

Read our COVID-19 research and news.

Advertisement



Mountain ecology under climate change

Novel trophic interactions under climate change promote alpine plant coexistence

DEA/ALBERT CEOLAN/CONTRIBUTOR/GETTY IMAGES

Contents

18 DECEMBER 2020
VOL 370, ISSUE 6523

Special Issue **2020 Breakthrough of the Year**

NEWS

[Summary](#) [Full Text](#)  [PDF](#)

A divisive disease

By Kai Kupferschmidt

Science | 18 Dec 2020 : 1395-1397 | 

As scientists struggled to understand and quell COVID-19, a second pandemic of misinformation and political mayhem raged.

[Summary](#) [Full Text](#)  [PDF](#)

Ones we've lost

By Dennis Normile, Bian Huihui, Lucy Hicks, Katie Langin, Paul Voosen, Cathleen O'Grady, Jocelyn Kaiser, Richard Stone, Rodrigo Pérez Ortega, Adrian Cho, Jeffrey Mervis

Science | 18 Dec 2020 : 1398-1401 | 

Scientists, too, died in the pandemic.

[Summary](#) [Full Text](#)  [PDF](#)

Runners-up

By Robert F. Service, Jocelyn Kaiser, Paul Voosen, Daniel Clery, Michael Price, Katie Langin, Jon Cohen, Robert F. Service, Elizabeth Pennisi

Science | 18 Dec 2020 : 1402-1407 | 

Science has named nine scientific advances as runners-up for the 2020 Breakthrough of the Year.

[Summary](#) [Full Text](#)  [PDF](#)

THIS WEEK IN SCIENCE

Research in *Science* journals.


Science | 18 Dec 2020 : 1428 | 

[Full Text](#)  [PDF](#)

EDITORIAL

A breakthrough for us all

By H. Holden Thorp

Science | 18 Dec 2020 : 1381 | 

[Summary](#) [Full Text](#)  [PDF](#)

EDITORS' CHOICE

This week in other journals.

Science | 18 Dec 2020 : 1429 | 

[Full Text](#)  [PDF](#)

[Summary](#) [Full Text](#)  [PDF](#)

IN DEPTH

People with Down syndrome face high risk from coronavirus

By Meredith Wadman

Science | 18 Dec 2020 : 1384-1385 | 

Advocates call for early vaccination of group made vulnerable by genetics and immune dysfunction.

[Summary](#) [Full Text](#)  [PDF](#)

As vaccines emerge, a global waiting game begins

By Jon Cohen, Kai Kupferschmidt

Science | 18 Dec 2020 : 1385-1387 | 

Rich countries snapped up limited supplies, so protection will lag for others.

[Summary](#) [Full Text](#)  [PDF](#)

Mars lander spies the planet's deep boundaries

By Paul Voosen

Science | 18 Dec 2020 : 1387-1388 | 

Despite lack of large quakes, InSight team fixes size of crust, mantle, and core.

[Summary](#) [Full Text](#)  [PDF](#)

mRNA's next challenge: Will it work as a drug?

By Kelly Servick

Science | 18 Dec 2020 : 1388-1389 | 

A winner in the vaccine race, messenger RNA faces obstacles in therapeutics.

[Summary](#) [Full Text](#)  [PDF](#)

Five years in, Paris pact still a work in progress

By Warren Cornwall

Science | 18 Dec 2020 : 1390 | 

Countries mark anniversary by increasing commitments, but 2°C goal elusive.

[Summary](#) [Full Text](#)  [PDF](#)

LGBTQ researchers say they want to be counted

By Katie Langin

Science | 18 Dec 2020 : 1391 | 

A search for good news

By Romaric Bouveret

Science | 18 Dec 2020 : 1522 | 

[Full Text](#)  [PDF](#)

LETTERS

Transparency is key to ethical vaccine research

By Preston W. Estep, George M. Church

Science | 18 Dec 2020 : 1422-1423 | 

[Full Text](#)  [PDF](#)

Transparency is key to ethical vaccine research—Response

By Christi J. Guerrini, Jacob S. Sherkow, Michelle N. Meyer, Patricia J. Zettler

Science | 18 Dec 2020 : 1423 | 

[Full Text](#)  [PDF](#)

Transparency is key to ethical vaccine research—Response

By Arthur Caplan, Alison Bateman-House

Science | 18 Dec 2020 : 1423-1424 | 

[Full Text](#)  [PDF](#)

BOOKS ET AL.

Datafication of digital natives

By Kate Eichhorn

Science | 18 Dec 2020 : 1420 | 

An anthropologist investigates how data surveillance intersects with the 21st-century family

[Summary](#) [Full Text](#)  [PDF](#)

Science detractors and their discontents

By Christopher J. Phillips

Science | 18 Dec 2020 : 1421 | 

A nuanced history interrogates critiques leveraged against science in the United States

[Summary](#) [Full Text](#)  [PDF](#)

Best books of 2020

Science | 18 Dec 2020 : 1421 | 

[Full Text](#)  [PDF](#)

POLICY FORUM

Core commitments for field trials of gene drive organisms

We must ensure that trials are scientifically, politically, and socially robust, publicly accountable, and widely transparent

[Summary](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

PERSPECTIVES

Wildfire smoke, a potential infectious agent

By Leda N. Kobziar, George R. Thompson III

Science | 18 Dec 2020 : 1408-1410 | 

Bacteria and fungi are transported in wildland fire smoke emissions

[Summary](#) [Full Text](#)  [PDF](#)

A gatekeeper for learning

By Flavio Donato

Science | 18 Dec 2020 : 1410-1411 | 

During associative learning, the perirhinal cortex controls burst firing of sensory neurons

[Summary](#) [Full Text](#)  [PDF](#)

Adding cognitive connections to the cerebellum

By Mary E. Hatten

Science | 18 Dec 2020 : 1411-1412 | 

During evolution, duplication of subnuclei generates broader cerebellar projections

[Summary](#) [Full Text](#)  [PDF](#)

A new spin on special relativity

By Matthew W. Daniels, Mark D. Stiles


Science | 18 Dec 2020 : 1413-1414 | 

Magnetic domain walls have their own speed limit

[Summary](#) [Full Text](#)  [PDF](#)

Bespoke myelin tailored to neuron type

By Belgin Yalçın, Michelle Monje

Science | 18 Dec 2020 : 1414-1415 | 

Experience changes neural circuits through myelination of distinct neuron classes

[Summary](#) [Full Text](#)  [PDF](#)

Summary Full Text PDF

ASSOCIATION AFFAIRS

2020 AAAS Kavli Science Journalism Award winners

By Earl Lane, Emily Hughes

Science | 18 Dec 2020 : 1425 | 

Entries feature reporting on topics ranging from Ebola to the global COVID-19 pandemic

[Summary](#) [Full Text](#)  [PDF](#)

2020 AAAS Kavli Science Journalism Award winners

Science | 18 Dec 2020 : 1426 | 

[Full Text](#)  [PDF](#)

RESEARCH ARTICLES

Neuron class-specific responses govern adaptive myelin remodeling in the neocortex

By Sung Min Yang, Katrin Michel, Vahbiz Jokhi, Elly Nedivi, Paola Arlotta

Science | 18 Dec 2020 | 

Distinct classes of neurons remodel their myelination profiles to diversify circuit tuning in response to sensory experience.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Perirhinal input to neocortical layer 1 controls learning

By Guy Doron, Jiyun N. Shin, Naoya Takahashi, Moritz Drüke, Christina Bocklisch, Salina Skenderi, Lisa de Mont, Maria Toumazou, Julia Ledderose, Michael Brecht, Richard Naud, Matthew E. Larkum

Science | 18 Dec 2020 | 

Perirhinal input, predominantly to sensory cortical layer 1, controls hippocampal-dependent associative learning in mice.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Mechanism of protein-guided folding of the active site U2/U6 RNA during spliceosome activation

By Cole Townsend, Majety N. Leelaram, Dmitry E. Agafonov, Olexandr Dybkov, Cindy L. Will, Karl Bertram, Henning Urlaub, Berthold Kastner, Holger Stark, Reinhard Lührmann

Science | 18 Dec 2020 | 


A cryo-electron microscopy study reveals the structure of human pre-B^{act} spliceosomes.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Cerebellar nuclei evolved by repeatedly duplicating a conserved cell-type set

By Justus M. Kebschull, Ethan B. Richman, Noam Ringach, Drew Friedmann, Eddy Albarran, Sai Saroja Kolluru, Robert C. Jones, William E. Allen, Ying Wang, Seung Woo Cho, Huaijun Zhou, Jun B. Ding, Howard Y. Chang, Karl Deisseroth, Stephen R. Quake, Liqun Luo


Sequence diversity analyses of an improved rhesus macaque genome enhance its biomedical utility

By Wesley C. Warren, R. Alan Harris, Marina Haukness, Ian T. Fiddes, Shwetha C. Murali, Jason Fernandes, Philip C. Dishuck, Jessica M. Storer, Muthuswamy Raveendran, LaDeana W. Hillier, David Porubsky, Yafei Mao, David Gordon, Mitchell R. Vollger, Alexandra P. Lewis, Katherine M. Munson, Elizabeth DeVogelaere, Joel Armstrong, Mark Diekhans, Jerilyn A. Walker, Chad Tomlinson, Tina A. Graves-Lindsay, Milinn Kremitzki, Sofie R. Salama, Peter A. Audano, Merly Escalona, Nicholas W. Maurer, Francesca Antonacci, Ludovica Mercuri, Flavia A. M. Maggiolini, Claudia Rita Catacchio, Jason G. Underwood, David H. O'Connor, Ashley D. Sanders, Jan O. Korbel, Betsy Ferguson, H. Michael Kubisch, Louis Picker, Ned H. Kalin, Douglas Rosene, Jon Levine, David H. Abbott, Stanton B. Gray, Mar M. Sanchez, Zsofia A. Kovacs-Balint, Joseph W. Kemnitz, Sara M. Thomasy, Jeffrey A. Roberts, Erin L. Kinnally, John P. Capitanio, J. H. Pate Skene, Michael Platt, Shelley A. Cole, Richard E. Green, Mario Ventura, Roger W. Wiseman, Benedict Paten, Mark A. Batzer, Jeffrey Rogers, Evan E. Eichler
Science | 18 Dec 2020 | 

Advanced sequencing technology improves the rhesus macaque genome assembly for modeling disease.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)


The ZSWIM8 ubiquitin ligase mediates target-directed microRNA degradation

By Charlie Y. Shi, Elena R. Kingston, Benjamin Kleaveland, Daniel H. Lin, Michael W. Stubna, David P. Bartel
Science | 18 Dec 2020 | 

Some microRNA targets trigger proteolysis of Argonaute proteins, allowing the sculpting of specific microRNA levels.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

A ubiquitin ligase mediates target-directed microRNA decay independently of tailing and trimming


By Jaeil Han, Collette A. LaVigne, Benjamin T. Jones, He Zhang, Frank Gillett, Joshua T. Mendell
Science | 18 Dec 2020 | 

Some microRNA targets trigger proteolysis of Argonaute proteins, allowing the sculpting of specific microRNA levels.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

REPORTS


Relativistic kinematics of a magnetic soliton

By Lucas Caretta, Se-Hyeok Oh, Takian Fakhru, Dong-Kyu Lee, Byung Hun Lee, Se Kwon Kim, Caroline A. Ross, Kyung-Jin Lee, Geoffrey S. D. Beach
Science | 18 Dec 2020 : 1438-1442 | 

The speed of driven magnetic domain walls is fundamentally limited in analogy to special relativity.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

How directed evolution reshapes the energy landscape in an enzyme to boost catalysis

By Renee Otten, Ricardo A. P. Pádua, H. Adrian Bunzel, Vy Nguyen, Warintra Pitsawong, MacKenzie Patterson, Shuo Sui, Sarah L. Perry, Aina E. Cohen, Donald Hilvert, Dorothee Kern
Science | 18 Dec 2020 : 1442-1446 | 

[Near-unity tunneling transmission is observed for acoustic excitations independent of the barrier properties.](#)
Science | 18 Dec 2020 : 1447-1450 | 

Near-unity tunneling transmission is observed for acoustic excitations independent of the barrier properties.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Multimessenger constraints on the neutron-star equation of state and the Hubble constant

By Tim Dietrich, Michael W. Coughlin, Peter T. H. Pang, Mattia Bulla, Jack Heinzl, Lina Issa, Ingo Tews, Sarah Antier

Science | 18 Dec 2020 : 1450-1453 | 

A combined analysis of multimessenger data on neutron stars constrains their equation of state and measures the Hubble constant.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Tailored quinones support high-turnover Pd catalysts for oxidative C–H arylation with O₂

By Chase A. Salazar, Kaylin N. Flesch, Brandon E. Haines, Philip S. Zhou, Djameladdin G. Musaev, Shannon S. Stahl


Science | 18 Dec 2020 : 1454-1460 | 

A bulky quinone accelerates arene coupling by palladium without inhibiting the subsequent catalyst reoxidation.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Quantum computational advantage using photons

By Han-Sen Zhong, Hui Wang, Yu-Hao Deng, Ming-Cheng Chen, Li-Chao Peng, Yi-Han Luo, Jian Qin, Dian Wu, Xing Ding, Yi Hu, Peng Hu, Xiao-Yan Yang, Wei-Jun Zhang, Hao Li, Yuxuan Li, Xiao Jiang, Lin Gan, Guangwen Yang, Lixing You, Zhen Wang, Li Li, Nai-Le Liu, Chao-Yang Lu, Jian-Wei Pan

Science | 18 Dec 2020 : 1460-1463 | 

Quantum computational advantage is demonstrated using boson sampling with photons.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

SARS-CoV-2 D614G variant exhibits efficient replication ex vivo and transmission in vivo

By Yixuan J. Hou, Shiho Chiba, Peter Halfmann, Camille Ehre, Makoto Kuroda, Kenneth H. Dinnon III, Sarah R. Leist, Alexandra Schäfer, Noriko Nakajima, Kenta Takahashi, Rhianna E. Lee, Teresa M. Mascenik, Rachel Graham, Caitlin E. Edwards, Longping V. Tse, Kenichi Okuda, Alena J. Markmann, Luther Bartelt, Aravinda de Silva, David M. Margolis, Richard C. Boucher, Scott H. Randell, Tadaki Suzuki, Lisa E. Gralinski, Yoshihiro Kawaoka, Ralph S. Baric

Science | 18 Dec 2020 : 1464-1468 | 

The current dominant structural variant of SARS-CoV-2 appears to have evolved from the ancestral form and enhances transmissibility.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Novel trophic interactions under climate change promote alpine plant coexistence

By Patrice Descombes, Camille Pitteloud, Gaëtan Glauser, Emmanuel Defossez, Alan Kergunteuil, Pierre-Marie Allard, Sergio Rasmann, Loïc Pellissier

An ultrapotent synthetic nanobody neutralizes SARS-CoV-2 by stabilizing inactive Spike

By Michael Schoof, Bryan Faust, Reuben A. Saunders, Smriti Sangwan, Veronica Rezelj, Nick Hoppe, Morgane Boone, Christian B. Billesbølle, Cristina Puchades, Caleigh M. Azumaya, Huong T. Kratochvil, Marcell Zimanyi, Ishan Deshpande, Jiahao Liang, Sasha Dickinson, Henry C. Nguyen, Cynthia M. Chio, Gregory E. Merz, Michael C. Thompson, Devan Diwanji, Kaitlin Schaefer, Aditya A. Anand, Niv Dobzinski, Beth Shoshana Zha, Camille R. Simoneau, Kristoffer Leon, Kris M. White, Un Seng Chio, Meghna Gupta, Mingliang Jin, Fei Li, Yanxin Liu, Kaihua Zhang, David Bulkley, Ming Sun, Amber M. Smith, Alexandra N. Rizo, Frank Moss, Axel F. Brilot, Sergei Pourmal, Raphael Trenker, Thomas Pospiech, Sayan Gupta, Benjamin Barsi-Rhyne, Vladislav Belyy, Andrew W. Barile-Hill, Silke Nock, Yuwei Liu, Nevan J. Krogan, Corie Y. Ralston, Danielle L. Swaney, Adolfo García-Sastre, Melanie Ott, Marco Vignuzzi, QCRG Structural Biology Consortium, Peter Walter, Aashish Manglik

Science | 18 Dec 2020 : 1473-1479 | 

Potent neutralizers of SARS-CoV-2 are identified by screening either synthetic or llama-produced nanobodies.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

Versatile and multivalent nanobodies efficiently neutralize SARS-CoV-2

By Yufei Xiang, Sham Nambulli, Zhengyun Xiao, Heng Liu, Zhe Sang, W. Paul Duprex, Dina Schneidman-Duhovny, Cheng Zhang, Yi Shi

Science | 18 Dec 2020 : 1479-1484 | 

Potent neutralizers of SARS-CoV-2 are identified by screening either synthetic or llama-produced nanobodies.

[Editor's Summary](#) [Abstract](#) [Full Text](#)  [PDF](#) [Supplementary Materials](#)

TECHNICAL COMMENTS

Response to Comment on “Meta-analysis reveals declines in terrestrial but increases in freshwater insect abundances”

By Roel van Klink, Diana E. Bowler, Konstantin B. Gongalsky, Ann B. Swengel, Jonathan M. Chase

Science | 18 Dec 2020 | 

[Abstract](#) [Full Text](#)  [PDF](#)

Comment on “Meta-analysis reveals declines in terrestrial but increases in freshwater insect abundances”

By Marion Desquilbet, Laurence Gaume, Manuela Grippa, Régis Céréghino, Jean-François Humbert, Jean-Marc Bonmatin, Pierre-André Cornillon, Dirk Maes, Hans Van Dyck, David Goulson

Science | 18 Dec 2020 | 

[Abstract](#) [Full Text](#)  [PDF](#)

MORE FROM SCIENCE

- [Current Table of Contents](#)
- [First Release Science Papers](#)
- [Archive](#)
- [Collections](#)
- [Book and Media Reviews](#)
- [About Science](#)
 - [Mission and Scope](#)
 - [Editors and Advisory Boards](#)

- [Contact Us](#)
- [Remote Access for Current Subscribers](#)
- [Editor's Blog](#)
- [Custom Publishing](#)
- [Awards](#)
- [Order a Single Issue](#)
- [Get the Science eTOC Alert](#)
- [Submit](#)

About The Cover



COVER As the COVID-19 pandemic exploded in 2020, scientists mobilized to develop and test dozens of candidate vaccines targeting the new coronavirus. Many aim to stimulate antibodies against the virus's protruding spike proteins, which enable it to infect human cells. In record time, several vaccines showed strong evidence of efficacy, giving a beleaguered world new hope. See page 1392.

Illustration: Adam Simpson/Heart Agency

Science

Vol 370, Issue 6523
18 December 2020

[Table of Contents](#)

[Print Table of Contents](#)



Advertisement

Advertisement

Read the Latest Issue of *Science*

19 March 2021

Vol 371, Issue 6535



[Table of Contents](#)

FEATURE

Medicine's longest year

ETHICS AND DIVERSITY

Justice, diversity, and research ethics review

PLANETARY SCIENCE

Doubling down on our earthly interventions

SCI COMMUN

News at a glance

ENGINEERING

Smart cities built with smart materials

WORKING LIFE

What sparks joy

Get Our E-Alerts

Receive emails from *Science*. [See full list](#)

- Science* Table of Contents
- Science* Daily News
- Weekly News Roundup
- Science* Editor's Choice
- First Release Notification
- Science* Careers Job Seeker

India 

Email address*

Required fields are indicated by an asterisk (*)

About Us

[Journals](#)
[News from Science](#)
[Leadership](#)
[Team Members](#)
[Work at AAAS](#)

For Advertisers

[Advertising Kits](#)
[Awards and Prizes](#)
[Custom Publishing](#)
[Webinars](#)

For Authors

[Submit](#)
[Information for Authors](#)
[Editorial Policies](#)

For Librarians

[Manage Your Institutional Subscription](#)
[Information for Librarians](#)
[Request a Quote](#)
[FAQs](#)

Related Sites

[AAAS.org](#)
[EurekAlert!](#)
[Science in the Classroom](#)
[Science Magazine Japanese](#)

Help

[Access and Subscriptions](#)
[Order a Single Issue](#)
[Reprints and Permissions](#)
[Contact Us](#)
[Accessibility](#)



[Become a Member](#)

[Log In](#) [ScienceMag.org](#) 
