieseberg*  
RESEARCH ARTICLE p. 594

#### **572** Deep sleep drives brain fluid oscillations

Rhythmic fluid flows in deep sleep may allow communication and clearance of waste products *By S. Grubb and M. Lauritzen*  
REPORT p. 628

#### **573** Order emerging from disorder

Entropy stabilization provides a new direction for developing functional materials *By N. Drogue and D. Bérardan*

#### **574** The immune system mimics a pathogen

A host metabolite binds a bacterial enzyme and traps its B<sub>12</sub> cofactor in an inactive state *By A. K. Boal*  
RESEARCH ARTICLE p. 589

### POLICY FORUM

#### **576** To help aging populations, classify organismal senescence

Comprehensive disease classification and staging is required to address unmet needs of aging populations *By S. R. G. Calimport et al.*

## BOOKS ET AL.

**579 Masculinity molecule, debunked**

Challenging stereotypes, two scholars unpack the social and cultural contexts of testosterone *By E. L. Milam*

**580 What does it mean to be alive?**

A winding romp through advances in cell biology pushes readers to ponder the boundaries of life *By M. A. Fisher*

## LETTERS

**581 Moon missions spark the human imagination**

*By D. K. Lahiri*

**581 Radiation is not a political tool**

*By M. Murakami et al.*

**582 Salmon in clear and present danger**

*By N. J. Muñoz et al.*

## RESEARCH

## IN BRIEF

**583** From *Science* and other journals

## REVIEWS

**586 Medicine**

Clonal hematopoiesis in human aging and disease

*S. Jaiswal and B. L. Ebert*

REVIEW SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAN4673

**587 Microbiology**

Microbiota and the social brain

*E. Sherwin et al.*

REVIEW SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAR2016

## RESEARCH ARTICLES

**588 Combustion physics**

A unified mechanism for unconfined deflagration-to-detonation transition in terrestrial chemical systems and type Ia supernovae *A. Y. Poludnenko et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAU7365

**589 Radical enzymes**

Itaconyl-CoA forms a stable biradical in methylmalonyl-CoA mutase and derails its activity and repair *M. Ruetz et al.*

PERSPECTIVE p. 574

**594 Butterfly genomics**

Genomic architecture and introgression shape a butterfly radiation *N. B. Edelman et al.*

PERSPECTIVE p. 570

**599 Viral immunology**

Measles virus infection diminishes preexisting antibodies that offer protection from other pathogens *M. J. Mina et al.*

NEWS STORY p. 560; *SCI. IMMUNOL.*  
RESEARCH ARTICLE BY V. PETROVA ET AL.  
10.1126/SCIIMMUNOL.AAY6125

**606 Plant microbiota**

Pathogen-induced activation of disease-suppressive functions in the endophytic root microbiome *V. J. Carrión et al.*

PERSPECTIVE p. 568

**613 Isotopic separation**

Barely porous organic cages for hydrogen isotope separation *M. Liu et al.*

## REPORTS

**620 Neonicotinoids**

Neonicotinoids disrupt aquatic food webs and decrease fishery yields *M. Yamamuro et al.*

PERSPECTIVE p. 566

**623 Surface magnetism**

Atomic-scale spin sensing with a single molecule at the apex of a scanning tunneling microscope *B. Verhac et al.*

**628 Neuroscience**

Coupled electrophysiological, hemodynamic, and cerebrospinal fluid oscillations in human sleep *N. E. Fultz et al.*

PERSPECTIVE p. 572

**631 Cell biology**

Spontaneous emergence of cell-like organization in *Xenopus* egg extracts *X. Cheng and J. E. Ferrell Jr.*

PERSPECTIVE p. 569

**637 Black holes**

A noninteracting low-mass black hole–giant star binary system *T. A. Thompson et al.*

PODCAST

**640 Structural virology**

Architecture of African swine fever virus and implications for viral assembly *N. Wang et al.*

**645 Batteries**

Reversible epitaxial electrodeposition of metals in battery anodes *J. Zheng et al.*

## DEPARTMENTS

**551 Editorial**

Equity and excellence in science *By H. Holden Thorp*

**654 Working Life**

Finding community during coffee breaks *By Vivienne Tam*

## ON THE COVER



*Heliconius melpomene* (left) and *H. erato* (right) gained protection from predators by evolving similar warning colors, an example of Müllerian mimicry. These species are among 20 sequenced butterfly genomes that illustrate the importance of hybridization and gene flow in genomic evolution. See pages 570 and 594. *Photo: Andrew Neild*

Science Staff .....	550
New Products.....	649
Science Careers .....	650

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

**366 (6465)**

*Science* **366** (6465), 551-654.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/366/6465>

**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. The title *Science* is a registered trademark of AAAS.

Copyright © 2019 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.

# CONTENTS

8 NOVEMBER 2019 • VOLUME 366 • ISSUE 6466

## NEWS

### IN BRIEF

**668** News at a glance

### IN DEPTH

**671 Next-generation artificial vision comes into view**

Researchers hone techniques to restore sight by stimulating the retina or brain *By K. Servick*

**672 Mystery oil spill threatens marine sanctuary in Brazil**

Months after its release, crude oil has reached Abrolhos Bank, a biodiversity hot spot in the southern Atlantic Ocean *By H. Escobar*

**673 Immigrants from the Middle East shaped Rome**

Genetic history of the city finds little European DNA at the height of the imperial period *By L. Wade*  
RESEARCH ARTICLE p. 708

**674 Rare case offers clues to staving off Alzheimer's**

Unusual mutation in a known Alzheimer's risk gene points to potential treatments *By K. Servick*

**675 Top Israeli immunologist's views on vaccines trigger furor**

Yehuda Shoenfeld has espoused ideas popular among vaccine skeptics and spoken at their meetings *By K. Kupferschmidt*

**676 Seed bonanza aids plan to save tropical trees**

"Mast year" yields seeds for living collections of Southeast Asia's endangered Dipterocarps *By Y. H. Law*

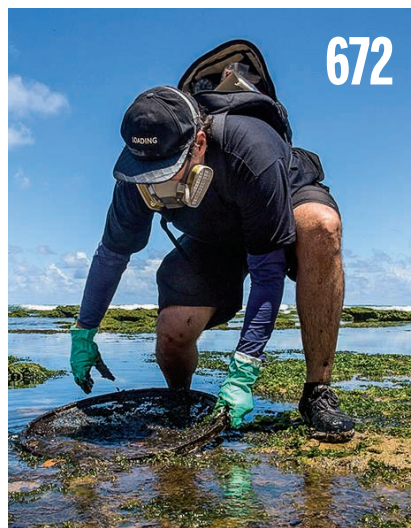
**677 NIH administrator resigned after sexual misconduct probe**

National Institute on Drug Abuse silent on reasons for recent departure of scientific director Antonello Bonci *By M. Wadman*

### FEATURES

**678 Unearthing the reality of slavery**

Excavations on a Caribbean island reveal the lives of enslaved Africans, and how their labor built today's world *By L. Wade*



## INSIGHTS

### PERSPECTIVES

**682 Deflating the myth of isolated communities**

Individual mobility at early settlements raises questions about tenets of culture history *By G. M. Feinman and J. E. Neitzel*  
REPORT p. 731

**684 Beyond the genome: RNA control of stem cells**

Alternative RNA processing controls muscle stem cell activity in distinct muscles *By H. Xi and A. Pyle*  
REPORT p. 734

**685 Double trouble for cancer gene**

Double mutations in an oncogene enhance tumor growth *By A. Toker*  
RESEARCH ARTICLE p. 714

**686 Explaining the puzzle of human diversity**

Centuries of Church exposure promote more individualistic and less conforming psychology *By M. J. Gelfand*  
RESEARCH ARTICLE p. 707

**688 Rescue from a fiery death: A therapeutic endeavor**

Inhibiting cell death by pyroptosis could limit inflammatory diseases and cancer *By N. Kayagaki and V. M. Dixit*





678

What may have been an overseer's house still stands on Estate Little Princess in St. Croix, U.S. Virgin Islands.

**690 A figure of merit for flexibility**

A thickness-dependent metric allows for comparison of materials for device applications  
By *J. Peng* and *G. J. Snyder*

**POLICY FORUM**

**692 Increasing gender diversity in the STEM research workforce**

Policies must address harassment and bias  
By *C. W. Greider* et al.

**BOOKS ET AL.**

**696 Seeking shared ground in space**

Efforts to communicate with extraterrestrials call into question the universality of language, math, and culture  
By *A. Ravnigani*

**697 Undercover in the asylum**

A defining antipsychiatry text comes under fire  
By *H. Pols*

**LETTERS**

**698 Disability inclusion enhances science**

By *A. C. Hartmann*

**698 Climate concerns and the disabled community**

By *A. Kosanic* et al.

**699 Collaboration across boundaries in the Amazon**

By *P. R. Prist* et al.

**700 Technical Comment abstracts**

**RESEARCH**

**IN BRIEF**

**702** From *Science* and other journals

**REVIEW**

**705 Plant science**

Revolutions in agriculture chart a course for targeted breeding of old and new crops  
*Y. Eshed* and *Z. B. Lippman*  
REVIEW SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAX0025

**RESEARCH ARTICLES**

**706 Biosynthetic enzymes**

Structures of a dimodular nonribosomal peptide synthetase reveal conformational flexibility  
*J. M. Reimer* et al.  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAW4388

**707 Psychology**

The Church, intensive kinship, and global psychological variation  
*J. F. Schulz* et al.  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAU5141  
PERSPECTIVE p. 686; PODCAST

**708 Ancient genomics**

Ancient Rome: A genetic crossroads of Europe and the Mediterranean  
*M. L. Antonio* et al.  
NEWS STORY p. 673

**714 Cancer**

Double *PIK3CA* mutations in cis increase oncogenicity and sensitivity to PI3K $\alpha$  inhibitors  
*N. Vasan* et al.  
PERSPECTIVE p. 685

**723 Air pollution**

Direct observation of changing NO $_x$  lifetime in North American cities  
*J. L. Laughner* and *R. C. Cohen*

**REPORTS**

**727 Topological optics**

Engineering spin-orbit synthetic Hamiltonians in liquid-crystal optical cavities  
*K. Rechcińska* et al.

**731 Ancient sociology**

Kinship-based social inequality in Bronze Age Europe  
*A. Mitnik* et al.  
PERSPECTIVE p. 682

**734 Stem cells**

Alternative polyadenylation of Pax3 controls muscle stem cell fate and muscle function  
*A. de Morree* et al.  
PERSPECTIVE p. 684

**738 Galaxies**

Gravitational lensing reveals ionizing ultraviolet photons escaping from a distant galaxy  
*T. E. Rivera-Thorsen* et al.

**742 Geochemistry**

Mineralogical control on the fate of continentally derived organic matter in the ocean  
*T. M. Blattmann* et al.

**745 Metrology**

Probing gravity by holding atoms for 20 seconds  
*V. Xu* et al.

**749 Solar cells**

Efficient, stable solar cells by using inherent bandgap of  $\alpha$ -phase formamidineum lead iodide  
*H. Min* et al.

**754 Polymer chemistry**

Stereosequenced crystalline polyhydroxyalkanoates from diastereomeric monomer mixtures  
*X. Tang* et al.

**DEPARTMENTS**

**667 Editorial**

Beyond vetting donors  
By *H. Holden Thorp*

**766 Working Life**

Respect the poster  
By *Anila D'Mello* and *Oliver Flynn*

**ON THE COVER**



Time-lapse image of the Roman Colosseum, which symbolizes the power and durability of Rome—one of the largest cities of the ancient world and seat of an empire of ~70 million people. A sample of ancient genomes spanning 12,000

years reveals that, from ~3000 years ago on, Rome had a population of diverse ancestries. Rapid genetic shifts in historical time reflect movements of people as Rome's political connections and trade networks changed. See pages 673 and 708.  
Credit: *Mark Bassett/Alamy Stock Photo*

Science Staff .....	666
New Products.....	759
Science Careers .....	760

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

**366 (6466)**

*Science* **366** (6466), 667-766.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/366/6466>

**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. The title *Science* is a registered trademark of AAAS.

Copyright © 2019 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.



## PERSPECTIVES

### 797 Translating translation in Down syndrome

Protein quality control mechanisms may hold the key to treatment of cognitive disability  
By M. Halliday and G. R. Mallucci

QUALITY CONTROL IN THE CELL p. 816;  
RESEARCH ARTICLE p. 843

### 798 Modeling the early development of a primate embryo

Post-implantation embryos from cynomolgus monkeys are cultured for extended periods  
By P. P. L. Tam

RESEARCH ARTICLES pp. 836 & 837

### 800 Cross-linking polyethylene through carbenes

A carbene-forming molecule can glue various polymers, even ones lacking functional groups  
By F. J. de Zwart et al.

REPORT p. 875

### 801 Piling on the pressures to ecosystems

Identifying dangerous combinations of assaults could prevent ecosystem collapse  
By P. Manning

REPORT p. 886

### 802 Cellular survival over genomic perfection

DNA repair pathways permit some damage, leading to mutagenesis but not always cancer  
By S. Nik-Zainal and B. A. Hall

QUALITY CONTROL IN THE CELL p. 816

### 804 Overcoming glass brittleness

Thin films of flawless amorphous alumina are ductile at room temperature  
By L. Wondraczek

REPORT p. 864

### 805 Reuniting biogeochemistry with ecology and evolution

Mining of biological and geochemical data pinpoints a key trait of freshwater plants  
By R. Marcé and B. Obrador

REPORT p. 878

### 806 Microbes and genes in heart failure

Human genetic variants and gut microbiota trigger cardiac inflammation  
By S. Epelman

REPORT p. 881

## BOOKS ET AL.

### 809 Returning the fallen

An anthropologist offers compelling context for ongoing efforts to repatriate service members killed in Vietnam  
By M. McFate

## NEWS

### IN BRIEF

778 News at a glance

### IN DEPTH

### 782 A new form of pure carbon dazzles and attracts

Reflective, conductive, and magnetic, U-carbon could have many practical uses—if it's real  
By W. Wayt Gibbs

### 783 'Secret science' plan is back, and critics say it's worse

EPA proposal would allow regulators to ignore many health studies  
By D. Malakoff

### 784 Bacterial toxin linked to severe alcoholic liver disease

In mice, viruses known as phages reduced alcohol-related liver problems by eliminating a gut microbe  
By E. Frederick

### 785 Drones reveal earthquake hazards hidden in the abyss

Low-cost approach enables United States to double scrutiny of seafloor creep in quake zones  
By P. Voosen

### 786 A mysterious disease is striking American beech trees

Researchers debate whether a tiny worm is to blame  
By G. Popkin

### 787 Top Democrat wants big AI push

Senator Charles Schumer calls for 5-year, \$100 billion plan  
By J. Mervis

## FEATURES

### 788 Life partners

Nancy Moran's passion for insects and their indwelling microbes helped the field of symbiosis come into its own  
By E. Pennisi

### 792 Arctic intruder

The *Polarstern* is enabling scientists to spend 1 year frozen in ice. Now, they must make sure the ship doesn't wreck their studies  
By S. Hall

PODCAST

## INSIGHTS

## POLICY FORUM

### 794 China's key role in scaling low-carbon energy technologies

Meeting the Paris goals will require collaboration with China  
By J. Helveston and J. Nahm

**810 The deadly diffusion of lethal technologies**

From 3D-printed guns to weaponized hobby drones, open technologies pose sinister threats *By G. Lucas*

**LETTERS****813 Seabirds: Sentinels beyond the oceans**

*By M. Thibault et al.*

**813 Save horseshoe crabs and coastal ecosystems**

*By H. Yang et al.*

**814 Consider Humboldt's map as intended**

*By C. U. Ulloa*

**814 Technical Comment abstracts****RESEARCH****IN BRIEF**

**833** From *Science* and other journals

**RESEARCH ARTICLES****Developmental biology**

**836** In vitro culture of cynomolgus monkey embryos beyond early gastrulation

*H. Ma et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [DX.DOI.ORG/10.1126/SCIENCE.AAX7890](https://doi.org/10.1126/SCIENCE.AAX7890)

**837** Dissecting primate early post-implantation development using long-term in vitro embryo culture

*Y. Niu et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [DX.DOI.ORG/10.1126/SCIENCE.AAW5754](https://doi.org/10.1126/SCIENCE.AAW5754)

PERSPECTIVE p. 798

**838 Structural biology**

Structure of the RSC complex bound to the nucleosome *Y. Ye et al.*

**843 Biomedicine**

Activation of the ISR mediates the behavioral and neurophysiological abnormalities in Down syndrome *P. J. Zhu et al.*

QUALITY CONTROL IN THE CELL p. 816; PERSPECTIVE p. 797

**850 Electrochemistry**

Engineering bunched Pt-Ni alloy nanocages for efficient oxygen reduction in practical fuel cells *X. Tian et al.*

**SPECIAL SECTION****Quality control in the cell****INTRODUCTION**

**816** Quality control in cell biology

**REVIEWS**

**818** Cellular quality control by the ubiquitin-proteasome system and autophagy *C. Pohl and I. Dikic*

**822** Cellular RNA surveillance in health and disease *S. L. Wolin and L. E. Maquat*

**827** Mitocellular communication: Shaping health and disease *A. Mottis et al.*

PERSPECTIVES pp. 797 & 802  
RESEARCH ARTICLE p. 843

**ON THE COVER**

Stylized view of the cell to illustrate that the nucleus exports RNA messages that are translated into proteins (blue) by ribosomes. Proteasomes and lysosomes degrade and recycle internalized, aberrant, or excess

proteins. The endoplasmic reticulum and Golgi complex package and sort cargoes for transport to other organelles or for export from the cell. Mitochondria provide power to the rest of the cell. For more on cellular quality control, see page 816. *Illustration: Nigel Sussman*

**REPORTS****856 Laser physics**

Widely tunable compact terahertz gas lasers *P. Chevalier et al.*

**860 Optoelectronics**

Nano-opto-electro-mechanical switches operated at CMOS-level voltages *C. Haffner et al.*

**864 Glasses**

Highly ductile amorphous oxide at room temperature and high strain rate *E. J. Frankberg et al.*

PERSPECTIVE p. 804

**870 2D materials**

Electrical control of interlayer exciton dynamics in atomically thin heterostructures *L. A. Jauregui et al.*

**875 Polymer chemistry**

A broadly applicable cross-linker for aliphatic polymers containing C–H bonds *M. L. Lepage et al.*

PERSPECTIVE p. 800

**878 Freshwater ecology**

Catchment properties and the photosynthetic trait composition of freshwater plant communities *L. L. Iversen et al.*

PERSPECTIVE p. 805

**881 Immunology**

Microbiota-derived peptide mimics drive lethal inflammatory cardiomyopathy *C. Gil-Cruz et al.*

PERSPECTIVE p. 806

**886 Soil ecology**

The role of multiple global change factors in driving soil functions and microbial biodiversity *M. C. Rillig et al.*

PERSPECTIVE p. 801

**890 Solar physics**

Generation of solar spicules and subsequent atmospheric heating *T. Samanta et al.*

PODCAST

**894 Quantum optics**

Thermally condensing photons into a coherently split state of light *C. Kurtscheid et al.*

**DEPARTMENTS****777 Editorial**

CRISPR's unwanted anniversary *By Jennifer Doudna*

**918 Working Life**

An escape into fiction *By Jeff Clark*

Science Staff ..... 776  
New Products ..... 898  
Science Careers ..... 902

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 #125488122. 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](http://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

**366 (6467)**

*Science* **366** (6467), 777-918.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/366/6467>

**PERMISSIONS**

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

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

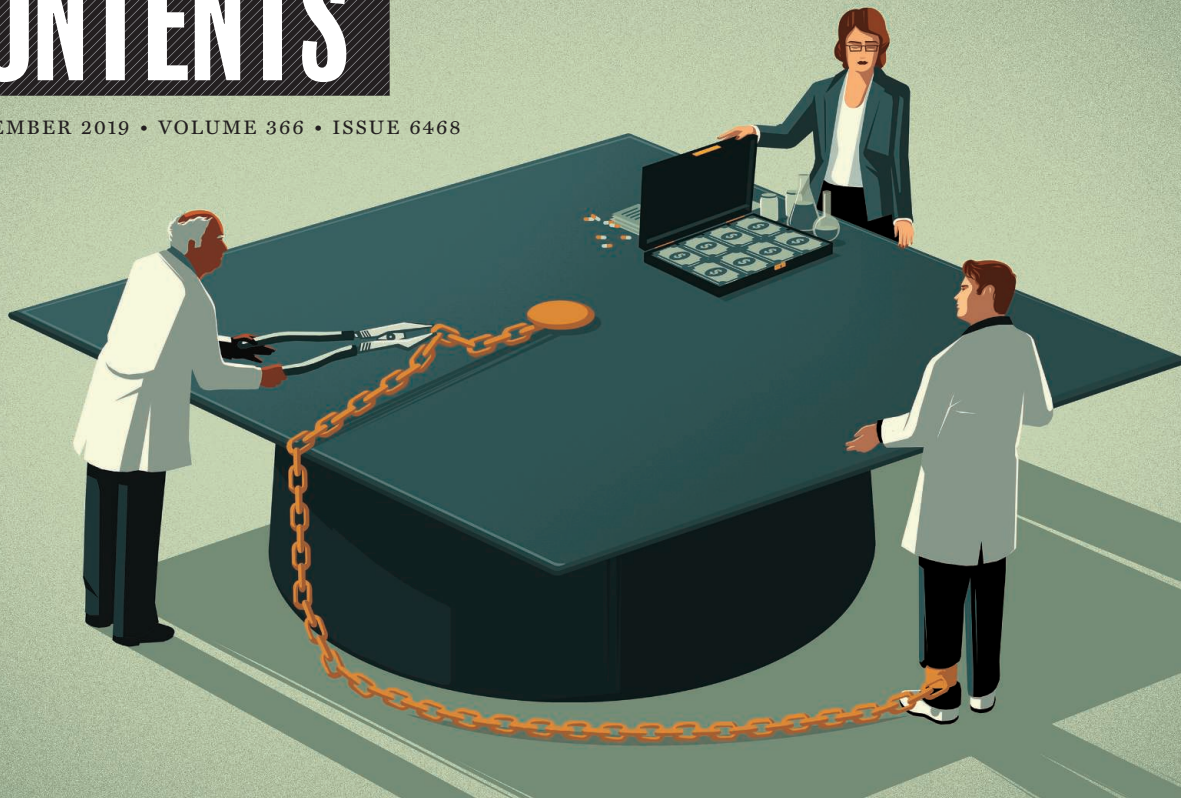
---

*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. The title *Science* is a registered trademark of AAAS.

Copyright © 2019 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.

# CONTENTS

22 NOVEMBER 2019 • VOLUME 366 • ISSUE 6468



941

Downloaded from <http://science.sciencemag.org/> on November 25, 2019

## NEWS

### IN BRIEF

**930** News at a glance

### IN DEPTH

#### **932 Bold plan to retrieve Mars samples takes shape**

NASA and Europe settle on suite of missions to bring back rocks from the Red Planet  
*By D. Clery and P. Voosen*

#### **934 After 20 years, golden rice nears approval**

Bangladesh may become the first country to adopt transgenic rice enriched in vitamin A  
*By E. Stokstad*

#### **935 Hong Kong protests hit universities**

Clashes have had little impact on research, but long-term effects on schools are unclear  
*By D. Normile*

#### **936 Researchers sound alarm on European data law**

Privacy regulations impede international studies on diabetes and Alzheimer's disease  
*By T. Rabesandratana*

#### **937 Australian blazes will 'reframe our understanding of bushfire'**

Fire scientist David Bowman discusses the unfolding crisis  
*By J. Pickrell*

### FEATURES

#### **938 The landslide laboratory**

Landslides aren't just hazards. An experiment in Taiwan could reveal their outsize effect on the climate  
*By K. Kornei*  
PODCAST

#### **941 Double dip**

An NIH program pays school debt to keep scientists in academia. Many break the rules by also taking industry money  
*By C. Piller*

## INSIGHTS

### PERSPECTIVES

#### **944 The world in a song**

Similar songs are used in similar contexts around the world  
*By W. T. Fitch and T. Popescu*  
RESEARCH ARTICLE p. 970

#### **946 The multistep morphing of beetle horns**

Genes that specify insect wings initiate horn development in dung beetles  
*By H. F. Nijhout*  
REPORT p. 1004

#### **947 Compelled to drink: Why some cannot stop**

Individual differences in aversive stimulus processing may explain compulsive alcohol drinking  
*By K. Nixon and R. A. Mangieri*  
REPORT p. 1008

#### **948 A catalytic one-two punch**

Cooperative catalysis enables the controlled synthesis of unnatural amino acids  
*By J. M. Ovian and E. N. Jacobsen*  
REPORT p. 990

#### **950 Unraveling the claims for (and against) green growth**

Can the global economy grow indefinitely, decoupled from Earth's limitations?  
*By T. Jackson and P. A. Victor*  
REVIEW p. 969

#### **952 Designer sense-response systems**

Artificially chemically induced protein dimerization yields biological sensor-actuator devices  
*By R. A. Chica*  
REPORT p. 1024

#### **953 Turning lateral roots into nodules**

The evolutionary origin of legume root nodules that help them grow is revealed  
*By A. Bishopp and M. J. Bennett*  
REPORT p. 1021

**955 Artificial intelligence for global health**

Socially responsible technologies promise to help address health care inequalities  
By A. Hosny and H. J. W. L. Aerts

**POLICY FORUM****957 How low should we go when warning for earthquakes?**

Social responses to alerts are critical but understudied  
By E. S. Cochran and A. L. Husker

**BOOKS ET AL.****959 Excavating Uruk**

A richly illustrated volume reveals what life was like in the world's first city  
By A. Robinson

**960 Trash, treasure, and everything in between**

A journalist traces the evolution of the large, but largely unknown, global secondhand market  
By K. Dooley

**LETTERS****961 EU Court: Science must justify future hunting**

By Y. Epstein et al.

**961 Time to ban lead hunting ammunition**

By C. Sonne et al.

**962 Beyond meat: Ecological functions of livestock**

By V. Proença and C. M. G. L. Teixeira

**PRIZE ESSAY****964 Three-dimensional genome structure of a single cell**

Chromosome organization in diploid cells reveals a structural basis for smell  
By L. Tan

**RESEARCH****IN BRIEF**

**966** From *Science* and other journals

**REVIEW****969 Nanomaterials**

Energy storage: The future enabled by nanomaterials  
E. Pomerantseva et al.

REVIEW SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAN8285  
PERSPECTIVE p. 950

**RESEARCH ARTICLES****970 Psychology of music**

Universality and diversity in human song  
S. A. Mehr et al.

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAX0868  
PERSPECTIVE p. 944; PODCAST

**971 Signal transduction**

Structural mechanism of a Rag GTPase activation checkpoint by the lysosomal folliculin complex  
R. E. Lawrence et al.

**977 Paleontology**

Exceptional continental record of biotic recovery after the Cretaceous–Paleogene mass extinction  
T. R. Lyson et al.

**REPORTS****983 2D magnetism**

Direct observation of van der Waals stacking–dependent interlayer magnetism  
W. Chen et al.

**987 Correlated electrons**

Strange metallicity in the doped Hubbard model  
E. W. Huang et al.

**990 Organic chemistry**

Highly enantioselective carbene insertion into N–H bonds of aliphatic amines  
M.-L. Li et al.

PERSPECTIVE p. 948

**995 Infection**

Host resistance factor SLC11A1 restricts *Salmonella* growth through magnesium deprivation  
O. Cunrath and D. Bumann

**999 Computer science**

Preventing undesirable behavior of intelligent machines  
P. S. Thomas et al.

**1004 Trait development**

Beetle horns evolved from wing serial homologs  
Y. Hu et al.

PERSPECTIVE p. 946

**1008 Neuroscience**

A cortical-brainstem circuit predicts and governs compulsive alcohol drinking  
C. A. Siciliano et al.

PERSPECTIVE p. 947

**1013 Immunometabolism**

Glutamine blockade induces divergent metabolic programs to overcome tumor immune evasion  
R. D. Leone et al.

**1021 Plant science**

A shared gene drives lateral root development and root nodule symbiosis pathways in *Lotus T. Soyano* et al.

PERSPECTIVE p. 953

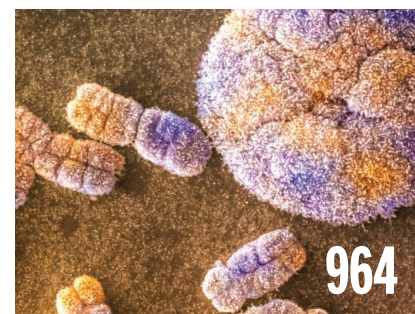
**1024 Protein design**

Computational design of a modular protein sense-response system  
A. A. Glasgow et al.

PERSPECTIVE p. 952

**1029 Cancer**

Peritumoral activation of the Hippo pathway effectors YAP and TAZ suppresses liver cancer in mice  
I. M. Moya et al.

**DEPARTMENTS****929 Editorial**

The context of diversity  
By Cato T. Laurencin

**1042 Working Life**

Sidestepping politics to teach climate  
By Ragupathy Kannan

**ON THE COVER**

*Onthophagus sagittarius* dung beetle with prominent horns on its head and thorax. The thoracic horn, an evolutionary novelty whose origin has been a long-standing mystery, is derived from

the same serially reiterated tissues that gave rise to wings in the more posterior thoracic segments. By textbook definition, evolutionary novelty requires the absence of homology, yet thoracic horns, considered a classic example of this phenomenon, appear to have originated by relying deeply on their homology to wings. See pages 946 and 1004. Photo: Alexander Wild

Science Staff ..... 928  
New Products.....1035  
Science Careers .....1036

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 #125488122. 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

**366 (6468)**

*Science* **366** (6468), 929-1042.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/366/6468>

**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. The title *Science* is a registered trademark of AAAS.

Copyright © 2019 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.



# CONTENTS

29 NOVEMBER 2019 • VOLUME 366 • ISSUE 6469



1062

In Malawi, a baby has received a new malaria vaccine.

## NEWS

### IN BRIEF

**1054** News at a glance

### IN DEPTH

**1056** **Bacteria-armed mosquitoes make dent in dengue**

Field trials suggest spreading *Wolbachia* could reduce cases of debilitating viruses  
By *K. Servick*

**1057** **Universities move to stop passing the harasser**

Changes in hiring practices ask job candidates to allow employers to disclose findings  
By *J. Mervis*

**1058** **U.K. parties stake out science stances in 'Brexit election'**

Contenders' Brexit policies are starkly different  
By *E. Stokstad*

**1059** **Questions churn about vaping's long-term risks**

Studies in people and animals explore potential chronic harms to the heart and lungs  
By *J. Couzin-Frankel*

**1060** **Top Chinese scientist faces questions about publications**

Case seen as a test of China's efforts to improve research integrity and crack down on scientific misconduct  
By *D. Normile*

**1061** **European Mars rover in a 'race against time' to fix parachutes**

ExoMars team looks to NASA for help after unexplained parachute tears  
By *D. Crary*

### FEATURES

**1062** **A shot of hope**

The first malaria vaccine is finally being rolled out—despite limited efficacy and nagging safety concerns  
By *J. de Vriese*

## INSIGHTS

### POLICY FORUM

**1066** **Cyber risk research impeded by disciplinary barriers**

Security progress requires cross-disciplinary collaboration  
By *G. Falco et al.*

### PERSPECTIVES

**1070** **A chemical path to quantum information**

Nanoscale graphene can be designed to function as a molecular qubit  
By *S. von Kugelgen and D. E. Freedman*  
REPORT p. 1107

**1071** **Regulation of negative emotional behavior**

A lower-brainstem structure regulates a psychobehavioral state for avoidance behavior  
By *S. Ikemoto*  
RESEARCH ARTICLE p. 1094

**1072** **An unexpected cofactor**

A mystery of bacterial chromosome segregation is explained by a nucleotide cofactor  
By *B. E. Funnell*  
REPORT p. 1129

**1074** **Immunology taught by vaccines**

Systems analysis of vaccine responses reveals the impact of the microbiota on human immunity  
By *B. Pulendran*

**1076** **Illuminating Earth's faults**

Submarine fiber-optic cables drive discovery of fault locations and ocean dynamics  
By *P. Jousset*  
REPORT p. 1103

**1077** **Immunostimulatory gut bacteria**

Some bacterial species stimulate inflammation, autoimmunity, and anticancer immunity  
By *L. Zitvogel and G. Kroemer*  
REPORT p. 1143

**1078** **Surface nanopatterning with polymer brushes**

A variety of surfaces are patterned with precisely defined cylindrical micelles  
By *A. Presa Soto*  
REPORT p. 1095

### BOOKS ET AL.

**1080** **The pursuit of Earth's waters**

A historian shares stories of six scientists who laid foundations for modern climate science  
By *L. Barnett*

**1081** **Arbiters of truth, then and now**

A 40-year-old tome's prescient observations about scientific fact-making resonate today  
By *J. Swift*

### LETTERS

**1082** **Fires scorching Bolivia's Chiquitano forest**

By *A. Romero-Muñoz et al.*

## 1082 Misguided approach to dengue vaccine risk

By A. Wilder-Smith et al.

## 1083 Need for mountain weather stations climbs

By D. S. Hik and S. N. Williamson

## 1083 Technical Comment abstracts

# RESEARCH

### IN BRIEF

1090 From *Science* and other journals

### RESEARCH ARTICLES

#### 1093 Neuroscience

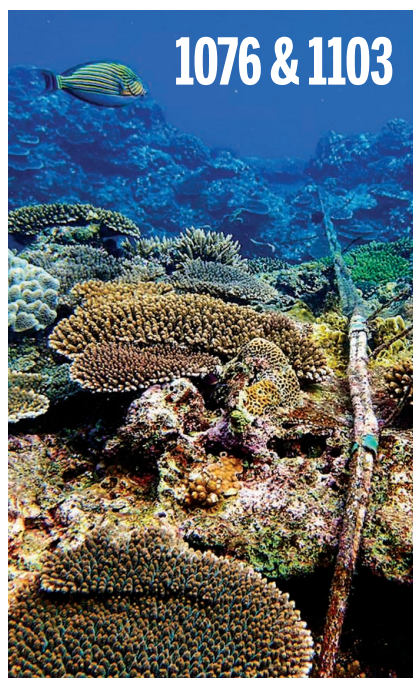
Dense connectomic reconstruction in layer 4 of the somatosensory cortex  
*A. Motta et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAY3134

#### 1094 Neuroscience

Median raphe controls acquisition of negative experience in the mouse  
*A. Szőnyi et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
DX.DOI.ORG/10.1126/SCIENCE.AAY8746  
PERSPECTIVE p. 1071



### REPORTS

#### 1095 Materials science

Tailored multifunctional micellar brushes via crystallization-driven growth from a surface  
*J. Cai et al.*

PERSPECTIVE p. 1078

#### 1099 Superconductivity

Incoherent strange metal sharply bounded by a critical doping in Bi2212  
*S.-D. Chen et al.*

#### 1103 Seismology

Illuminating seafloor faults and ocean dynamics with dark fiber distributed acoustic sensing  
*N. J. Lindsey et al.*

PERSPECTIVE p. 1076; PODCAST

#### 1107 Quantum materials

Quantum units from the topological engineering of molecular graphenoids  
*F. Lombardi et al.*

PERSPECTIVE p. 1070

#### 1111 Chemical physics

Direct observation of bimolecular reactions of ultracold KRb molecules  
*M.-G. Hu et al.*

#### 1116 Elastocalorics

Fatigue-resistant high-performance elastocaloric materials made by additive manufacturing  
*H. Hou et al.*

#### Magnonics

1121 Mutual control of coherent spin waves and magnetic domain walls in a magnonic device  
*J. Han et al.*

1125 Magnetization switching by magnon-mediated spin torque through an antiferromagnetic insulator  
*Y. Wang et al.*

#### 1129 Biochemistry

Self-organization of *parS* centromeres by the ParB CTP hydrolase  
*Y.-M. Soh et al.*

PERSPECTIVE p. 1072

#### 1134 Enhancer genomics

Brain cell type-specific enhancer-promoter interactome maps and disease-risk association  
*A. Nott et al.*

#### 1139 Molecular biology

Comprehensive AAV capsid fitness landscape reveals a viral gene and enables machine-guided design  
*P. J. Ogden et al.*

#### 1143 Microbiome

Lactose drives *Enterococcus* expansion to promote graft-versus-host disease  
*C. K. Stein-Thoeringer et al.*

PERSPECTIVE p. 1077

#### 1150 Protein folding

Watching helical membrane proteins fold reveals a common N-to-C-terminal folding pathway  
*H.-K. Choi et al.*

### DEPARTMENTS

#### 1053 Editorial

An even bigger climate problem  
*By Carolina Schmidt*

#### 1162 Working Life

Giving thanks in China  
*By Barbara Gastel*

### ON THE COVER



Nerve cells from the mouse brain, densely reconstructed in this volume. For a century, neuron reconstruction in the cerebral cortex showed only ~1 in 1000 nerve cells (black); now researchers can use

3D electron microscopy and AI-based image analysis to reconstruct all of them (gray). The connectivity matrix between thousands of axons and dendrites can be measured, yielding insights about the formational patterns of brain circuits and possible imprints of learning in the neuronal network. See page 1093. *Image: V. Altounian/Science; Data: A. Motta et al., Science 366 eaay3134 (2019)*

Science Staff .....	1052
AAAS News & Notes .....	1084
New Products .....	1157
Science Careers .....	1158

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

**366 (6469)**

*Science* **366** (6469), 1053-1162.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/366/6469>

**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. The title *Science* is a registered trademark of AAAS.

Copyright © 2019 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.

## EDITORIAL

---

Physician burnout: the need to rehumanise health systems

A new framework for managing extremely preterm births

Chagas disease: still a neglected emergency

## COMMENT

---

Do we need any new TAVR device?

NIRS-intravascular imaging to predict coronary events

A new treatment for chronic rhinosinusitis with nasal polyps

North–South inequities in research collaboration in humanitarian and conflict contexts

Achieving health equity: democracy matters

Offline: The broken promise of cancer medicine

## WORLD REPORT

---

Bülent Şık: Turkish scientist convicted

Inquiry says that “UK drugs policy is failing”

Syrian conflict causes new humanitarian and health concerns



## PERSPECTIVES

---

The inside game

Rebecca McKetin: global leader in methamphetamine research

Entirely appropriate language

Other voices, other rooms

The carbon footprint



## OBITUARY

---

Liane Brauch Russell



## CORRESPONDENCE

---

Is war a man-made public health problem?

Reducing health inequity for Māori people in New Zealand

Does the first assault on women's rights occur in utero?

Health and welfare in Japan

Health and welfare in Japan

Health and welfare in Japan

Ocular injuries caused by less-lethal weapons in France

UK FASHIoN—how clinically relevant are the results?

Alcohol consumption and vascular disease: other

points to consider

Alcohol consumption and vascular disease: other points to consider

Alcohol consumption and vascular disease: other points to consider – Authors' reply

## DEPARTMENT OF ERROR

---

Department of Error

Department of Error

## ARTICLES

---

Safety and efficacy of a self-expanding versus a balloon-expandable bioprosthesis for transcatheter aortic valve replacement in patients with symptomatic severe aortic stenosis: a randomised non-inferiority trial

Identification of patients and plaques vulnerable to future coronary events with near-infrared spectroscopy intravascular ultrasound imaging: a prospective, cohort study

Efficacy and safety of dupilumab in patients with severe chronic rhinosinusitis with nasal polyps (LIBERTY NP SINUS-24 and LIBERTY NP SINUS-52): results from two multicentre, randomised, double-blind, placebo-controlled, parallel-group phase 3 trials

## CLINICAL PICTURE

---

Paraplegia and spinal deformity in a Mozambican child with Pott's disease and tuberculous scrofula



## SERIES

---

Responding to global stimulant use: challenges and opportunities

New psychoactive substances: challenges for drug surveillance, control, and public health responses

# The Lancet

**Vol.394**

Number 10210 | Nov 09, 2019

p 1685-1778 | e35

## EDITORIAL

---

ICPD at 25 years: time to expand the agenda

A Brexit general election: the wrong question

Aged care in Australia falls short



## COMMENT

---

CRASH-3: a win for patients with traumatic brain injury

[Open Access](#)

Improving survival of infants with low birthweight cared for outside hospitals

Triple therapy in a single inhaler: a new option for uncontrolled asthma

Accountability for respectful maternity care

[Open Access](#)

Challenging social structures and changing research cultures

Offline: A perilous birthday party for mental health

## WORLD REPORT

---

Violent protests in Chile linked to health-care inequities

Indonesian forest fires raise concerns about health

## PERSPECTIVES

---

Michael Bloomberg: the optimistic engineer

Rukhmabai: doctor and social reformer

Out on the pitch: sport and mental health in LGBT people

## OBITUARY

---

Kurt J Isselbacher

## CORRESPONDENCE

---

Reduce the delay in tuberculosis diagnosis in India

A child's right to health

A perpendicular framing for global health

The Global Fund impact

The Global Fund impact – Authors' reply

Deep learning and medical diagnosis



Deep learning and medical diagnosis

Deep learning and medical diagnosis – Authors' reply

Philip Morris International: time for a new conversation

## DEPARTMENT OF ERROR

---

Department of Error

Department of Error

## CORRESPONDENCE

---

Chile: civil unrest and Cochrane Colloquium cancelled

## ARTICLES

---

Effects of tranexamic acid on death, disability, vascular occlusive events and other morbidities in patients with acute traumatic brain injury (CRASH-3): a randomised, placebo-controlled trial

[Open Access](#)

Effect of community-initiated kangaroo mother care on survival of infants with low birthweight: a randomised controlled trial

Single inhaler extrafine triple therapy in uncontrolled asthma (TRIMARAN and TRIGGER): two double-blind, parallel-group, randomised, controlled phase 3 trials

How women are treated during facility-based childbirth in four countries: a cross-sectional study with labour observations and community-based surveys

[Open Access](#)



## CLINICAL PICTURE

---

A difficult pill to swallow: drug-induced oesophagitis



## THERAPEUTICS

---

Targeting calcitonin gene-related peptide: a new era in migraine therapy



## HEALTH POLICY

---

The ethics of the Global Kidney Exchange programme

# The Lancet

**Vol.394**

Number 10211 | Nov 16, 2019

p 1779-1878 | e36

## EDITORIAL

---

Raising the profile of men's health

Health and climate change: making the link matter

A generation on the brink



## COMMENT

---

Anaesthetic interventions and long-term tumour recurrence

What is the first choice for blood pressure treatment?

Premature mortality, causes of death, and mental disorders

Air travel for global health: flying in the face of sustainable development?

A roadmap for sustainably governing the global antimicrobial commons

Offline: The gravy train of systematic reviews

## WORLD REPORT

---

Cycling safety concerns grow in US cities

Progress lags on vaccines to beat antimicrobial resistance

## PERSPECTIVES

---

Can skin cancer diagnosis be transformed by AI?

Herminia Palacio: new driving force at the Guttmacher Institute

Progress and nostalgia in *A Visit from the Goon Squad*

George Eliot, *Middlemarch*, and *The Lancet*

## OBITUARY

---

Dorothea Buck

## CORRESPONDENCE

---

AI-augmented multidisciplinary teams: hype or hope?

Uncertainties in the GBD 2017 estimates on diet and health

Uncertainties in the GBD 2017 estimates on diet and health

Uncertainties in the GBD 2017 estimates on diet and health – Authors' reply

Time to revisit indications for cholecystectomy

Time to revisit indications for cholecystectomy – Author's reply

Time for *The Lancet* to realign with the evidence on e-cigarettes?

Online education opportunity for Syria's future doctors

Collective burial of Nazi-era anatomical specimens

## DEPARTMENT OF ERROR

---

Department of Error

## ARTICLES

---

Recurrence of breast cancer after regional or general anaesthesia: a randomised controlled trial

Comprehensive comparative effectiveness and safety of first-line antihypertensive drug classes: a systematic, multinational, large-scale analysis

A comprehensive analysis of mortality-related health metrics associated with mental disorders: a nationwide, register-based cohort study



## CLINICAL PICTURE

---

Trigeminal neuralgia plus hemifacial spasm caused by a dilated artery: a case of painful tic convulsif syndrome



## REVIEW

---

The 2019 report of The *Lancet* Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate

# The Lancet

**Vol.394**

Number 10212 | Nov 23, 2019

p 1879-1964 | e37

## EDITORIAL

---

2020: unleashing the full potential of nursing

Lung cancer: some progress, but still a lot more to do

Promoting and prescribing the arts for health



## COMMENT

---

Deep anaesthesia and poor outcomes: the jury is still out

PD-1 immunotherapy for recurrent or metastatic HNSCC

Immunotherapy: a new era in small-cell lung cancer

Entering the era of highly effective CFTR modulator therapy

The scale and profile of global dementia research funding

Offline: Why global health must talk about death

## WORLD REPORT

---

No clear way ahead: smog in northern India

Ebola virus vaccine receives prequalification

2019 Prince Mahidol Award winners announced

## PERSPECTIVES

---

A mother bears witness to the conflict in Syria

Mirror fragments

Migraine

The misuses of “biological sex”

## OBITUARY

---

Bernard Fisher

## CORRESPONDENCE

---

WHO's slow progress on transgender and gender

diverse health

Protecting the health of children moving to Canada

Sharing data safely while preserving privacy

Data must be shared—also with researchers outside of Europe

The life improvement value: a new measure of cost-efficiency

Quantifying the benefit of non-small-cell lung cancer immunotherapy

Quantifying the benefit of non-small-cell lung cancer immunotherapy – Authors' reply

Representation of women among scientific Nobel Prize nominees

## ARTICLES

---

Anaesthetic depth and complications after major surgery: an international, randomised controlled trial

Pembrolizumab alone or with chemotherapy versus cetuximab with chemotherapy for recurrent or metastatic squamous cell carcinoma of the head and neck (KEYNOTE-048): a randomised, open-label, phase 3 study

Durvalumab plus platinum–etoposide versus platinum–etoposide in first-line treatment of extensive-stage small-cell lung cancer (CASPIAN): a randomised, controlled, open-label, phase 3 trial

Efficacy and safety of the elexacaftor plus tezacaftor plus ivacaftor combination regimen in people with cystic fibrosis homozygous for the *F508del* mutation: a double-blind, randomised, phase 3 trial



## CLINICAL PICTURE

---

[Seeing red degeneration in uterine fibroids in pregnancy: proceed with caution](#)



## SEMINAR

---

[Acute kidney injury](#)

# The Lancet

**Vol.394**

Number 10213 | Nov 30, 2019

p 1965-2038 | e38

## EDITORIAL

---

[Research integrity: time for global action](#)

[The unfolding migrant crisis in Latin America](#)

[Muscular dystrophy: new treatments, new hopes](#)



## COMMENT

---

[Osteoarthritis: a new short-term treatment option?](#)

[Innovation in valve repair devices](#)



[Improving NASH with a little help from thyromimetics](#)

[Dolutegravir: advancing ethical research in pregnancy](#)

[The political determinants of health and wellbeing in the Lebanese uprising](#)

[Offline: It's time to prepare your anti-CV](#)



## WORLD REPORT

---

[Will Trump snuff out e-cigarettes?](#)

[Image irregularities found in prominent scientist's papers](#)



## PERSPECTIVES

---

[Truth and torture in the war on terror](#)

[Liz Grant: prioritising palliative care and planetary health](#)

[Stroke: the doctor as patient](#)



## OBITUARY

---

[Sadako Ogata](#)



## CORRESPONDENCE

---

[Global health, human rights, and the law](#)

[Global health, human rights, and the law](#)

[Global health, human rights, and the law – Authors' reply](#)

[Clinical outcomes after ABO-incompatible renal transplantation](#)

[Clinical outcomes after ABO-incompatible renal transplantation](#)

[Clinical outcomes after ABO-incompatible renal transplantation – Authors' reply](#)

[The harsh effects of sanctions on Iranian health](#)

[The first local cases of Zika virus in Europe](#)

[Youth activists for our health](#)

[Brazil's health-care system](#)

## ARTICLES

---

[Results of a 6-week treatment with 10 mg prednisolone in patients with hand osteoarthritis \(HOPE\): a double-blind, randomised, placebo-controlled trial](#)

[Transcatheter edge-to-edge repair for reduction of tricuspid regurgitation: 6-month outcomes of the TRILUMINATE single-arm study](#)

[Resmetirom \(MGL-3196\) for the treatment of non-alcoholic steatohepatitis: a multicentre, randomised, double-blind,](#)

[placebo-controlled, phase 2 trial](#)

## CLINICAL PICTURE

---

[Now you see it: progressive radiographic findings in avascular necrosis of the hip](#)

## SEMINAR

---

[Muscular dystrophies](#)



November 7, 2019

---

**CASE CHALLENGE**

## A Man with Dyspnea, Odynophagia, and Abdominal Pain

A 34-year-old HIV-positive man presented with progressive dyspnea and abdominal pain. What is the most likely diagnosis?



Vote and comment. Find the answers in the full text of the case, to be published on November 21.

---

**PERSPECTIVE**

---

## The U.S. Insulin Crisis — Rationing a Lifesaving Medication Discovered in the 1920s

M. Fralick and A.S. Kesselheim

N Engl J Med 2019;381:1793-1795

---

## Will Emergency Holds Reduce Opioid Overdose Deaths?

E.A. Samuels, O.U. Warren, C.S. Davis, and P.P. Christopher

N Engl J Med 2019;381:1795-1797 | Published Online October 16, 2019

---

## A Good Physician — On Complacency and Communication

M.M. Kittleson

N Engl J Med 2019;381:1798-1799

---

**ORIGINAL ARTICLES**

---

## Neurodegenerative Disease Mortality among Former Professional Soccer Players

D.F. Mackay and Others

---

N Engl J Med 2019;381:1801-1808 | Published Online October 21, 2019

---

## Elexacaftor–Tezacaftor–Ivacaftor for Cystic Fibrosis with a Single Phe508del Allele

P.G. Middleton and Others

N Engl J Med 2019;381:1809-1819 | Published Online October 31, 2019

---

## Five-Year Outcomes after PCI or CABG for Left Main Coronary Disease

G.W. Stone and Others

N Engl J Med 2019;381:1820-1830 | Published Online September 28, 2019

---

## Prevention of Early Ventilator-Associated Pneumonia after Cardiac Arrest

B. François and Others

N Engl J Med 2019;381:1831-1842

---

## Efficacy of a Tetravalent Dengue Vaccine in Healthy Children and Adolescents

S. Biswal and Others

DOI: 10.1056/NEJMoa1903869 | November 6, 2019

---

### CLINICAL PRACTICE

---

## Acute Severe Hypertension

A.J. Peixoto

N Engl J Med 2019;381:1843-1852

CME  

---

**Additional Published Content**



---

IMAGES IN CLINICAL MEDICINE

---

## A Bleeding Toe

Z. Luo and S. Zhao

N Engl J Med 2019;381:1853

---

## Liver Fluke

J. Kwok and J.L. Buxbaum

N Engl J Med 2019;381:e34

---

### CLINICAL PROBLEM-SOLVING

---

## Double Trouble

C. Smith and Others

N Engl J Med 2019;381:1854-1860

---

### EDITORIALS

---

## Soccer and Mortality — Good News and Bad News

R.A. Stern

N Engl J Med 2019;381:1862-1863 | Published Online October 21, 2019

---

## Realizing the Dream of Molecularly Targeted Therapies for Cystic Fibrosis

F.S. Collins

N Engl J Med 2019;381:1863-1865 | Published Online October 31, 2019

---

### CLINICAL IMPLICATIONS OF BASIC RESEARCH

---

## Nonalcoholic Fatty Liver Disease, Insulin Resistance, and Ceramides

V.T. Samuel and G.I. Shulman

N Engl J Med 2019;381:1866-1869

---

**MEDICINE AND SOCIETY**

---

Health, Social Reform, and Medical Schools — The Training of American Physicians and the Dissenting Tradition

M. Chowkwanyun and B. Howell

N Engl J Med 2019;381:1870-1875

---

**CORRESPONDENCE**

---

Total Penis, Scrotum, and Lower Abdominal Wall Transplantation

---

Deaths Associated with Emicizumab in Patients with Hemophilia A

---

Teplizumab in Relatives at Risk for Type 1 Diabetes

---

Warm Autoimmune Hemolytic Anemia

---

Pheochromocytoma and Paraganglioma



November 14, 2019

---

**PERSPECTIVE**

---

**Learning from the Dead**

K.M. De Cock, E. Zielinski-Gutiérrez, and S.B. Lucas

N Engl J Med 2019;381:1889-1891

---

**Modernizing the FDA's 510(k) Pathway**

V.K. Rathi and J.S. Ross

N Engl J Med 2019;381:1891-1893 | Published Online October 23, 2019

---

**Last Song — Sharing Humanity while Maintaining Boundaries**

J. Wales

N Engl J Med 2019;381:1894-1895

---

**ORIGINAL ARTICLES**

---

**Phase 3 Efficacy Trial of Modified Vaccinia Ankara as a Vaccine against Smallpox**

P.R. Pittman and Others

N Engl J Med 2019;381:1897-1908

---

**Large-Scale Assessment of a Smartwatch to Identify Atrial Fibrillation**

M.V. Perez and Others

N Engl J Med 2019;381:1909-1917



---

## Trial of Apremilast for Oral Ulcers in Behçet's Syndrome

G. Hatemi and Others

N Engl J Med 2019;381:1918-1928

---

## Secondary Surgical Cytoreduction for Recurrent Ovarian Cancer

R.L. Coleman and Others

N Engl J Med 2019;381:1929-1939

---

## A Phase 3 Trial of Difelikefalin in Hemodialysis Patients with Pruritus

S. Fishbane and Others

DOI: 10.1056/NEJMoa1912770 | November 8, 2019

---

### REVIEW ARTICLE

---

## Acute Upper Airway Obstruction

A. Eskander, J.R. de Almeida, and J.C. Irish

N Engl J Med 2019;381:1940-1949

---

### IMAGES IN CLINICAL MEDICINE

---

## Iris Transillumination Defects in Pigment Dispersion Syndrome

L. Lyons and A. Amram

N Engl J Med 2019;381:1950

---

## Velvety Palms

D. Miyashiro and J.A. Sanches

N Engl J Med 2019;381:e35

---

### CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

---

---

## Case 35-2019: A 66-Year-Old Man with Pancytopenia and Rash

M.V. Maus, M.B. Leick, K.M. Cornejo, and V. Nardi

N Engl J Med 2019;381:1951-1960

---

### EDITORIALS

---

## On the “Take” as a Biomarker

L.R. Baden and I.K. Damon

N Engl J Med 2019;381:1962-1963

---

## Watched by Apple

E.W. Champion and J.A. Jarcho

N Engl J Med 2019;381:1964-1965

---

### SPECIAL REPORT

---

## 10-Year Update on Study Results Submitted to ClinicalTrials.gov

D.A. Zarin and Others

N Engl J Med 2019;381:1966-1974

---

### CORRESPONDENCE

---

## Apremilast in Treatment-Refractory Recurrent Aphthous Stomatitis

---

## Selinexor for Refractory Multiple Myeloma

---

## Measles

---

## Drug Effects on the Thyroid



November 21, 2019

---

**PERSPECTIVE**

---

**Who Pays in Medicare Part D? Giving Plans More Skin in the Game**

E.E. Trish and Others

DOI: 10.1056/NEJMp1912357 | November 20, 2019

---

**Case Studies in Social Medicine: Biological Citizenship — A 53-Year-Old Man with Schizoaffective Disorder and PTSD Applying for Supplemental Security Income**

I. Kalofonos

N Engl J Med 2019;381:1985-1989

---

**Eastern Equine Encephalitis Virus — Another Emergent Arbovirus in the United States**

D.M. Morens, G.K. Folkers, and A.S. Fauci

N Engl J Med 2019;381:1989-1992

---

**The Den**

S. Jha

N Engl J Med 2019;381:1992-1993

---

**ORIGINAL ARTICLES**

---

**Dapagliflozin in Patients with Heart Failure and Reduced Ejection Fraction**

J.J.V. McMurray and Others

N Engl J Med 2019;381:1995-2008 | Published Online September 19, 2019

---

**Efficacy of a Tetravalent Dengue Vaccine in Healthy Children and Adolescents**

---

S. Biswal and Others

N Engl J Med 2019;381:2009-2019 | Published Online November 6, 2019

---

## **Nivolumab plus Ipilimumab in Advanced Non–Small-Cell Lung Cancer**

M.D. Hellmann and Others

N Engl J Med 2019;381:2020-2031 | Published Online September 28, 2019

---

## **Ticagrelor with or without Aspirin in High-Risk Patients after PCI**

R. Mehran and Others

N Engl J Med 2019;381:2032-2042 | Published Online September 26, 2019

---

## **Brief Report: Drug-Resistant *E. coli* Bacteremia Transmitted by Fecal Microbiota Transplant**

Z. DeFilipp and Others

N Engl J Med 2019;381:2043-2050 | Published Online October 30, 2019

---

## **Reduced Leaflet Motion after Transcatheter Aortic-Valve Replacement**

O. De Backer and Others

DOI: 10.1056/NEJMoa1911426 | November 16, 2019

---

## **A Controlled Trial of Rivaroxaban after Transcatheter Aortic-Valve Replacement**

G.D. Dangas and Others

DOI: 10.1056/NEJMoa1911425 | November 16, 2019

---

## **Early Surgery or Conservative Care for Asymptomatic Aortic Stenosis**

D.-H. Kang and Others

DOI: 10.1056/NEJMoa1912846 | November 16, 2019

---

**Additional Published Content**



---

**VIDEOS IN CLINICAL MEDICINE**

---

**Focused Cardiac Ultrasonography for Left Ventricular Systolic Function**

G. Prada and Others

N Engl J Med 2019;381:e36

---

**IMAGES IN CLINICAL MEDICINE**

---

**Lateral Knee Dislocation**

L. Ganti and A. Hanna

N Engl J Med 2019;381:2051

---

**Myxomatous Mitral-Valve Prolapse**

F.A. Farooqui and S. Deepti

N Engl J Med 2019;381:e37

---

**CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL**

---

**Case 36-2019: A 34-Year-Old Man with Dyspnea, Odynophagia, and Abdominal Pain**

M. Saag and Others

N Engl J Med 2019;381:2052-2061

---

**EDITORIALS**

---

## Heart-Failure Therapy — New Drugs but Old Habits?

J.C. Fang

N Engl J Med 2019;381:2063-2064 | Published Online September 19, 2019

---

## Fecal Microbiota Transplantation for Dysbiosis — Predictable Risks

M.J. Blaser

N Engl J Med 2019;381:2064-2066 | Published Online October 30, 2019

---

## Timing of Intervention in Aortic Stenosis

P. Lancellotti and M.A. Vannan

DOI: 10.1056/NEJMe1914382 | November 16, 2019

---

### CLINICAL IMPLICATIONS OF BASIC RESEARCH

---

## An Anti-Opioid System, Courtesy of a Worm Model

B.L. Kieffer

N Engl J Med 2019;381:2067-2069

---

### CORRESPONDENCE

---

## Donor Screening for Fecal Microbiota Transplantation

Published Online October 30, 2019

---

## Ambient Air Pollution and Mortality in 652 Cities

---

## Oral Semaglutide and Cardiovascular Outcomes in Type 2 Diabetes

---

## Pulmonary Illness Related to E-Cigarette Use

DOI: 10.1056/NEJMc1915111 | November 20, 2019

---

## More on the Pathology of Vaping-Associated Lung Injury

DOI: 10.1056/NEJMc1914980 | November 20, 2019



November 28, 2019

---

**INTERACTIVE MEDICAL CASE**

**Facing Uncertainty**

C. Thomas and Others | N Engl J Med 2019;381:e39

This interactive case features a 57-year-old woman who presents with a 1-year history of a facial rash and a 2-week history of productive cough and worsening shortness of breath.

[Test your diagnostic and therapeutic skills at NEJM.org.](#)

---

**PERSPECTIVE**

---

**PrEParing to End the HIV Epidemic — California’s Route as a Road Map for the United States**

D.S. Kazi, I.T. Katz, and A.K. Jha

DOI: 10.1056/NEJMp1912293 | November 27, 2019

---

**Advancing Legislation on Drug Pricing — Is There a Path Forward?**

S.B. Dusetzina and J. Oberlander

N Engl J Med 2019;381:2081-2084

---

**Which Drug Prices Should Medicare Negotiate? A “Too Little” or “Too Late” Approach**

P.B. Bach

N Engl J Med 2019;381:2084-2086

---

**Roadside Assistance**

H. Kovich

N Engl J Med 2019;381:2087-2089

---

**ORIGINAL ARTICLES**

---

**Supplemental MRI Screening for Women with Extremely Dense Breast Tissue**

M.F. Bakker and Others

N Engl J Med 2019;381:2091-2102

---

**Randomized Trial of Three Anticonvulsant Medications for Status Epilepticus**

J. Kapur and Others

N Engl J Med 2019;381:2103-2113

---

**Trial of Satralizumab in Neuromyelitis Optica Spectrum Disorder**

T. Yamamura and Others

N Engl J Med 2019;381:2114-2124

---

**Diagnosis of Pulmonary Embolism with d-Dimer Adjusted to Clinical Probability**

C. Kearon and Others

N Engl J Med 2019;381:2125-2134

---

**Overall Survival with Osimertinib in Untreated, *EGFR*-Mutated Advanced NSCLC**

S.S. Ramalingam and Others

DOI: 10.1056/NEJMoa1913662 | November 21, 2009

---

**A Randomized, Controlled Trial of Ebola Virus Disease Therapeutics**

S. Mulangu and Others

DOI: 10.1056/NEJMoa1910993 | November 27, 2019

---

**CLINICAL PRACTICE**

---

**Essential Thrombocythemia**

A. Tefferi and A. Pardanani



---

N Engl J Med 2019;381:2135-2144

---

**REVIEW ARTICLE**

---

**Frontiers in Medicine: Genome Sequencing during a Patient's Journey through Cancer**

J. Nangalia and P.J. Campbell

N Engl J Med 2019;381:2145-2156

---

**IMAGES IN CLINICAL MEDICINE**

---

**Congenital Syphilis**

A.C. Arrieta and J. Singh

N Engl J Med 2019;381:2157

---

**Fitz-Hugh–Curtis Syndrome**

F. Guerra and D. Coletta

N Engl J Med 2019;381:e38

---

**INTERACTIVE MEDICAL CASE**

---

**Facing Uncertainty**

C. Thomas and Others

N Engl J Med 2019;381:e39

---

**CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL**

---

**Case 37-2019: A 20-Month-Old Boy with Severe Anemia**

B.M. Cummings and Others

N Engl J Med 2019;381:2158-2167

---

**EDITORIALS**

---

**Detecting Breast Cancer in Women with Dense Breasts**

D.L. Longo

N Engl J Med 2019;381:2169-2170

---

**Management of Established Status Epilepticus**

P.E. Smith

N Engl J Med 2019;381:2171-2172

---

**Monoclonal Antibody Therapy for Ebola Virus Disease**

M.M. Levine

DOI: 10.1056/NEJMe1915350 | November 27, 2019

---

**MEDICINE AND SOCIETY**

---

**Transforming Culture in Health Care**

M. Nurok and T.H. Lee

N Engl J Med 2019;381:2173-2175

---

**CORRESPONDENCE**

---

**Imbalance in T-Helper 17 Cells and Targeted Therapy in an Infant with SAM-like**

---

Syndrome

---

Trial of SAGE-217 in Patients with Major Depressive Disorder

---

Universal Testing and Treatment for HIV Infection in Botswana

---

Adrenal Crisis

---

A Terminal Event

---

Macrolide Resistance and Longer-Term Assessment of Azithromycin in MORDOR I