

# **EDUDOC SERVICES: CURRENT CONTENT**



## **CURRENT CONTENTS**

**August - 2019**



## **LIBRARY AND DOCUMENTATION DIVISION**

**NATIONAL INSTITUTE OF EDUCATION**

**National Council of Educational Research & Training**

**Sri Aurobindo Marg, New Delhi - 110016**

**Phone: 01126592316, 26592237, 26592317**

**E-mail: [dldi.ncert@gmail.com](mailto:dldi.ncert@gmail.com)**

## **Introduction**

“**Current Contents**” prepared by Library and Documentation Division aims to identify the articles published in the learned journals received by the library in the month of August 2019.

Current Contents are arranged alphabetically under the broad subject headings. It gives the details about the name of the Journal, volume, issue month and year of publication. It will be our endeavour to bring out this as a reference tool, which will make our readers aware about the current contents available in different learned journals of their subject of interest.

Current Contents will be useful to our faculty members in selecting/recommending relevant articles for their research.

Keeping in mind the integration of ICT and Digitisation, attempt has been made to provide the Web-link of the current issues, which will facilitate the readers to access the articles, except the ‘\*’ marked journal titles

We eagerly await to received your views and comments.

(Prof. Saroj Yadav)  
Chairperson, LDD,  
NCERT, New Delhi

Sr. No.	Name of Journals	Vol.	Issue	Month	Year	Pages
<b>Biology</b>						
1.	<u>Biochemistry and Molecular Biology Education</u>	47	1 2 4	Jan-Feb Mar-Apr Jul-Aug	2019	6-11
<b>Economics</b>						
2.	Economist	432	9153 9154 9155 9156 9157	27 Jul 3 Aug 10 Aug 17 Aug 24 Aug	2019	17-26
3.	<u>Journal of Economic Education</u>	50	3	Jul-Sep	2019	45
<b>Education</b>						
4.	<u>Educational Policy</u>	33	4 5	Jun Jul	2019	29&31
5.	<u>International Journal of Inclusive Education</u>	23	7-8	Jul-Aug	2019	35
6.	<u>Journal of Educational Measurement</u>	56	2	Summer	2019	52
<b>Educational Psychology</b>						
7.	Journal of Educational Psychology	111	5 6	Jul Aug	2019	46-49
<b>Educational Research</b>						
8.	शैक्षणिक संदर्भ	42	65(122)	May-Jun	2019	98
9.	<u>American Educational Research Journal</u>	56	3	Jun	2019	1
10.	<u>Applied Measurement in Education</u>	32	3	Jul-Sep	2019	4
11.	<u>Educational Evaluation and Policy Analysis</u>	41	2	Jun	2019	27
12.	<u>Educational Measurement: Issues and Practice</u>	38	2	Summer	2019	28
13.	<u>Review of Educational Research</u>	89	3	Jun	2019	97
14.	<u>Scandinavian Journal of Educational Research</u>	63	3 5	Apr Aug	2019	99-100
<b>Environmental Education</b>						
15.	Resurgence & Ecologist		313 314 315	Mar-Apr May-Jun Jul-Aug	2019	91-96

<b>Geography</b>						
16.	<u>Journal of Geography</u>	118	4	Jul-Aug	2019	53
17.	National Geographic Magazine	6 7	12 1	Jul Aug	2019	66-69
<b>Higher Education</b>						
18.	University News	57	29 30 31 32 33	22 Jul 29 Jul 5 Aug 12 Aug 19 Aug	2019	118-123
<b>Library Science</b>						
19.	Library Herald : Journal of the Delhi Library Association	57	2	Jun	2019	59
<b>Linguistics</b>						
20.	English Teaching Professional		123	Jun	2019	30
21.	Indian Literature: Sahitya Akademi's Bi-Monthly Journal	63	3(311)	May-Jun	2019	33-34
22.	Language Problems & Language Planning	42	3	Dec	2018	57-58
23.	<u>Linguistics and Education</u>	51		Jun	2019	60
24.	<u>Loksanskritam (Sanskrit)</u>	35	2	Aug	2019	61-62
25.	<u>Natural Language and Linguistic Theory</u>	37	3	Aug	2019	70
<b>Mathematics Education</b>						
26.	<u>Journal of Mathematics Teacher Education</u>	22	4	Aug	2019	54
27.	Mathematics Teaching		267	Jul	2019	65
<b>Physics</b>						
28.	American Journal of Physics	87	8	Aug	2019	2-3
29.	<u>Contemporary Physics</u>	60	1	Mar	2019	13
30.	<u>Physics Today</u>	72	7	Jul	2019	76-77
31.	<u>Physics World</u>	32	8	Aug	2019	78
32.	<u>Pramana: Journal of Physics</u>	93	1 2	Jul Aug	2019	79-81
<b>Psychology</b>						
33.	Journal of Applied Developmental Psychology	63	-	Jul-Aug	2019	36
34.	<u>Journal of Applied Social Psychology</u>	49	6 7	Jun Jul	2019	37-38

35.	<u>Journal of Counseling &amp; Development</u>	97	3	Jul	2019	39-40
36.	<u>Journal of Counseling Psychology</u>	66	4	Jul	2019	41-43
37.	<u>Journal of Cross-Cultural Psychology</u>	50	5	Jun	2019	44
38.	<u>Psychological Bulletin</u>	145	4 6 7	Apr Jun Jul	2019	82-84
39.	<u>Psychological Review</u>	126	4	Jul	2019	85
40.	<u>Psychology in the Schools</u>	56	6 7	Jul Aug	2019	86-87
<b>Science</b>						
41.	<u>Current Science</u>	117	2	25 Jul	2019	14-16
42.	<u>New Scientist</u>	243	3237 3238 3239 3240 3241	6 Jul 13 Jul 20 Jul 27 Jul 3 Aug	2019	71-75
43.	<u>Science</u>	365	6448 6449 6450 6451 6452	5 Jul 12 Jul 19 Jul 28 Jul 2 Aug	2019	103-112
<b>Science Education</b>						
44.	<u>Journal of Research in Science Teaching</u>	56	6	Aug	2019	56
45.	<u>Journal of the Learning Science</u>	28	3	Jul-Aug	2019	51
46.	<u>Resonance: Journal of Science Education</u>	24	7 8	Jul Aug	2019	89-90
47.	<u>Science Education</u>	103	4	Jul	2019	113-114
48.	<u>Scientific American</u>	321	2	Aug	2019	115-116
49.	<u>School Science Review</u>	100	373	Jun	2019	101-102
<b>Social Science</b>						
50.	<u>Biblio</u>	24	7-9	Jul-Sep	2019	5
51.	<u>Man and Development *</u>	41	2	Jun	2019	63
52.	<u>Man and Life</u>	45	1-2	Jan-Jun	2019	64
53.	<u>Seminar</u>		720	Aug	2019	117
54.	<u>Young Children</u>	74	3	Jul	2019	124-125
<b>Special Education</b>						
55.	<u>European Journal of Special Needs Education</u>	34	4	Oct	2019	32

56.	Remedial and Special Education	40	3	Jun	2019	88
	<b>Teacher Education</b>					
57.	<u>Journal of Education for Teaching</u>	44	5	Dec	2018	50
58.	<u>Journal of Human Values</u>	25	2	May	2019	
59.	<u>Journal of Peace Education</u>	16	2	Aug	2019	55

1

# American Educational Research Journal

Volume 56, Number 3—June 2019

- 603 “What Am I Doing to Be a Good Ancestor?": An Indigenized Phenomenology of Giving Back Among Native College Graduates  
*Nicole Alia Salis Reyes*
- 638 “Common” Instruction? Logics of Ability and Teacher Decision Making Across Tracks in the Era of Common Standards  
*Emily M. Hodge*
- 676 Building Linguistically Integrated Classroom Communities: The Role of Teacher Practices  
*Amanda K. Kibler, Lauren Molloy Elreda, Vonna L. Hemmler, Miriam R. Arbeit, Rebecca Beeson, and Haley E. Johnson*
- 716 Politicization in Process: Developing Political Concepts, Practices, Epistemologies, and Identities Through Activist Engagement  
*Joe Curnow, Amil Davis, and Lila Asber*
- 753 Teachers’ Voices: Perceptions of Effective Professional Development and Classwide Implementation of Self-Regulated Strategy Development in Writing  
*Debra McKeown, Mary Brindle, Karen R. Harris, Karin Sandmel, Trisha D. Steinbrecher, Steve Graham, Kathleen Lynne Lane, and Wendy Peia Oakes*
- 792 How Do Teachers Make Sense of Data in the Context of High-Stakes Decision Making?  
*Kristin Vanlommel and Kim Schildkamp*
- 822 Examining How Stakeholders at the Local, State, and National Levels Made Sense of the Changed Kindergarten  
*Christopher P. Brown, Joanna Englehardt, David P. Barry, and Da Hei Ku*
- 868 Who Is Here to Help Me? The Work-Related Social Networks of Staff of Color in Two Mid-Sized Districts  
*Travis J. Bristol and Matthew Shirrell*
- 899 Involvement Practices, Socioeconomic Status, and Student Science Achievement: Insights From a Typology of Home and School Involvement Patterns  
*Cheng Yong Tan*
- 925 How College Students Use Advanced Placement Credit  
*Brent J. Evans*
- 955 Under What Conditions Do School Districts Learn From External Partners? The Role of Absorptive Capacity  
*Caitlin C. Farrell, Cynthia E. Coburn, and Seonae Chong*
- 995 Toward Equity in Mathematics Education for Students With Dis/abilities: A Case Study of Professional Learning  
*Paulo Tan and Kathleen King Thorius*
- 1033 “So Much of My Very Soul”: How Youth Organizers’ Identity Projects Pave Agentive Pathways for Civic Engagement  
*Sonia M. Rosen*

Handwritten notes and stamps, including a date stamp: JUN 18 2019.



Cover figure: The rendezvous of the Apollo 11 lunar module with the command/service module. See the article on p. 627 for explanations of the counter-intuitive trajectories that are necessary to bring together two orbiting objects.

**BACK OF THE ENVELOPE**

- 613 Low-entropy expressions *Sanjoy Mahajan*

**RESOURCE LETTER**

- 616 Resource Letter: GP-1: Gender and Physics  
*Jennifer Blue,  
Adrienne Traxler,  
and Geraldine  
Cochran*

**PAPERS**

- 627 The delicate dance of orbital rendezvous *Bradley W. Carroll*  
638 Maximal angular correlation in  $\gamma - \gamma$  coincidences: A quantitative study *Filipe Moura*  
643 Note on the history effect in fluid mechanics *Humphrey J. Maris*  
646 Free fall through the rotating and inhomogeneous Earth *Stefan Isermann*  
654 Data-driven decision making in an introductory physics lab  
*John R. Walkup,  
Roger A. Key,  
Patrick R. M. Talbot,  
and Michael A.  
Walkup*  
660 Electric field lines: The implications of students' interpretation on their understanding of the concept of electric field and of the superposition principle *Esmeralda Campos,  
Genaro Zavala,  
Kristina Zuza,  
and Jenaro Guisasola*  
668 Why physical understanding should precede the mathematical formalism—Conditional quantum probabilities as a case-study *Yakir Aharonov,  
Eliahu Cohen,  
and David H. Oaknin*  
674 Three-line derivation of the Thomas precession *Paweł Lewulis  
and Andrzej Dragan*

**NOTES AND DISCUSSIONS**

- 675 Alternative statements of the Rayleigh monotonicity law for linear time-invariant resistor networks driven by only voltages or only currents  
*Seppo J. Karrila  
and Alex Karrila*

- 679 Comment on "Peculiarities in the gravitational field of a filamentary ring" [Am. J. Phys. 87, 384–394 (2019)]
- 680 Entropy and unavailable energy

*J. West*

*P.-M. Binder,  
Dallas K. Tada, and  
Cooper B. Howlett*

**COMPUTATIONAL PHYSICS**

- 682 The hardwall method of solving the radial Schrödinger equation and unmasking hidden symmetries

*Siu A. Chin  
and John Massey*

**BOOK REVIEWS**

- 687 *Isaac Newton and Natural Philosophy* by Nicolo Guicciardini
- 688 Books Received

*Michael Nauenberg*

Find your future at  
[aapt.org/careercenter](http://aapt.org/careercenter)

**AAPT**  
PHYSICS EDUCATION

**Career Center** is your resource for  
**physics teaching jobs.**

4

Volume 32, Number 3

July–September 2019

# APPLIED MEASUREMENT IN EDUCATION

**SPECIAL ISSUE**

**The Evolution of Cognitive Ability Tests and Score Interpretation**

*Guest editor: A. Alexander Beaujean*

4

<b>INTRODUCTION</b> Empirical Considerations on Intelligence Testing and Models of Intelligence: Updates for Educational Measurement Professionals <i>Kurt F. Geisinger</i>	193
<b>REVIEWS</b> The One and the Many: Enduring Legacies of Spearman and Thurstone on Intelligence Test Score Interpretation <i>A. Alexander Beaujean and Nicholas F. Benson</i>	198
Critically Reflecting on the Origins, Evolution, and Impact of the Cattell-Horn-Carroll (CHC) Model <i>Ryan J. McGill and Stefan C. Dombrowski</i>	216
Challenges to the Cattell-Horn-Carroll Theory: Empirical, Clinical, and Policy Implications <i>Gary L. Canivez and Eric A. Youngstrom</i>	232
Deconstructing CHC <i>John D. Wasserman</i>	249

(5) 22/8/19  
 प्रकाशन परामर्श  
 पुस्तकालय और प्रकाशन विभाग  
 240 पी० एच० एच०  
 14 दिल्ली-110

# Biblio:

A REVIEW OF BOOKS

### Founder Editors

Dileep Padgaonkar †(1944 - 2016)  
 Arvind N Das † (1948 - 2000)  
 Darryl D'Monte † (1944 - 2019)

### Consulting Editor

Rukmini Bhaya Nair

### Consulting Deputy Editor

Amita Baviskar

### Consulting Associate Editor

Manisha Sethi

### Managing Editor & Publisher

Brinda Datta

### Editorial Advisory Board:

Seema Alavi, Alice Albinia,  
 Tabish Khair, Prem Shankar Jha,  
 Sukumar Muralidharan.

### Subscription & Sales Manager:

Mohan Singh

Subscription and Editorial

Address: 2204 Sector D 2,

Vasant Kunj, New Delhi - 110070

Tel: 91-11- 2689 2429

E-mail: infoatbiblio@gmail.com

Owned, printed and published by  
 Brinda Datta, 2204 Sector D 2,  
 Vasant Kunj, New Delhi - 110070.  
 Printed at Archana Advertising Pvt.  
 Ltd., C 78 Okhla Industrial Area,  
 Phase 1, New Delhi - 110 020.  
 Editor: Brinda Datta  
 All rights reserved. Reproduction in  
 any manner without the permission  
 of the publisher is prohibited.  
 RNI No. 65560/96  
 ISSN No. 0971-8982

The views expressed by the  
 contributors are their own and do  
 not reflect the editorial policy of  
*Biblio: A Review of Books*

### Forthcoming in Biblio

#### Fiction:

*The Carpet Weaver*  
 by Nemat Sadat

*Small Days and Nights*  
 by Tishani Doshi

*Plastic Emotions* by Shiromi Pinto

*Blue is Like Blue: Stories*  
 by Vinod Kumar Shukla;  
 trs. by Arvind Krishna Mehrotra  
 and Sara Rai

#### Non-Fiction:

*This Land is Our Land:  
 An Immigrant's Manifesto*  
 by Suketu Mehta

*Malevolent Republic*  
 by KS Komireddi

*The Truth About Us*  
 by Sanjoy Chakravorty

*Nightmarch: A Journey into  
 India's Naxal Heartlands*  
 by Alpa Shah

*Reel India: Cinema Off the Beaten  
 Track* by Namrata Joshi

#### Wildlife & Environment:

*Wild Himalaya* by Stephen Alter  
*Bird Business*  
 by Rohan Chakravarty

*Cities and Canopies* by Harini  
 Nagendra and Seema Mundoli

*Rewilding* by Bahar Dutt

## C O N T E N T S

VOL. XXIV NOS. 7-9

40 PAGES

JULY-SEPTEMBER 2019

- |    |  |                        |
|----|--|------------------------|
| 7  | Superior: The Return of Race Science by Angela Saini   | Mini Kapoor            |
| 8  | The Politics of Empire at the Accession of George III: The East India Company and the Crisis and Transformation of Britain's Imperial State by James M. Vaughn | Sunit Singh            |
| 10 | Whitehall and the Black Republic: A Study of Britain's Attitude Towards Liberia 1914 - 1939 by Jyotirmoy Pal Chaudhuri   | Hari Vasudevan         |
| 11 | The English Maharani: Queen Victoria and India by Miles Taylor   | Amar Farooqui          |
| 12 | Jallianwala Bagh, 1919: The Real Story by Kishwar Desai; Jallianwala Bagh: An Empire of Fear and the Making of the Amritsar Massacre by Kim A. Wagner          | Harish Trivedi         |
| 14 | Jallianwala Bagh: Literary Responses in Prose and Poetry introduced and edited by Rakhshanda Jalil   | Navdeep Suri           |
| 16 | Modern South India: A History from the 17th Century to Our Times by Rajmohan Gandhi  | Aparna Balachandran    |
| 17 | Ivory Throne: Chronicles of the House of Travancore and Rebel Sultans: The Deccan from Khilji to Shivaji by Manu S. Pillai                                     | Ranjit Nair            |
| 18 | Eric Hobsbawm: A Life in History by Richard J. Evans   | Achin Vanaik           |
| 20 | Mind Without Fear by Rajat Gupta   | Devangshu Datta        |
| 22 | Economic Theory and Policy amidst Global Discontent: Essays in Honour of Deepak Nayyar edited by Ananya Ghosh Dastidar, Rajeev Malhotra and Vivek Suneja       | Prem Shankar Jha       |
| 24 | The Third Pillar: How Markets and the State Leave the Community Behind by Raghuram G. Rajan  | Pulin B Nayak          |
| 26 | What the Economy Needs Now edited by Abhijit Banerjee, Gita Gopalan, Raghuram Rajan and Mihir S. Sharma  | Mohan Guruswamy        |
| 27 | The Lost Decade 2008-18: How India's Growth Story Devolved into Growth without a Story by Puja Mehra   | Rajeev Malhotra        |
| 28 | Business and Politics in India edited by Christophe Jaffrelot, Atul Kohli and Kanta Murali   | TK Arun                |
| 30 | Jobonomics: India's Employment Crisis and What the Future Holds by Goutam Das  | Bibek Debroy           |
| 32 | Gun Island: A Novel by Amitav Ghosh  | Supriya Chaudhuri      |
| 33 | The Night of Broken Glass by Feroz Rather  | Abir Bazaz             |
| 34 | Pilgrimage by Ira Singh  | Amrita Sen             |
| 37 | Shabryar: A Life in Poetry by Rakhshanda Jalil   | Mohammad Asim Siddiqui |
| 38 | The Gollanz Book of South Asian Science Fiction edited by Tarun K. Saini   | Kajal Basu             |

COVER: Detail of the painting 'Vasco da Gama before the Zamorin of Calicut' by Velosa Salgado, Sociedade de Geografia de Lisboa. (Source: Wikimedia Commons)



BIRLA  
CORPORATION  
LIMITED

THE SPECIAL SECTION ON POLITICAL ECONOMY  
IS SUPPORTED BY BIRLA CORPORATION LIMITED

1 year Individual online subscription: Rs 1000 / USD 15

2 year Individual online subscription: Rs 1500 / USD 22

3 year Individual online subscription: Rs 2000 / USD 30

1 year Institutional online subscription: Rs 2000 / USD 30

# Biochemistry and Molecular Biology Education

JANUARY/FEBRUARY 2019  
VOLUME 47, NO. 1

6



## TABLE OF CONTENTS

(This issue is available in electronic form at <http://www.BAMBE.net>.)

### ARTICLES

- **Highly Effective Active Learning in a One-Year Biochemistry Series with Limited Resources (pages 7–15)**  
*Norbert Reich and Yuedong Wang*  
Published online 13 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21186
- **A Practical Guide to Developing Virtual and Augmented Reality Exercises for Teaching Structural Biology (pages 16–24)**  
*Maria-Jose Garcia-Bonete, Maja Jensen and Gergely Katona*  
Published online 26 November 2018 in Wiley Online Library | DOI: 10.1002/bmb.21188
- An Idea to Explore: Understanding Redox Reactions in Biochemistry (pages 25–28)**  
*Raymond Ochs*  
Published online 22 November 2018 in Wiley Online Library | DOI: 10.1002/bmb.21189
- **Barriers and Strategies: Implementing Active Learning in Biomedical Science Lectures (pages 29–40)**  
*Alice M. Kim, Caroline J. Speed and Janet O. Macaulay*  
Published online 8 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21190
- **The Effect and Influence of Undergraduate Research on Medical Undergraduates in China (pages 41–50)**  
*Qiangru Huang, Zhihao Yue, Junqing Lin, Yangyi Zhang, Shuang Yuan, Quan Zhuang and Cheng Peng*  
Published online 21 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21194
- Biology Graduate Teaching Assistants as Novice Educators: Are There Similarities in Teaching Ability and Practice Beliefs Between Teaching Assistants and K–12 Teachers? (pages 51–57)**  
*Grant E. Gardner and Jennifer Parrish*  
Published online 13 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21196
- **Is Learning Outcome after Team Based Learning Influenced by Gender and Academic Standing? (pages 58–66)**  
*Saswati Das, Kajal Nandi, Priyanki Baruah, Sajib K. Sarkar, Binita Goswami and Bidhan C. Koner*  
Published online 20 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21197
- **Guided Inquiry Activity Linking Thermodynamic Parameters of Protein Unfolding to Structure Using Differential Scanning Fluorimetry Data in the Biophysical Chemistry Classroom (pages 67–75)**  
*Patrick Emery, Ellen J. Yeziarski and Richard C. Page*  
Published online 22 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21198

Cover Art  
Image created by Don Voet

■ Online version of this article contains Supporting Information.

- S Computational Strategy for Visualizing Structures and Teaching Biochemistry (pages 76–84)**  
*Paula Alvarez Abreu, Karina de Lima Carvalho, Vitor Won-Held Rabelo and Helena Carla Castro*  
Published online 22 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21199

STUDENT CENTERED EDUCATION

- S Teaching Metabolism with Scientific Articles: A New Approach (pages 85–92)**  
*Camila Cicuto, Maurícus Pazinato and Bayardo Torres*  
Published online 26 November 2018 in Wiley Online Library | DOI: 10.1002/bmb.21187

LABORATORY EXERCISES

- S A Laboratory Work to Introduce Biochemistry Undergraduate Students to Basic Enzyme Kinetics-Alkaline Phosphatase as a Model (pages 93–99)**  
*Johanna G. Miquet, Lorena González, Ana I. Sotelo and Rodolfo M. González Lebrero*  
Published online 21 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21195

- Using Fluorescent Lipids Contributes to the Active Learning of Principles Underlying Lipid Signaling (pages 100–105)**  
*Micaela Peppino Margutti, Matias Reyna and Ana L. Villasuso*  
Published online 25 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21201

THE LIGHTER SIDE

- Teaching the Telephone Book (page 106)**  
*Daniel J. Klionsky*  
Published online 11 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21193

NOTICES

- Meetings Calendar (page 107)**  
Published online in Wiley Online Library | DOI: 10.1002/bmb.21211



Scan to read current issue in Online Library.

# Biochemistry and Molecular Biology Education

MARCH/APRIL 2019  
VOLUME 47, NO. 2

8



## TABLE OF CONTENTS

(This issue is available in electronic form at <http://www.BAMBEEd.net>.)

### ARTICLES

**A Novel Grading Strategy for Team-Based Learning Exercises in a Hands-on Course in Molecular Biology for Senior Undergraduate Underrepresented Students in Medicine Resulted in Stronger Student Performance (pages 115–123)**

*Gonzalo A. Carrasco, Kathryn C. Behling and Osvaldo J. Lopez*

Published online 27 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21200

- ☐ **Characterization of the Recombinant (*R*)- and (*S*)-Hydroxypropyl-Coenzyme M Dehydrogenases: A Case Study to Augment the Teaching of Enzyme Kinetics and Stereoselectivity (pages 124–132)**

*Daniel D. Clark*

Published online 28 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21202

- ☐ **Creating Custom Foldit Puzzles for Teaching Biochemistry (pages 133–139)**

*Lorna Dsilva, Shubhi Mittal, Brian Koeprnick, Jeff Flatten, Seth Cooper and Scott Horowitz*

Published online 14 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21208

### STUDENT CENTERED EDUCATION

**Inconsistencies in Some Common Terms and Notations in Enzymology: Textbook Examples and Suggestions (pages 140–144)**

*Aditya Arya and Amit Kumar*

Published online 25 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21204

### LABORATORY EXERCISES

- ☐ **An Undergraduate Laboratory Experience Using CRISPR-cas9 Technology to Deactivate Green Fluorescent Protein Expression in *Escherichia coli* (pages 145–155)**

*Jay N. Pieczynski, Amber Deets, Alexis McDuffee and H. Lynn Kee*

Published online 21 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21206

**Exploring Ligand–Protein Interaction: A Laboratory Exercise on Herbicide Binding to Plasma Transport Protein (pages 156–160)**

*Amira Adlin Roslan and Saad Tayyab*

Published online 10 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21207

- ☐ **An Undergraduate Laboratory on RNA Sequencing Analysis of Bacterial Gene Expression (pages 161–167)**

*Kevin T. Militello and Josephine A. Reinhardt*

Published online 25 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21212

Cover Art  
Image created by Don Voet

☐ Online version of this article contains Supporting Information.

**A Designed Experiment: Polymorphism Analysis of Angiotensin-Converting Enzyme Gene from Human Buccal Epithelial Cells (pages 168–174)**

*Li Jiao, Li Xueli, Shi Xiujian, Jia Song, Xu Jie, Lv Lixia, Yang Wenzhuo and Xu Lei*  
Published online 29 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21215

**ASSESSMENT TOOLS AND DISCUSSIONS**

**Teaching Methods for Microbiology in Saudi Arabia (pages 175–178)**

*Fuad Ameen*  
Published online 12 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21209

**Development and Validation of the Biotechnology Literacy Test (pages 179–188)**

*Esra Açıkgül Firat and Mustafa S. Köksal*  
Published online 8 February 2019 in Wiley Online Library | DOI: 10.1002/bmb.21216

**BIOTECHNOLOGY EDUCATION**

**It Is Time for a New Direction in Biotechnology Education Research (pages 189–200)**

*Ola Nordqvist and Henrik Aronsson*  
Published online 25 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21214

**MULTIMEDIA IN BIOCHEMISTRY AND MOLECULAR BIOLOGY EDUCATION**

**OligoCOOL: A Mobile Application for Nucleotide Sequence Analysis (pages 201–206)**

*Babak Khorsand, Anahita Khammari, Niloofar Shirvanizadeh, Javad Zahiri and Seyed Shahriar Arab*  
Published online 25 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21213

**COMPUTER SOFTWARE**

**A Convenient Tool for Bivariate Data Analysis and Bar Graph Plotting with R (pages 207–210)**

*Andreas Hofmann, Megan Cross, Malte A. Karow, Jan H. Straub, Christoph S. Clemen and Ludwig Eichinger*  
Published online 10 January 2019 in Wiley Online Library | DOI: 10.1002/bmb.21205

**THE LIGHTER SIDE**

**Song: I Love Ketone Bodies (to the Tune of “Shape of you”) (page 211)**

*Derek T. McLachlin*  
Published online 27 December 2018 in Wiley Online Library | DOI: 10.1002/bmb.21203

**NOTICES**

**Meetings Calendar (page 212)**

Published online in Wiley Online Library | DOI: 10.1002/bmb.21233

Scan to read current issue in Online Library.



# Biochemistry and Molecular Biology Education

JULY/AUGUST 2019  
VOLUME 47, NO. 4

10



## TABLE OF CONTENTS

(This issue is available in electronic form at <http://www.BAMBE.net>.)

### EDITORIAL

#### **Harnessing Interdisciplinary Education in Biochemistry and Molecular Biology (page 369)**

*Janet Olwyn Macaulay*

Published online 27 June 2019 in Wiley Online Library | DOI: 10.1002/bmb.21283

### ARTICLES

#### **Plagiarism or Not? Investigation of Turnitin®-Detected Similarity Hits in Biology Laboratory Reports (pages 370–379)**

*Tricia Bertram Gallant, Madeleine Picciotto, Goran Bozinovic and Ella Tour*

Published online 28 March 2019 in Wiley Online Library | DOI: 10.1002/bmb.21236

#### **Describing Teacher Conceptions of Technology in Authentic Science Inquiry Using Technological Pedagogical Content Knowledge as a Lens (pages 380–387)**

*Chandrani Mishra, Soo Jung Ha, Loran Carleton Parker and Kari L. Clase*

Published online 9 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21242

#### **Invisible Signals from the Underground: A Practical Method to Investigate the Effect of Microbial Volatile Organic Compounds Emitted by Rhizobacteria on Plant Growth (pages 388–393)**

*Lorena del Rosario Cappellari, Julieta Chiappero and Erika Banchio*

Published online 9 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21243

#### **Greetings from Foodland: Teaching Biochemistry to BS Students in Food-Related Courses in Italy (pages 394–403)**

*Stefania Iametti, Alberto Barbiroli, Mauro Marengo and Francesco Bonomi*

Published online 15 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21245

#### **Google Classroom as a Learning Management System to Teach Biochemistry in a Medical School (pages 404–407)**

*Sambit Dash*

Published online 17 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21246

#### **Exploring the Molecular Genetic Foundations of Cancer Biology and How Biomedical Advances Are Made in an Advanced Undergraduate Course (pages 408–416)**

*Stephen Alexander and Mark Hannink*

Published online 15 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21247

Cover Art  
Image created by Don Voet

Online version of this article contains Supporting Information.

**S Making it Stick: A CURE Designed to Introduce Students to the Scientific Process and the Host Response to Foreign Materials (pages 417–425)**

*Joshua B. Slee and Jacqueline S. McLaughlin*

Published online 19 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21248

**S Visualization of Giant Virus Particles and Development of “VIRAMOS” for High School and University Biology Course (pages 426–431)**

*Motohiro Akashi, Sho Fukaya, Chieko Uchiyama, Keita Aoki and Masaharu Takemura*

Published online 25 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21249

**S Flexible and Modular 3D-Printed Peptide Models (pages 432–437)**

*Sean M. Kerwin*

Published online 26 April 2019 in Wiley Online Library | DOI: 10.1002/bmb.21250

**CURRICULUM DEVELOPMENT**

**S Bacterial Cellobiose Metabolism: An Inquiry-Driven, Comprehensive Undergraduate Laboratory Teaching Approach to Promote Investigative Learning (pages 438–445)**

*Gopal R. Periyannan*

Published online 28 March 2019 in Wiley Online Library | DOI: 10.1002/bmb.21237

**S When Both  $K_m$  and  $V_{max}$  Are Altered, Is the Enzyme Inhibited or Activated? (pages 446–449)**

*Todd P. Silverstein*

Published online 25 March 2019 in Wiley Online Library | DOI: 10.1002/bmb.21235

**LABORATORY EXERCISES**

**S Understanding Plant Nitrogen Nutrition Through a Laboratory Experiment (pages 450–458)**

*Francisco Ortigosa, José M. Valderrama-Martín, Concepción Ávila, Francisco M. Cánovas and Rafael A. Cañas*

Published online 25 March 2019 in Wiley Online Library | DOI: 10.1002/bmb.21239

**S Analysis of Kombucha to Teach Biochemical Concepts and Techniques to Undergraduate Students (pages 459–467)**

*Kaitlin B. Applegate, Patrick R. Cheek and Jennifer K. Inlow*

Published online 20 March 2019 in Wiley Online Library | DOI: 10.1002/bmb.21240

**S Making Glue from Seeds and Gums: Working with Plant-Based Polymers to Introduce Students to Plant Biochemistry (pages 468–475)**

*Thiya Mukherjee, Ruben Lerma-Reyes, Kyle A. Thompson and Kathrin Schrick*

Published online 10 May 2019 in Wiley Online Library | DOI: 10.1002/bmb.21252

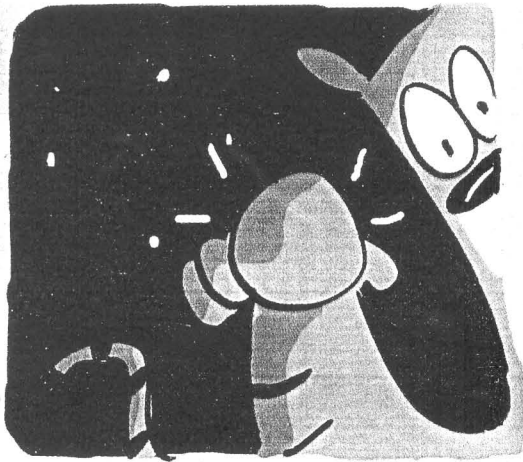
**STUDENT CENTERED EDUCATION**

**Individual Identification and Correction of Mistakes in Statements of Biochemical Significance: An Effective Learning Process for Graduate Medical Students (pages 476–480)**

*Zachariah Bobby, M. R. Radhika, K. Srilatha, U. Nithin Kumar and S. Kavitha*

Published online 29 March 2019 in Wiley Online Library | DOI: 10.1002/bmb.21241

# चक्मक



## इस बार

चुआ-चुआकर खाई - रावेन्द्रकुमार रवि	1
पकड़ा गया बाघ! - रोहन चक्रवर्ती	2
गोपी गवैया बाघा बजैया - उपेन्द्रकिशोर रायचौधरी	4
खुशियों का शहर माण्डू - दिलीप चिंचालकर	8
गणित है मजेदार	12
तुम भी बनाओ - मॉन्स्टर बुकमार्क	14
किट्टू उड़नछू! - हर्षिका उदासी	15
क्यों-क्यों?	18
बगीचा-ए-रसोई - नेचर कॉन्ज़र्वेशन फाउण्डेशन	22
सवाल के बवाल - हर्षवर्धन कुमार	24
भारतीय सेना के साथ पाँच दिन - रितिका गौर	25
कुछ लोगों को मच्छर ज्यादा क्यों काटते हैं?	28
बटरफ्लाई - बाणीप्रसन्न	29
तुम भी जानो	30
विस्थापन से प्रभावित समुदाय व बच्चे - सबीना खान	31
मेश पन्न	34
मेमना की होली - शीतल कुमारी	39
भूल-भुलैया	40
माथापच्ची	41
चित्रपहेली	43

प्रकाशक प्रभाग  
 एकलव्य और प्रलेखन प्रभाग  
 30 30 30 30 30

सम्पादन  
विनता विश्वनाथन

डिजाइन  
कनक शशि

सह सम्पादक  
कविता तिवारी  
सजिता नायर

सलाहकार  
सी एन सुब्रह्मण्यम  
शशि सबलोक

सम्पादकीय सहयोग  
भरत त्रिपाठी

विज्ञान सलाहकार  
सुशील जोशी

एकलव्य

वितरण  
अनक राम साहू  
सहयोग  
कमलेश यादव

एक प्रति : ₹ 50  
वार्षिक : ₹ 500  
तीन साल : ₹ 1350  
आजीवन : ₹ 6000  
सभी डाक खर्च हम देंगे

चन्दा (एकलव्य के नाम से बने) मनीऑर्डर/चेक से भेज सकते हैं। एकलव्य भोपाल के खाते में ऑनलाइन जमा करने के लिए विवरण: बैंक का नाम व पता - स्टेट बैंक ऑफ इण्डिया, महावीर नगर, भोपाल खाता नम्बर - 10107770248 IFSC कोड - SBIN0038867 कृपया खाते में राशि डालने के बाद इसकी पूरी जानकारी accounts.pitara@eklavya.in पर जरूर दें।

एकलव्य फाउण्डेशन, जाटखेड़ी, फॉर्च्यून कस्तूरी के पास, भोपाल, मध्य प्रदेश 462 026, फोन: +91 755 2977770 से 3 तक  
email - chakmak@eklavya.in, circulation@eklavya.in, www.chakmak.eklavya.in, www.eklavya.in

अगस्त 2019  
चक्मक बाल विज्ञान पत्रिका

CONTENTS

Review articles

- 1 Quantum mechanics and classical light  
*Thomas Konrad and Andrew Forbes*
- 23 Extragalactic background light: inventory of light throughout the cosmic history  
*Kalevi Mattila and Petri Väisänen*
- 45 A revolution in science: the eclipse expeditions of 1919  
*Peter Coles*

Essay reviews

- 60 Reflections on the Scientific Method at the beginning of the twenty-first century  
*Juan A. Añel*
- 63 The exoplanet handbook, 2nd edition  
*B. Ishak*
- 66 Quantum field theory lectures of Sidney Coleman  
*Stephen J. Blundell*

69 Book reviews

28/8/19  
 प्रलेखन प्रभाग  
 मुद्रणकालय और प्रलेखन प्रभाग  
 एच 0 सी 0 आ 0 एच 0 एच 0  
 आई दिल्ली-16

**Cover illustrations: Top left** provided by C. Couteau from **'Spontaneous parametric down-conversion'**, *Contemporary Physics* (2018), 59:3, 291–304. Section of Figure 1. (a) Feynman's diagram of SPDC where one photon at energy  $\hbar\omega_3$  splits into two twin photons at energies  $\hbar\omega_2$  and  $\hbar\omega_1$  and (b) representation of energy conservation of SPDC, (c) is the representation of momentum conservation of SPDC and (d) is a schematic of SPDC where a UV pump laser generates red SPDC photons coming out of the crystal in two cone shapes.

**Middle left** provided by D. R. Bowler from **'Building bridges: matching density functional theory with experiment'**, *Contemporary Physics* (2018), 59:4, 377–390. Section of Figure 3. The Haiku model for the Bi nanolines, seen in perspective. This slab model has ten layers of silicon, with the base fixed and terminated in hydrogen to mimic semi-infinite bulk. The normal tetrahedral bonding of silicon is clear in the lower layers. The significant reconstruction below the bismuth dimers, shown in purple, is formed of five-membered and seven-membered rings. The Bi nanoline replaces four silicon dimers in the surface.

**Middle right** provided by S. E. Venegas-Andraca, W. Cruz-Santos, C. McGeoch and M. Lanzagorta from **'A cross-disciplinary introduction to quantum annealing-based algorithms'**, *Contemporary Physics* (2018), 59:2, 174–197. Section of Figure 5. Each qubit is a loop of niobium controlled by Josephson junctions and biases represented by  $\oplus$ s in this diagram. The direction of current in the loop controls the state of the qubit, which may be spin-up or spin-down. When cooled to temperatures below 20 mK, niobium loops can be placed in superposition, with current running in both directions, corresponding to a superposition of spin-up and spin-down states.

**Bottom right** provided by A. Cavalleri from **'Photo-induced superconductivity'**, *Contemporary Physics* (2018), 59:1, 31–46. Section of Figure 12. Face-centred cubic unit cell of  $K_3C_{60}$ . Blue bonds link the C atoms on each  $C_{60}$  molecule. K atoms are represented as red spheres.

ina, USA  
rmany

ably read  
ployed in

o explore

oks available:

July 2019 (14)  
 वसुधैव कुटुम्बकम्  
 बुद्धकालीय और प्रलेखन प्रमस  
 १० १० ३० ५० ५०  
 १६

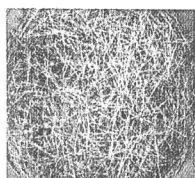
# CURRENT SCIENCE

170	<b>In this issue</b>
	<b>GUEST EDITORIAL</b>
171	<b>Tradition versus modernity in biomedical research: the choices for India</b> Anand Kumar Bachhawat
	<b>CORRESPONDENCE</b>
173	<b>Indian scientific research and Indian research journals</b> Ashok K. Tiwari
173	<b>Urban waste recycling in developing countries should be improved</b> Alexander Gorobets
	<b>NEWS</b>
175	<b>Science Last Fortnight</b>
179	<b>CSIR-NPL establishes an apex-level calibration facility for defibrillator analyzer and defibrillator machine</b> Rajesh, V. K. Tanwar, G. Sumana, V. V. Agarwal, V. N. Ojha and D. K. Aswal
180	<b>Understanding the universe through mega science projects</b> Parul R. Sheth
	<b>COMMENTARY</b>
181	<b>India needs long-term biodiversity monitoring in urban landscapes</b> Ashish N. Nerlekar, Snehangshu Das, Akshay A. Onkar, Mayur Bhagwat, Pranav Mhaisalkar, Sairandhri A. Lapalikar, Vinayak D. Chavan and Minakshi C. Mahajan
182	<b>Addressing poverty in India's Revised National Tuberculosis Control Programme: are we failing to harness the opportunities?</b> Kumaravel Ilangovan and Sharath Burugina Nagaraja
	<b>SCIENTIFIC CORRESPONDENCE</b>
186	<b>When nature decides who stays and who goes: Priority effects extirpating the non-native brown trout <i>Salmo trutta fario</i> L. population from a Himalayan river</b> Aashna Sharma, Vineet Kumar Dubey, Prakash Nautiyal, Jeyaraj Antony Johnson, Yogesh Kumar Rawal and Kuppusamy Sivakumar
188	<b>Science educational and recreational benefits of the Bioresources Nature Park at Nilambur, Kerala, India</b> U. M. Chandrashekara and P. K. Reshma
	<b>GENERAL ARTICLE</b>
190	<b>Scientometric analysis of <i>Current Science</i></b> Marisha
	<b>REVIEW ARTICLES</b>
198	<b>Encystment and excystment in ciliated protists: multidimensional approach</b> Harpreet Kaur, Sara Iqbal, Evelyn Inga and Dorcas Yawe
204	<b>On the recent floods in India</b> Kamaljit Ray, P. Pandey, C. Pandey, A. P. Dimri and K. Kishore



RESEARCH ARTICLES

- 219 **Doubling farmers' income through *Populus deltoides*-based agroforestry systems in northwestern India: an economic analysis**  
S. B. Chavan and R. S. Dhillon
- 227 **Individual borrowing and default behaviour in surplus and constrained credit environments: evidence from India**  
Padmavathi Koride and Anjula Gurtoo
- 235 **Slump test: laboratory and numerical simulation-based approach for consistency of mill tailings paste**  
S. K. Behera, Prashant, C. N. Ghosh, D. P. Mishra, P. K. Mandal, Aniket Verma, Sumeet Mohanty, Kanhaiya Mishra and P. K. Singh
- 242 **Bleaching stress on Indian coral reef regions during mass coral bleaching years using NOAA OISST data**  
Mohit Arora, Nandini Ray Chaudhury, Ashwin Gujrati and Ramesh Chandra Patel
- 251 **Mineral magnetic characterization of archeological potsherds: an example from the Deccan Province, western Maharashtra, India**  
Jyotibala Singh, S. J. Sangode and P. D. Sabale
- 260 **Shear resistance behaviour of geogrid-confined RC elements under static and cyclic loading**  
R. Siva Chidambaram and Pankaj Agarwal



RESEARCH COMMUNICATIONS

- 272 **Pencil trace on cellulose compounds: a heat source**  
Amit R. Morarka and Aditee C. Joshi
- 275 **Control of substrates on pothole geometry**  
Balai Chandra Das
- 282 **Agriculture development-based mapping of agro-ecological sub-regions and its implications for doubling farmers' income in India**  
S. K. Srivastava, N. P. Singh, Jaspal Singh, K. V. Rao and S. J. Balaji
- 288 **An efficient method for acclimatization: *in vitro* hardening of tissue culture-raised tea plants (*Camellia sinensis* (L.) O. Kuntze)**  
Niladri Bag, Lok Man S. Palni and Shyamal Kumar Nandi
- 293 **Molecular phylogeography of *Ficus benghalensis* Linnaeus using nrDNA ITS 1, cpDNA trnL and cpDNA rps16 from the Indian subcontinent**  
Sheetal Sharma, Richa Mehra and Felix Bast
- 298 **Magmatic epidote in the Grenvillian granitoids of North Purulia Shear Zone, Chhotanagpur Gneissic Complex, India and its significance**  
Ankita Basak, Bapi Goswami, Ananya Singha, Somshubhra Das and Chitta Bhattacharyya
- 304 **Analysis of accidents due to slope failure in Indian opencast coal mines**  
A. K. Dash



BOOK REVIEWS

- 309 **The Mathematics of India: Concepts, Methods, Connections**, P. P. Divakaran; reviewed by M. S. Narasimhan
- 311 **Annual Review of Medicine, 2018**. C. Thomas Caskey, Mary E. Klotman and Peter Scardino (eds); reviewed by C. C. Kartha
- 314 **Terrestrial Depositional Systems: Deciphering Complexities through Multiple Stratigraphic Methods**. Kate E. Zeigler and William G. Parker (eds); reviewed by Dilip Saha

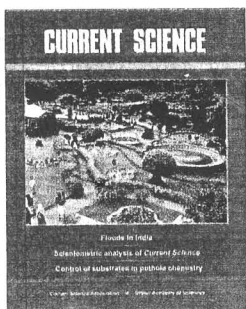
**PERSONAL NEWS**

- 317 **N. C. Subrahmanyam (1943–2019)**  
Sailaja V. Elchuri, Nagesh Chirumamilla and George Thomas
- 319 **N. Anand (1947–2018)**  
S. Nagaraj

---

**HISTORICAL NOTES**

- 321 **Inception of Entomological Society of India and inaugural issue of the *Indian Journal of Entomology***  
Anantanarayanan Raman and Chitra Narayanasamy
- 



◀ COVER. Bioresources Nature Park, Kerala Forest Research Institute, Nilambur. See page 188.

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



### On the cover

The partnership between Vladimir Putin and Xi Jinping is much better for China than it is for Russia: leader, page 7. How Vladimir Putin's embrace of China weakens Russia: briefing, page 15

• **Britain's new prime minister** Boris Johnson promises thrills but is heading for a serious spill: leader, page 8. The new prime minister will lead a fragile—and potentially short-lived—government, page 42. Why predicting the impact of no-deal is so hard, page 43. The hazards of having a prime minister who hates to be hated: Bagehot, page 44

• **Heatwaves and climate change** Extreme heat is a silent killer. Countries must do more to adapt: leader, page 9. Greenhouse-gas emissions contribute to the rising frequency of heatwaves, page 58

• **Microsoft's lessons for other tech giants** What the software company's surprising comeback can teach its tech rivals, page 10

• **Liberal Canada: a special report** As many Western countries turn to populism, Canadians will soon decide if they want to remain a liberal beacon, says Brooke Unger, after page 36

### The world this week

5 A summary of political and business news

#### Leaders

- 7 **Russia and China**  
Brothers in arms
- 8 **Britain's new prime minister**  
Here we go
- 9 **Heatwaves**  
Hot as hell
- 9 **Currency wars**  
Do not escalate
- 10 **Microsoft**  
Rebooted

#### Letters

- 12 On conservatism, taxing assets, Uzbekistan, Nazi operations, work

#### Briefing

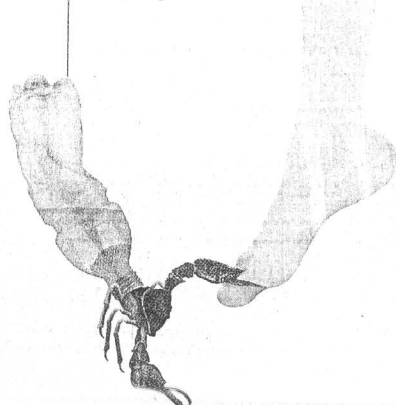
- 15 **Russia and China**  
The junior partner

#### Special report: Canada

**The liberal north**  
After page 36



**Schumpeter** The plastics business has yet to come to terms with a backlash against its products, page 51



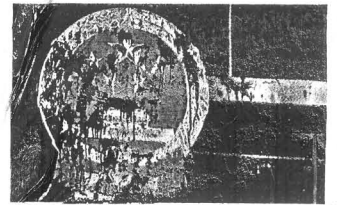
### Asia

- 19 Taiwan's president
- 20 North-east Asia's contested skies
- 21 Indian politics
- 21 Pakistan and America
- 22 **Banyan** Japan's identity



### China

- 23 Hong Kong's protests
- 24 International reactions to Xinjiang



### United States

- 25 Overcrowded primaries
- 26 Mueller's testimony
- 27 New Orleans and snow
- 28 Indian-Americans
- 29 **Lexington** Hotshots in Alaska



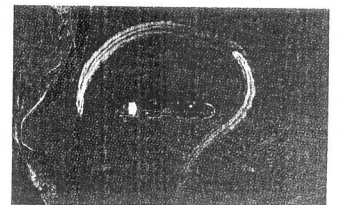
### The Americas

- 30 Corruption in Brazil
- 31 Picking judges in Guatemala
- 31 Poor but sexy Oaxaca
- 32 **Bello** Latin America and Europe



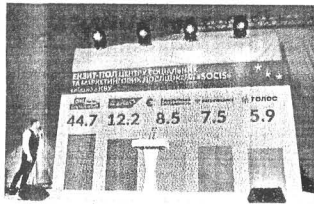
### Middle East & Africa

- 33 The Gulf crisis
- 34 Croquet in Egypt
- 34 Separatism in Ethiopia
- 35 South African politics
- 36 Africa's coal craze



**Europe**

- 37 Ukraine's elections
- 38 Protests in Moscow
- 38 Kosovo's prime minister resigns
- 39 Berlin's Jewish Museum
- 40 Malta and abortion
- 40 Tour de France
- 41 **Charlemagne** The muscles from Brussels



**Britain**

- 42 The new government
- 43 No-deal forecasts
- 44 **Bagehot** Lonely at the top



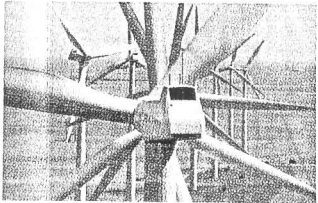
**International**

- 45 Designing parliamentary chambers



**Business**

- 47 Greening American utilities
- 48 Tech in the crosshairs
- 49 **Bartleby** The curse of efficiency
- 50 Lego v Barbie in China
- 50 Germany's no-frills grocers
- 51 **Schumpeter** The plastics business



**Finance & economics**

- 52 Europe's bright spots
- 53 Currencies, trade and Trump
- 54 Land of the tax-free
- 54 Profiting from robo-advice
- 55 **Buttonwood** The auto-technocrats
- 56 Pricing live music
- 56 The perils of fine print
- 57 **Free exchange** Culture and growth



**Science & technology**

- 58 Heatwaves and climate
- 59 Living tree stumps
- 60 Flat lenses



**Books & arts**

- 63 Fact and fiction on film
- 64 A hero of the resistance
- 65 Islam in America
- 65 Kipling in Vermont
- 66 Gaia meets AI



**Economic & financial indicators**

- 68 Statistics on 42 economies

**Graphic detail**

- 69 Yield curves and economic growth across the rich world

**Obituary**

- 70 Li Peng, the butcher of Beijing

**The Economist**

Volume 432 Number 9153  
 Published since September 1843  
 to take part in 'a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress.'

Editorial offices in London and also:  
 Amsterdam, Beijing, Berlin, Brussels, Cairo, Chicago, Johannesburg, Madrid, Mexico City, Moscow, Mumbai, New Delhi, New York, Paris, San Francisco, São Paulo, Seoul, Shanghai, Singapore, Tokyo, Washington DC

**Subscription service**

For our full range of subscription offers, including digital only or print and digital combined, visit: [Economist.com/offers](http://Economist.com/offers)

You can also subscribe by post, telephone or email:

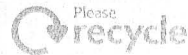
Post: **The Economist Subscription Centre, Tanjong Pagar Post Office, P.O. Box 671, Singapore 910817, Republic of Singapore**

Telephone: +65 6534 5166

Email: [Asia@subscriptions.economist.com](mailto:Asia@subscriptions.economist.com)

**One-year print-only subscription (51 issues):**

Australia.....	A \$575
China.....	CNY 2,778
Hong Kong & Macau.....	HK \$2,760
India.....	₹ 12,299
Japan.....	Yen 52,899
Korea.....	KRW 440,000
Malaysia.....	RM 940
New Zealand.....	NZ \$639
Singapore & Brunei.....	S \$509
Taiwan.....	NT \$10,799
Thailand.....	US \$350
Other countries.....	Contact us as above



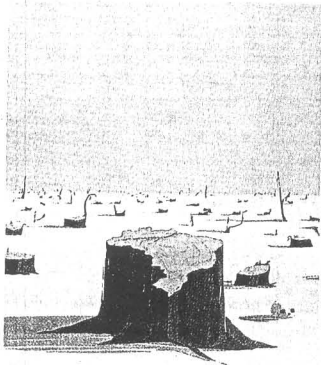
PEFC certified  
 This copy of *The Economist* is printed on paper sourced from sustainably managed forests, recycled and controlled sources certified by PEFC  
[www.pefc.org](http://www.pefc.org)

19

# Contents

# Economist

The Economist August 3rd 2019 3



### On the cover

**Brazil has the power to save Earth's greatest rainforest—or destroy it: leader, page 7. The Amazon is approaching the point of its irreversible destruction: briefing, page 16**

• **The Fed makes its move** America's central bank cuts rates for the first time in over a decade, page 58. Lower rates may help emerging markets more than anyone: leader, page 8. Emerging-market dreams of rich-world incomes meet reality: Free exchange, page 63

• **Congo: fighting Ebola in a war zone** Disease is not the only enemy in Congo: leader, page 12. How do you reform a country where gunmen torch clinics? Page 37

• **Foodoo economics—meals on wheels** Delivering food is anything but a tasty business: Schumpeter, page 57

• **Big armchairs and Chinese diplomacy** Why is China so fond of meetings in over-stuffed furniture? Chaguan, page 25

### The world this week

5 A summary of political and business news

### Leaders

7 **The future of the Amazon** Deathwatch

8 **The Federal Reserve and emerging markets** An opportunity

8 **Baltimore** Saving Charm City

10 **Digital payments** The dash from cash

12 **Congo** If it bleeds, pay heed

### Letters

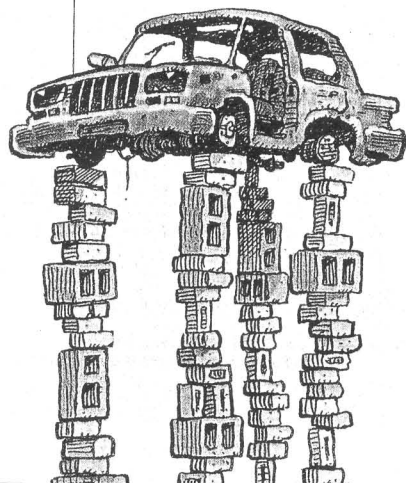
14 On insurance, Tommy Flowers, Colombia, the future, flatmates

### Briefing

16 **The Amazon** On the brink



**Charlemagne** Europe is edging towards the post-car city, page 47



### Asia

19 Politics in Singapore

20 Aboriginal rights in Australia

21 Japan's disabled MPs

21 Smoking in Indonesia

22 **Banyan** A federal Philippines

### China

23 Jobless graduates

24 Hong Kong's protests

25 **Chaguan** The semiotics of meeting rooms

### United States

27 Baltimore's murder rate

29 Donald Trump's intelligence chief

29 The last man of Mount Rushmore

30 Puerto Rico's political crisis

31 **Lexington** The mighty Dolphins

### The Americas

34 The humbling of Honduras's strongman

35 Uber in Vancouver

36 Early elections in Peru?

36 Art that moves

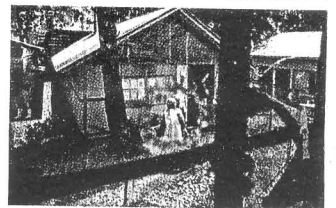
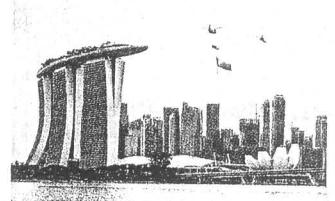
### Middle East & Africa

37 The challenge of Congo

40 Tyranny in Tanzania

40 An exodus from Gaza

41 The death of Beji Caid Essebsi

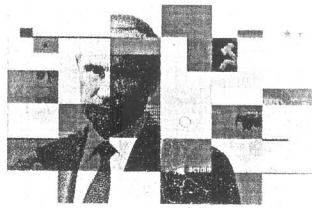


Handwritten signature and date: jms 14/8/19

Handwritten text in Hindi: श्री जय प्रमाण, श्री कालय और प्रलेखन प्रकल्प, श्री 10 आ 40 फी, श्री दिल्ली-16

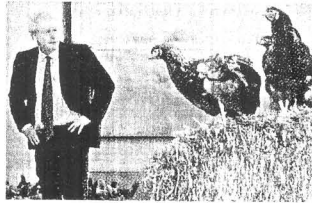
Europe

- 43 Russian subversion in the Baltics
- 44 Greece's tricky budget
- 45 The rise of rosé
- 45 The Kaiser's property
- 46 Fire in the Arctic
- 47 Charlemagne Carless cities



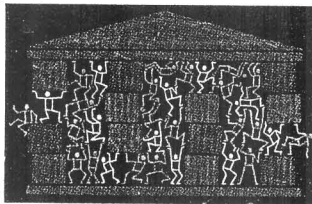
Britain

- 48 Boris's game of chicken
- 49 No-deal's threat to Northern Ireland
- 50 Bagehot The Tory revolutionaries



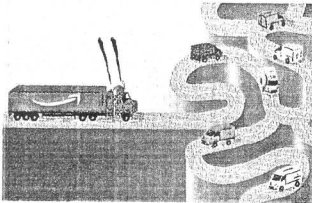
International

- 51 Are Western democracies becoming ungovernable?



Business

- 53 How to beat Bezos
- 54 SoftBank's double Vision
- 55 Bartleby Keeping staff happy
- 56 A generic merger
- 56 Tragedy in India Inc
- 57 Schumpeter Online food fights



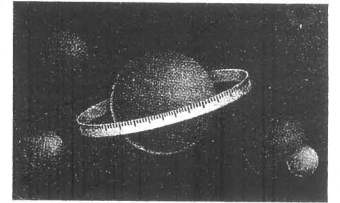
Finance & economics

- 58 The Powell pirouette
- 59 Buttonwood Unalloyed blessings
- 60 The LSE's monster trade
- 60 The Mittelstand and inequality
- 61 British class-action cases
- 62 Luring back Portuguese emigrants
- 62 Wall Street and Warren
- 63 Free exchange Emerging-markets' broken dreams



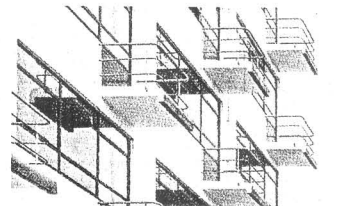
Science & technology

- 64 The rise of planetology
- 65 Mayan human sacrifice
- 66 Power from the night air



Books & arts

- 68 The Bauhaus
- 69 The disinformation age
- 70 Mosquitos
- 70 Sporting fiction



Economic & financial indicators

- 72 Statistics on 42 economies

Graphic detail

- 73 High internet use and state support help countries ditch cash

Obituary

- 74 Robert Morgenthau, Manhattan's longest-serving DA

The Economist

Volume 432 Number 9154  
 Published since September 1843 to take part in 'a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress.'

Editorial offices in London and also: Amsterdam, Beijing, Berlin, Brussels, Cairo, Chicago, Johannesburg, Madrid, Mexico City, Moscow, Mumbai, New Delhi, New York, Paris, San Francisco, São Paulo, Seoul, Shanghai, Singapore, Tokyo, Washington DC

Subscription service

For our full range of subscription offers, including digital only or print and digital combined, visit: [Economist.com/offers](http://Economist.com/offers)

You can also subscribe by post, telephone or email:

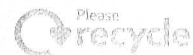
Post: The Economist Subscription Centre, Tanjong Pagar Post Office, P.O. Box 671, Singapore 910817, Republic of Singapore

Telephone: +65 6534 5166

Email: [Asia@subscriptions.economist.com](mailto:Asia@subscriptions.economist.com)

One-year print-only subscription (51 issues):

Australia.....	A \$575
China.....	CNY 2,778
Hong Kong & Macau.....	HK \$2,760
India.....	₹12,299
Japan.....	Yen 52,899
Korea.....	KRW 440,000
Malaysia.....	RM 940
New Zealand.....	NZ \$639
Singapore & Brunei.....	S \$509
Taiwan.....	NT \$10,799
Thailand.....	US \$350
Other countries.....	Contact us as above



PEFC certified  
 This copy of *The Economist* is printed on paper sourced from sustainably managed forests, recycled and controlled sources certified by PEFC  
[www.pefc.org](http://www.pefc.org)



### On the cover

If China were to react brutally, the consequences would be disastrous—and not just for Hong Kong: leader, page 7. Asia's pre-eminent financial centre is on the brink: briefing, page 14

• **Guns: America's tragic exceptionalism** Other rich countries do not have frequent mass shootings. There is a simple reason for that: leader, page 8. America grapples with a lethal mix of terrorism and lax gun laws, page 23

• **Modi's bad move on Kashmir** The revocation of its autonomy points to a radical nationalist agenda: leader, page 9. Narendra Modi dashes the old rules in a bid to remake a troubled territory, page 17

• **From trade war to currency war** America cannot have a strong economy, rising tariffs and a weak dollar all at the same time: leader, page 8. Hostilities escalate, and the fog of war descends, page 53

• **Seed capitalism—the business of fertility** Investors are pouring money into companies that promise to help people conceive, page 47

### The world this week

5 A summary of political and financial news

### Leaders

7 **The future of Hong Kong** How will this end?

8 **US-China trade** Dangerous escalation

8 **Mass shootings** It's the guns

9 **Kashmir's status** Modi's bad move

10 **Endangered species** The elephant in the room

### Letters

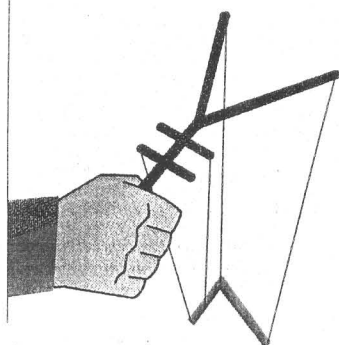
12 On happiness and politics, Zhao Ziyang, America, plastic, Boris Johnson, the Moon

### Briefing

14 **Turmoil in Hong Kong** Seeing red



**Buttonwood** How yuan-dollar became the world's most closely watched asset price, page 54



### Asia

17 Modi's Kashmir strike

18 Uzbekistan's gulag

19 Japan's constitution

19 Race in Singapore



### China

20 Tensions with Taiwan

21 Saving old buildings

22 **Chaguan** The Huawei conundrum



### United States

23 Mass shootings

24 Toni Morrison

25 Sheriff Tom Dart

26 Wyoming coal

28 **Lexington** Rowing about rights



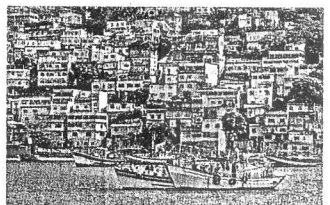
### The Americas

29 Espirito Santo, Brazil's model state

30 Argentina's election

31 Venezuela's sanctions

31 Cruises and the Caribbean



### Middle East & Africa

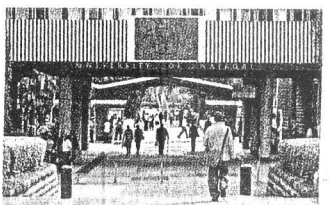
32 African universities

33 More mathematicians

34 Liberia on the edge

34 Ride-sharing in Lebanon

35 Egypt's poor



Handwritten signature and date: 14/8/19  
A library stamp in Hindi: 'ब्रिटेन नाम पुस्तकालय और प्रलेखन प्रणाली' with numbers '10 10 10 10 10' and '16'.

## Europe

- 37 Migrants in Italy
- 38 Norway's fish-smugglers
- 38 Brussels' revolving doors
- 39 Social care in the Netherlands
- 39 Tension in the Black Sea
- 40 The Faroes' puffins
- 41 **Charlemagne** The eastern summer



## Britain

- 42 Can anyone stop no-deal?
- 43 5G in Scotland's islands
- 44 **Bagehot** Theresa 2.0



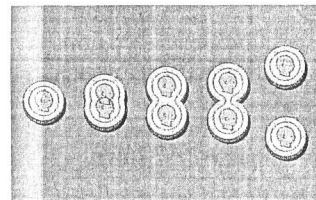
## International

- 45 The trade in endangered species



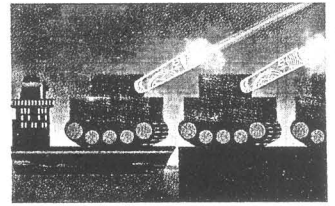
## Business

- 47 The fertility business
- 48 Fertility benefits
- 49 Investors flee the Permian
- 49 Steelmaking and tariffs
- 50 Apps for the old
- 50 Cash in America Inc
- 50 Private equity in Germany
- 51 **Bartleby** Profiting from holidays
- 52 **Schumpeter** Cyber Exxon Valdez



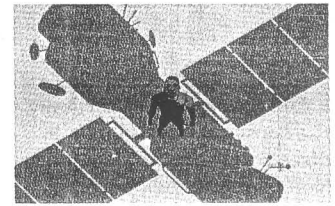
## Finance &amp; economics

- 53 The trade war escalates
- 54 **Buttonwood** The yuan cracks seven
- 55 John Flint leaves HSBC
- 55 The Fed and payments
- 56 Bond yields turn negative
- 57 Global banks in India
- 58 **Free exchange** The growth of shrinkflation



## Science &amp; technology

- 60 Space debris and safety
- 61 The IPCC land-use report
- 62 The virtues of bush fires



## Books &amp; arts

- 63 Walter Bagehot
- 64 Maternal fears
- 65 Life in New Orleans
- 65 Art and activism in Australia
- 66 **Johnson** Size v simplicity



## Economic &amp; financial indicators

- 68 Statistics on 42 economies

## Graphic detail

- 69 Silicon Valley's giants look more entrenched than ever before

## Obituary

- 70 Sutopo Purwo Nugroho, Indonesia's voice of good sense

The Economist

Volume 432 Number 9155

Published since September 1843 to take part in "a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress."

Editorial offices in London and also: Amsterdam, Beijing, Berlin, Brussels, Cairo, Chicago, Johannesburg, Madrid, Mexico City, Moscow, Mumbai, New Delhi, New York, Paris, San Francisco, São Paulo, Seoul, Shanghai, Singapore, Tokyo, Washington DC

## Subscription service

For our full range of subscription offers, including digital only or print and digital combined, visit: [Economist.com/offers](http://Economist.com/offers)

You can also subscribe by post, telephone or email:

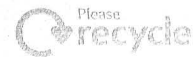
Post: **The Economist Subscription Centre, Tanjong Pagar Post Office, P.O. Box 671, Singapore 910817, Republic of Singapore**

Telephone: +65 6534 5166

Email: [Asia@subscriptions.economist.com](mailto:Asia@subscriptions.economist.com)

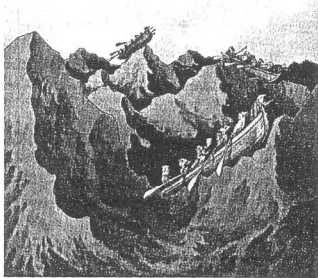
## One-year print-only subscription (51 issues):

Australia.....	A \$575
China.....	CNY 2,778
Hong Kong & Macau.....	HK \$2,760
India.....	₹12,299
Japan.....	Yen 52,899
Korea.....	KRW 440,000
Malaysia.....	RM 940
New Zealand.....	NZ \$639
Singapore & Brunei.....	S \$509
Taiwan.....	NT \$10,799
Thailand.....	US \$350
Other countries.....	Contact us as above



**PEFC certified**  
This copy of *The Economist* is printed on paper sourced from sustainably managed forests, recycled and controlled sources certified by PEFC  
[www.pefc.org](http://www.pefc.org)

23



### On the cover

A dozen years ago investors were complacent about the risk of recession. Today they are overwhelmed by anxiety: leader, page 9. The effect of the trade war on America is frustratingly hard to pin down, page 53. The world's monetary system is breaking: Free exchange, page 59

• **Why Bernie could yet save Trump** America's leading democratic socialist is unlikely to gain the Democratic ticket. But he could stop a moderate from winning the presidency: Lexington, page 30

• **Indian business cools on Modi** Bosses and investors are growing disenchanted with their champion, page 47

• **How to prepare for rising sea levels** Today's plans are inadequate: leader, page 11. The water is coming, page 15

• **Fooling facial recognition** As the technology spreads, so do ideas for subverting it, page 60

### The world this week

- 5 A summary of political and business news

### Leaders

- 9 **Financial markets**  
The Age of Anxiety
- 10 **Nuclear doctrine**  
Finger on the button
- 10 **Civil liberties**  
Speak up
- 11 **Rising seas**  
A world without beaches
- 12 **Zimbabwe**  
Land of hope and worry

### Letters

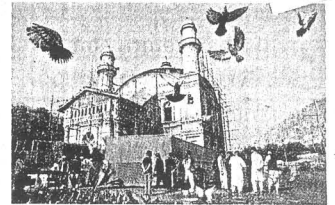
- 14 On the teaching of history

### Briefing

- 15 **The rising seas**  
The world is not ready

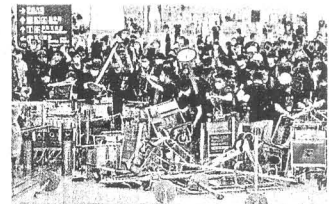
### Asia

- 19 Afghan peace talks
- 20 Kashmir's clampdown
- 21 Drama in Kyrgyzstan
- 21 A sultana in Java?



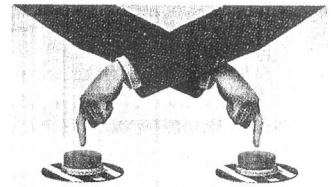
### China

- 22 Hong Kong in turmoil
- 23 When tourists perform
- 24 **Chaguan** Black hands in Hong Kong



### United States

- 25 Nuclear weapons
- 26 Democratic no-hopers
- 27 Drug markets
- 27 Trading water
- 28 Co-pay charities
- 30 **Lexington** Bernie Sanders



### The Americas

- 31 Argentina's election
- 32 Guatemala's new president



### Middle East & Africa

- 33 Zimbabwe's crisis
- 34 A power vacuum in Gabon
- 35 Rwanda's odd statistics
- 35 Chaos in Yemen
- 36 Speaking French in Morocco



### Chaguan Why

Communist officials imagine that America is behind the unrest in Hong Kong, page 24



Aug 27 8/19  
प्रलेखन प्रभाग  
पुस्तकालय और प्रलेखन प्रभाग  
राज्य शांति भवन  
नई दिल्ली-16

Europe

- 37 Jihadists return home
- 38 Salvini stumbles
- 39 Protests in Russia
- 39 German GDP shrinks
- 40 Soviet blocks
- 41 **Charlemagne** How the EU sees Boris Johnson



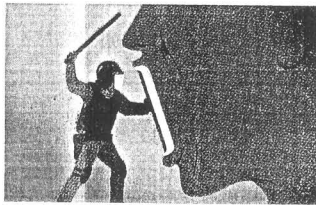
Britain

- 42 Railway reform
- 43 High-speed rail



International

- 44 The new censors



Business

- 47 India Inc's Modi blues
- 49 Saudi Aramco's awkward earnings debut
- 49 Chinese tech resilience
- 50 Viacom and CBS reunited
- 51 WeWork sets out its stall
- 52 **Schumpeter** FredEx



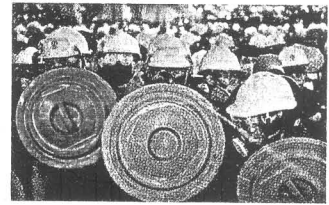
Finance & economics

- 53 The trade war's costs
- 55 Making sense of markets
- 55 The chill from Brexit
- 56 Goldman in Malaysia
- 56 Bond insurers' woes
- 57 Costing climate change
- 58 Debt and despair in Sri Lanka
- 59 **Free exchange** The end of Bretton Woods II



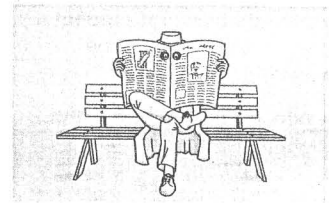
Science & technology

- 60 Fooling face recognition
- 61 A nuclear accident
- 62 Two treatments for Ebola
- 62 P-P-Pick up a penguin



Books & arts

- 64 Mick Herron's spies
- 65 Reagan and Gorbachev
- 66 Music and morals
- 66 A magical Western



Economic & financial indicators

- 68 Statistics on 42 economies

Graphic detail

- 69 Violence in Afghanistan last year was worse than in Syria

Obituary

- 70 Toni Morrison, chronicler of black America

The Economist

Volume 432 Number 9156

Published since September 1843 to take part in 'a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress.'

Editorial offices in London and also: Amsterdam, Beijing, Berlin, Brussels, Cairo, Chicago, Johannesburg, Madrid, Mexico City, Moscow, Mumbai, New Delhi, New York, Paris, San Francisco, São Paulo, Seoul, Shanghai, Singapore, Tokyo, Washington DC

Subscription service

For our full range of subscription offers, including digital only or print and digital combined, visit: Economist.com/offers

You can also subscribe by post, telephone or email:

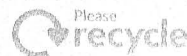
Post: The Economist Subscription Centre, Tanjong Pagar Post Office, P.O. Box 671, Singapore 910817, Republic of Singapore

Telephone: +65 6534 5166

Email: Asia@subscriptions.economist.com

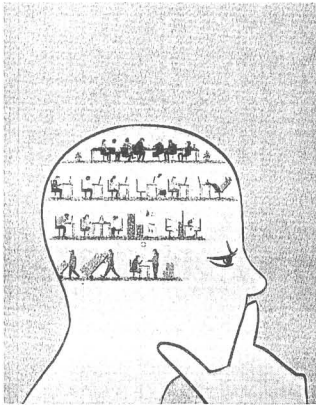
One-year print-only subscription (51 issues):

Australia.....	A	\$575
China.....	CNY	2,778
Hong Kong & Macau.....	HK	\$2,760
India.....	₹	12,299
Japan.....	Yen	52,899
Korea.....	KRW	440,000
Malaysia.....	RM	940
New Zealand.....	NZ	\$639
Singapore & Brunei.....	S	\$509
Taiwan.....	NT	\$10,799
Thailand.....	US	\$350
Other countries.....	Contact us as above	



PEFC certified This copy of The Economist is printed on paper sourced from sustainably managed forests, recycled and controlled sources certified by PEFC www.pefc.org

25



On the cover

Competition, not corporatism, is the answer to capitalism's problems: leader, page 7. The idea that companies with a sense of purpose could help deal with social injustice, climate change and inequality is sweeping through parts of the business world: briefing, page 14

• **China bullies Cathay Pacific** The Communist Party shows its disregard for rules and markets: leader, page 9. The link between the Hong Kong protests and the most expensive property market in the world, page 22. Multinationals in Hong Kong are rattled, page 49. China's thin-skinned online nationalists want to be both loved and feared by the West: Chaguan, page 24

• **How recessions begin** The onset of a downturn is as much a matter of mood as of money: Free exchange, page 58. Is the Japanification of bond markets a passing phase or permanent state? Buttonwood, page 56. The case for more fiscal stimulus in Germany: leader, page 10

• **Who should run Italy now?** A snap election could worsen the country's budget woes: leader, page 9. Matteo Salvini hopes for elections. His opponents hope to avoid them, page 37

• **Gravity waves and nuclear pasta** The observation of a merger between a black hole and a neutron star marks the maturity of gravitational astronomy, page 60

The world this week

5 A summary of political and business news

Leaders

- 7 **Shareholder capitalism** What companies are for
- 8 **Coal and climate change** Betting on black
- 9 **Italian politics** Time to govern, not campaign
- 9 **Business in China** Cathay's mayday
- 10 **Germany's economy** Take aim

Letters

- 12 On the Amazon, BlackRock, Toni Morrison, e-scooters, HR, dry cleaning

Briefing

- 14 **Corporate purpose** I'm from a company, and I'm here to help



• **Banyan** When India's government abuses its power, the media don't roll over. They cheer, page 21



Asia

- 17 Asia's coal addiction
- 19 Racism in Indonesia
- 19 American F-16s for Taiwan
- 20 Karaoke in South Korea
- 20 Protecting Indian witnesses
- 21 **Banyan** India's supine media



China

- 22 Hong Kong's tycoons
- 23 All quiet in Macau
- 24 **Chaguan** Digital nationalism



United States

- 25 Immigration enforcement
- 26 Democrats' rural problem
- 27 Evictions examined
- 28 Abortion war



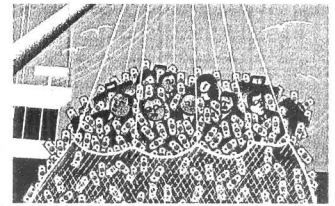
The Americas

- 30 Paraguay's dam mess
- 31 The burning Amazon
- 31 Mexico's marathon cheats
- 32 **Bello** The limits of technocracy



Middle East & Africa

- 33 Graft in Mozambique
- 34 Ending polio in Africa
- 35 A hopeful deal in Sudan
- 35 Missing Hosni Mubarak
- 36 Syrians in Lebanon



26/8/19

प्रलेखन प्रयोग  
पुस्तकालय और प्रलेखन प्रयोग  
११० ११० ५० ५० ५०  
५१ दिवस-१६

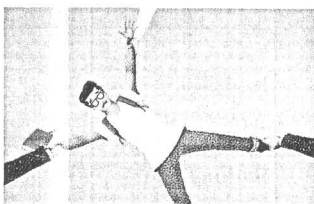
Europe

- 37 Italy's populists split
- 38 Buying Greenland
- 38 Joblessness in southern Europe
- 39 Transylvania's beasts
- 40 Charlemagne Ghosts of Terezin



Britain

- 42 The battle for students
- 43 Iran's tanker sets sail
- 44 Bagehot Boris's brain



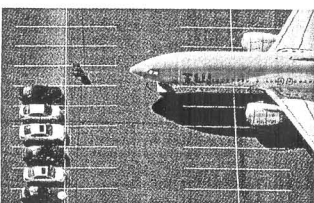
International

- 45 Insuring the poor



Business

- 47 Waiting for Boeing
- 48 GE and Wall Street
- 49 Clipping Cathay's wings
- 50 Chunky AI chips
- 50 Keeping customers happy
- 51 Confessions of a tycoon
- 51 Corporate comedy
- 52 Schumpeter Vodafone seeks the G-spot



Finance & economics

- 53 Revitalising Credit Suisse
- 55 Tax wars: US v France
- 55 China's new interest rate
- 56 Buttonwood Bonds and Japanification
- 57 Apple's credit card
- 57 Multinationals and wages
- 58 Free exchange How recessions start



Science & technology

- 60 Gravitational astronomy



Books & arts

- 63 Art and incarceration
- 64 Edna O'Brien's new novel
- 64 David Ben-Gurion
- 65 Johnson The language superpower



Economic & financial indicators

- 68 Statistics on 42 economies

Graphic detail

- 69 With Burgundy, wine investors have beaten the stockmarket

Obituary

- 70 Steve Sawyer, Gandalf of Greenpeace

The Economist

Volume 432 Number 9157

Published since September 1843 to take part in 'a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress.'

Editorial offices in London and also: Amsterdam, Beijing, Berlin, Brussels, Cairo, Chicago, Johannesburg, Madrid, Mexico City, Moscow, Mumbai, New Delhi, New York, Paris, San Francisco, São Paulo, Seoul, Shanghai, Singapore, Tokyo, Washington DC

Subscription service

For our full range of subscription offers, including digital only or print and digital combined, visit: Economist.com/offers

You can also subscribe by post, telephone or email:

Post: The Economist Subscription Centre, Tanjong Pagar Post Office, P.O. Box 671, Singapore 910817, Republic of Singapore

Telephone: +65 6534 5166

Email: Asia@subscriptions.economist.com

One-year print-only subscription (51 issues):

Australia.....	A \$575
China.....	CNY 2,778
Hong Kong & Macau.....	HK \$2,760
India.....	₹12,299
Japan.....	Yen 52,899
Korea.....	KRW 440,000
Malaysia.....	RM 940
New Zealand.....	NZ \$639
Singapore & Brunei.....	S \$509
Taiwan.....	NT \$10,799
Thailand.....	US \$350
Other countries.....	Contact us as above



PEFC certified This copy of The Economist is printed on paper sourced from sustainably managed forests, recycled and controlled sources certified by PEFC www.pefc.org

# Educational Evaluation and Policy Analysis

Volume 41, Number 2

June 2019

Teacher Characteristics, Student Beliefs, and the Gender Gap in STEM Fields* .....	127
<i>Dario Sansone</i>	
What Is in a Definition? The <i>How</i> and <i>When</i> of Special Education Subgroup Analysis in Preschool Evaluations* .....	145
<i>Anna Shapiro and Christina Weiland</i>	
The Impact of the Michigan Merit Curriculum on High School Math Course-Taking* .....	164
<i>Soobin Kim, Gregory Wallsworth, Ran Xu, Barbara Schneider, Kenneth Frank, Brian Jacob, and Susan Dynarski</i>	
The Financial Benefits and Burdens of Performance Funding in Higher Education* .....	189
<i>Lori Prince Hagood</i>	
Promoting Deeper Learning in High School: Evidence of Opportunities and Outcomes* .....	214
<i>Jordan Rickles, Kristina L. Zeiser, Rui Yang, Jennifer O'Day, and Michael S. Garet</i>	
Corrigendum .....	NP1

\*Accepted under the editorship of Joshua Cowen, Cassandra Guarino, Spyros Konstantopoulos, and Peter Youngs



Los Angeles | London | New Delhi  
Singapore | Washington DC | Melbourne

# EDUCATIONAL MEASUREMENT: ISSUES AND PRACTICE

Volume 38, Number 2  
Summer 2019

12/18/19 April June

## CONTENTS

मनस्य प्रमाण  
संस्कृतकालय और प्रतियोग प्रमाण  
संख्ये ३० अ० प्र० प०  
नई दिल्ली-16

3 Editorial  
*Deborah Harris*

### Data Visualization

5 On the Cover  
*Ally Shay Thomas*

### Articles

6 Rater Certification Tests: A Psychometric Approach\*  
*Yigal Attali*

14 Are There Gender Differences in *How* Students Write Their Essays? An Analysis of Writing Processes\*  
*Mo Zhang, Randy E. Bennett, Paul Deane, and Peter W. van Rijn*

27 Motivation for Educational Attainment in Grade 9 Predicts High School Completion\*  
*Stephen G. West, Jan N. Hughes, Han Joe Kim, and Shelby S. Bauer*

41 Examination of Indices of High School Performance Based on the Graded Response Model\*  
*Jeff Allen and Krista Mattern*

53 *Designing Knowledge-In-Use Assessments to Promote Deeper Learning\**  
*Christopher J. Harris, Joseph S. Krajcik, James W. Pellegrino, and Angela Haydel DeBarger*

68 Reliably Assessing Growth with Longitudinal Diagnostic Classification Models\*  
*Matthew J. Madison*

79 Interpreting Probabilistic Classifications From Diagnostic Psychometric Models\*  
*Laine Bradshaw and Roy Levy*

89 Characterizing and Diagnosing Complex Professional Competencies—An Example of Intrapreneurship\*  
*Ann Cathrice George, Sandra Bley, and James Pellegrino*

101 The Effects of Inattentive Responding on Construct Validity Evidence When Measuring Social-Emotional Learning Competencies\*  
*Jeffrey T. Steedle, Maxwell Hong, and Ying Cheng*

\*Manuscript was accepted under the editorship of Howard T. Everson.

### ITEMS Corner

112 ITEMS Portal Development Update  
*André A. Rupp*

114 Digital Module 05: Diagnostic Measurement—The G-DINA Framework  
*Wenchao Ma and Jimmy de la Torre*

116 Digital Module 06: Bayesian Psychometrics—Posterior Predictive Model Checking  
*Allison Ames and Aaron Myers*

*Front cover visual: Visualizing Hierarchical Score Inferences*

For submission instructions, subscription and all other information visit:  
[www.ncme.org](http://www.ncme.org) or  
[www.wileyonlinelibrary.com](http://www.wileyonlinelibrary.com)

© 2019 by the National Council on Measurement in Education. All rights reserved. No part of this publication may be reproduced, stored, or transmitted in any form or by any means without the prior permission in writing from the copyright holder. Authorization to photocopy items for internal and personal use is granted by the copyright holder for libraries and other users registered with their local Reproduction Rights Organization (RRO), e.g., Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, USA ([www.copyright.com](http://www.copyright.com)), provided the appropriate fee is paid directly to the RRO. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for republication, for creating new collective works, or for resale. Permissions for such reuse can be obtained using the RightsLink "Request Permissions" link on Wiley Online Library. Special requests should be addressed to: [Permissions@wiley.com](mailto:Permissions@wiley.com)

#### Disclaimer

The Publisher, the National Council on Measurement in Education, and Editors cannot be held responsible for errors or any consequences arising from the use of information contained in this journal; the views and opinions expressed do not necessarily reflect those of the Publisher, Council and Editors, neither does the publication of advertisements

# Contents

## Articles

- The Rhode to Turnaround: The Impact of Waivers to No Child Left Behind on School Performance 555  
*Shaun M. Dougherty and Jennie M. Weiner*
- Quasi-Markets, Competition, and School Choice Lotteries 587  
*Adrian W. Chew*
- Are School Districts Allocating Resources Equitably? The Every Student Succeeds Act, Teacher Experience Gaps, and Equitable Resource Allocation 615  
*David S. Knight*
- Common Core State Standards on Twitter: Public Sentiment and Opinion Leaders 650  
*Yinying Wang and David J. Fikis*

July  
31/8/19 ✓  
प्रवेशिका प्रभाग  
बुकपकालव और प्रवेशिका प्रभाग  
200 री0 20 प्र0 40  
110 दिल्ली-16

18/19  
इलेक्ट्रॉन प्रमाण  
पुस्तकालय और प्रलेखन प्रमर्क  
310 310 310 310  
7ई दिल्ली-16

Issue 123  
July 2019

# Contents

## MAIN FEATURE

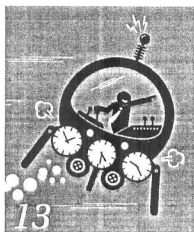
- 4 Seven facets of meaning**  
James Porcaro imparts some insights from his professional career



## FEATURES

### IN THE CLASSROOM

- 8 Writing with a smiley**  
Jonathan Lee and Benjamin Moorhouse embrace instant expression



### GRAMMAR

- 11 Look at it this way**  
Jade Blue teaches grammar with graphics

### GRAMMAR

- 13 Time shock**   
Jessica D'Ambrosio takes her students time travelling



### IN THE CLASSROOM

- 17 The motivation factor**  
Paul Bress believes enthusiasm is key

### IN THE CLASSROOM

- 18 Cast away!**  
Sandi Ferdiansyah finds inspiration in film



### IN THE CLASSROOM

- 24 Students' stories 13**   
David Heathfield celebrates collaborative storytelling

### IN THE CLASSROOM

- 26 Freeze frame**  
Alan Keenan turns his students into bank robbers

### VOCABULARY

- 37 Breadth versus depth**  
Miao Li approaches lexis from two different directions

### SKILLS

- 39 Are you listening?**  
Jamie Clayton advocates extensive listening

### IN THE CLASSROOM

- 43 Making 'halfalogues' whole**  
Hall Houston encourages eavesdropping

## TEACHING YOUNG LEARNERS

- 20 From reading to writing**  
Melanie Oh Hye Min uses storybooks as models for writing


## TEACHER DEVELOPMENT


- 45 Effective classroom management**  
Reham Mohsen and Nick Baguley share solutions to five common challenges

## TECHNOLOGY

- 47 A walk through art and technology**  
Tien Minh Mai makes his classroom a museum
- 50 High five!**  
Frederick Gay sees the pedagogical possibilities of HTML5
- 54 Five things you always wanted to know about: using technology with your learners in class**  
Nicky Hockly tells how technology can be introduced in lessons
- 55 Webwatcher**  
Russell Stannard goes on a world tour

## REGULAR FEATURES

- 30 IT WORKS IN PRACTICE**
- 32 REVIEWS**
- 34 SCRAPBOOK** 
- 56 NOT ONLY, BUT ALSO ...**  
Chia Suan Chong engages with empathy

 Includes materials designed to photocopy, some of which can now be downloaded from the ETP website (see page 3)

31

Policy

Volume 33 Number 5 July 2019

Educational Policy

# Contents

lege

ge

1991-1998

Editor, 1988-1996

1998

-2004

1-2006

Editor, 1996-2013

1998-2016

### Articles

Democracy in Action and the Creation of Colorado's School Finance Gordian Knot <i>Al Ramirez</i>	687
Evaluating the Accuracy of Productivity Indicators in Performance Funding Models <i>Aaron S. Horn and Giljae Lee</i>	702
Holistic School Quality Measurement and the Future of Accountability: Pilot-Test Results <i>Douglas J. Gagnon and Jack Schneider</i>	734
Equity, Access, and Mathematics Coursetaking Within Purposefully Created Small High Schools <i>Miya T. Warner and Douglas D. Ready</i>	761

Sheila Slaughter  
*University of Georgia*

Christine Sleeter  
*California State University,  
Monterey Bay*

Marshall Smith  
*Fewlitt Foundation*

Jary Sykes  
*Michigan State University*

Adam Urbanski  
*Rochester Teachers  
Association*

Lois Weis  
*SUNY Buffalo*

Priscilla Wohlstetter  
*University of Southern  
California*

Kenneth Wong  
*Brown University*

Carol Camp Yeakey  
*Washington University-  
St. Louis*

Handwritten notes and stamps, including a date '7/18/19' and a circled '31'.

EUROPEAN JOURNAL  
OF SPECIAL NEEDS EDUCATION

Volume 34 Number 4 October 2019

<i>Marianne Nilsen Kvande, Oda Bjørklund, Stian Lydersen, Jay Belsky and Lars Wichstrøm</i>	409
<i>Mari Nislin and Henri Pesonen</i>	424
<i>Marta Sandoval Mena, Cecilia Simón Rueda and Gerardo Echeita Sarrionandia</i>	441
<i>Alberto Pérez-Torralba, Raúl Reina, Juan Carlos Pastor-Vicedo and Sixto González-Villora</i>	455
<i>Anne Randi Fagerlid Festøy and Peder Haug</i>	469
<i>Jude K. Tah</i>	485
<i>Craig Goodall and Alison MacKenzie</i>	499
<i>Anne-Katrien Koenen, Eleonora Vervoort, Geert Kelchtermans, Karine Verschueren and Jantine L. Spilt</i>	514
<i>Geanina Cucu Ciuhan</i>	530
<i>Ivana Bogavac, Marijana Rakonjac, Ljiljana Jeličić, Silvana Punišić and Miško Subotić</i>	538
<i>Rachel A. Takriti, Susan J. Atkinson and Hala Elhoweris</i>	546
	555

33

# Indian Literature

Sahitya Akademi's Bimonthly Journal

No. 311: May/June 2019  
Vol. LXIII No. 3

*Editorial Office:*  
Sahitya Akademi, Rabindra Bhawan,  
35, Ferozeshah Road, New Delhi-110001.

All original, unpublished submissions should be sent to [indianlit@sahitya-akademi.gov.in](mailto:indianlit@sahitya-akademi.gov.in)

*Cover Pairings:* Anupriya

In India inclusive of mailing: single copy, one hundred rupees; one year (six issues) five hundred rupees; three years (eighteen issues) one thousand three hundred rupees. *Abroad by airmail:* single copy, fifteen US dollars; one year (six issues) seventy five US dollars; three years (eighteen issues) two hundred US dollars. *Abroad by seairmail:* single copy, six US dollars; one year (six issues) thirty two US dollars; three years (eighteen issues) ninety US dollars.

Send your subscription to Sahitya Akademi, Sales Section, 'Swati', Mandir Marg, New Delhi 110001. Ph: 011-23745297, 23364204 • 4 D L Khan Road, (Near SSKM Hospital), Kolkata 700025 • Central College Campus, Dr. B.R. Ambedkar Veedhi, Bengaluru 560001 • 172, Mumbai Marathi Granth Sangrahalaya Marg, Dadar, Mumbai 400014 • Main Building, Guna Buildings (Second Floor), 443 (304), Anna Salai, Teynampet, Chennai 600183.

Articles in this journal do not necessarily reflect the views or policies of the Sahitya Akademi. All material is protected by copyright and cannot be used in any manner without the permission of the respective authors and the Sahitya Akademi.

Published by K. Sreenivasarao, Secretary, Sahitya Akademi, Rabindra Bhawan, 35, Ferozeshah Road, New Delhi-110001, India and printed by him at Welkish Printers, P/P-5 Maurya Enclave, Delhi-110034.



## Contents

IMPRESSIONS, EXPRESSIONS... 6

### IN MEMORIAM

*Harish Trivedi*  
The One and Only Namwar Singh 18

*Ravi Bhushan*  
The Namwarism of Namwar Singh 32

*Madan Kashyap*  
The First Modernist Critic of Hindi 44

*Prem Singh*  
Imparting Creative Dimension to Marxist Criticism:  
The Role of Namwar Singh 47

*Interview*  
Namwar Singh in Dialogue with Sukritia Paul Kumar on  
Modernism in Hindi (1989) 51

*Jyotika Elhance*  
Centenary of the Jallianwala Bagh Martyrs 57

*Poetry*  
*Subhadra Kumari Chauhan* 58

### HINDI POETRY IN THE CYBERSPACE

*Anamika*  
Note 60

Mohit Kataria		61
Neeraj Dwivedi		62
Rakesh Rohit		63
Ruchi Bhalla		65
Sharad Kokas		66
Varsha Gorchhia		68
Veeru Sonkar		69
Yashasvini		71

## POETRY

Chandrakant Patil	Marathi	73
Pravasini Mahakud	Odia / Hindi	79
Mogalli Ganesh	Kannada	90
Sanjukta Dasgupta	English	94
Selina Choubey	English	101
Ardra Manasi	English	106
Rajosik Mitra	English	113

## STORYTIME

Tara		
Paramita Satpathy	Odia	121
Ankur Betageri		
In a Foreign Land	English	130

## LITERARY CRITICISM

Ather Farouqi		
Translation, A Post-colonial Agenda: Premchand's <i>Soz-i Watan</i> in Perspective		146
Suchitra Awasthi		
Interrogating the Gandhian Sensibilities of the Protagonists in the Works of Raja Rao		154
Amit Kumar Raul		
The Anatomy of Stress: A Literary Discourse		163

FAKIR MOHAN SENAPATI- DEATH CENTENARY ON 15 JUNE 2018; 175 <sup>TH</sup> BIRTH ANNIVERSARY ON 14 <sup>TH</sup> JANUARY 2018	170
--	-----

## PREVIEW

Monica Das		
Memoirs and More of an Insider: A close Brush with the Relics of a Legend called Fakir Mohan Senapati		171

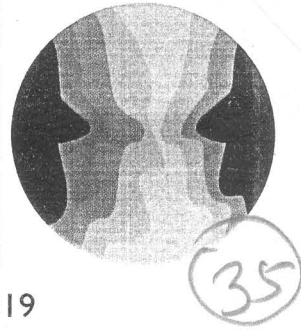
## REVIEWS

K. Satchidanandan		
<i>Banaras and The Other</i> By Gulzar		180
Shirshendu Chakrabarti		
<i>Rereading Tagore</i> By Amiya Dev		184
Mridula Garg		
<i>Eye Contact</i> By Achla Bansal		187
Ranu Uniyal		
<i>Searching for Durga Sabyasachi</i> By Chandini Santosh		190
Pramod K Nayar		
<i>Tips for Living in an Expanding Universe</i> By E. V. Ramakrishnan		193
Alka Tyagi		
<i>Socioliterary Cultures in South Asia</i> By Anisur Rahman		196
Krishnan Unni. P		
<i>The Butterfly Effect</i> By Rajat Chaudhuri		200
K. Srilata		
<i>Cosmopolitan</i> By Mustansir Dalvi		203

## OUR CONTRIBUTORS

International Journal of

**Inclusive  
Education**



Volume 23 Numbers 7-8 July-August 2019

CONTENTS

**Issues 7-8, Special Issue: The Salamanca Statement: 25 Years On**  
*Guest Edited by Mel Ainscow, Roger Slee and Marnie Best*

(pp. 671-907)

 **Routledge**  
Taylor & Francis Group



Volume 63, July/August 2019

CONTENTS



36

<i>Laura Ros and Jose M. Latorre</i>	16	<i>Seulki Ku, Xin Feng, Emma G. Hooper, Qiong Wu and Micah Gerhardt</i>	76
Longitudinal associations of first-grade teaching with reading in early primary school <i>Xin Tang, Eija Pakarinen, Marja-Kristiina Lerkkanen, Joonas Muotka and Jari-Erik Nurmi</i>	23	Narrowing the achievement gap in low-achieving children by targeted executive function training <i>Cuiqing Wang, Susanne M. Jaeggi, Ling Yang, Tianshu Zhang, Xiaozhong He, Martin Buschkuhl and Qiong Zhang</i>	87
Let's Connect: A developmentally-driven emotion-focused parenting intervention <i>Anne Shaffer, Monica M. Fitzgerald, Kimberly Shipman and Marcela Torres</i>	33		



37

17/8/19

पुस्तक प्रलेखन प्रमर्श  
10 270 30 10  
14 दिल्ली-16

# Journal of Applied Social Psychology

VOLUME 49 • ISSUE 6 • JUNE 2019

- 331-348 Feel good now or regret it later? The respective roles of affective attitudes and anticipated affective reactions for explaining health-promoting and health risk behavioral intentions  
COURTNEY J. STEVENS, ARIELLE S. GILLMAN, CASEY K. GARDINER, ERIKA A. MONTANARO, ANGELA D. BRYAN, and MARK CONNER
- 349-360 Mitigation system threat partially mediates the effects of right-wing ideologies on climate change beliefs  
EDWARD J. R. CLARKE, MATHEW LING, EMILY J. KOTHE, ANNA KLAS, and BEN RICHARDSON
- 361-371 How many migrants are people willing to welcome into their country? The effect of numerical anchoring on migrants' acceptance  
FANNY LALOT, ALAIN QUIAMZADE, and JUAN M. FALOMIR-PICHAstor
- 372-380 Mindsets of health and healthy eating intentions  
FANICE N. THOMAS, JENNIFER L. BURNETTE, and CRYSTAL L. HOYT
- 381-394 Efficacy of a Photovoice-based video as an online mental illness anti-stigma intervention and the role of empathy in audience response: A randomized controlled trial  
GREGORY K. TIPPIN and K. AMANDA MARANZAN
- 395 Corrigendum
- 396 Corrigendum

# Journal of Applied Social Psychology

VOLUME 49 • ISSUE 7 • JULY 2019

- 399-408 A test of positive and negative extended intergroup contact in a Chinese minority with perceived group norms and intergroup anxiety as mediators  
CHANGCHENG WANG, FEI HUANG, and LORIS VEZZALI
- 409-415 The experience of ego threat in the public arena: A study of air ball shots performance in collegiate basketball  
NADAV GOLDSCHMIED and DAMIEN VIRA
- 416-425 Adults with conflicting or facilitating goals differ in adherence-related self-regulatory factors and exercise over time  
JOCELYN E. BLOUIN and NANCY C. GYURCSIK
- 426-447 Individuating information influences partisan judgments  
MOLLIE A. PRICE-BLACKSHEAR, KENNON M. SHELDON, MICHAEL J. CORCORAN, and B. ANN BETTENCOURT
- 448-458 Can you be yourself in business? How reminders of business affect the perceived value of authenticity  
MICHAIL D. KOKKORIS and CONSTANTINE SEDIKIDES
- 459-470 The week after: Do the effects of imagined contact last over time?  
MARIA IOANNOU

39

# Journal of & Counseling Development

19819  
19819 317 19819 19819  
198 310 310 310 310  
198 19819-16

Volume 97 ■ Number 3 ■ July 2019

## ■ From the Editor

Introduction ■ 225

Matthew E. Lemberger-Truelove, *Editor*

## ■ Research

Influence of Attachment Style on  
Sexual Abuse Survivors' Posttraumatic Growth ■ 227

Kristina M. Nelson, W. Bryce Hagedorn, & Glenn W. Lambie

Individual and Group Child-Centered Play Therapy:  
Impact on Social-Emotional Competencies ■ 238

Sarah M. Blalock, Natalya Lindo, & Dee C. Ray

Relationships Between Treatment Attitudes, Psychological Symptoms,  
Emotional Competence, and Help-Seeking Intentions ■ 250

Erin F. Ward-Ciesielski, Anne R. Limowski,  
Samuel N. Kreper, & Michael J. McDermott

Expanding Perspectives: Systemic Approaches to  
College Students Experiencing Depression ■ 260

Sean Newhart, Patrick R. Mullen, & Daniel Gutierrez

The Impact of a Brief Bullying Bystander  
Intervention on Depressive Symptoms ■ 270

Aida Midgett & Diana M. Dumas

Survivors' Stories: Navigating Parenthood  
After Surviving Child Sexual Abuse ■ 281

Maria Haiyasoso & Heather Trepal

(Continued on next page)

■ International

Examining the Clinical Efficacy of Core Transformation:  
A Randomized Clinical Trial ■ 293

Dinesh J. Braganza, Ralph L. Piedmont, Jesse Fox,  
Geraldine M. Fialkowski, & Richard M. Gray

Movies as a Therapeutic Technique in School-Based Counseling Groups  
to Reduce Parent-Adolescent Conflict ■ 306

Lubna Tannous Haddad & Zipora Shechtman

■ Theory

Cognitive Complexity: Differentiation and Integration  
in Counseling Practice and Training ■ 317

Brett D. Wilkinson & John A. Dewell

■ Practice

SHORES: A Practical Mnemonic for Suicide Protective Factors ■ 325

Jenny L. Cureton & Matthew Fink

■ Other

Guidelines for Authors ■ 336

JOURNAL OF

# Counseling Psychology®

(41)  
11/8/19  
1.1.2019 4:44 PM  
1.1.2019 4:44 PM  
310 310 310 40 40  
11/8/19

July 2019

Volume 66  
Number 4

www.apa.org/pubs/journals/cou

© 2019  
American  
Psychological  
Association

## Articles

- 385 Health Disparities Between Genderqueer, Transgender, and Cisgender Individuals: An Extension of Minority Stress Theory  
*G. Tyler Lefevor, Caroline C. Boyd-Rogers, Brianna M. Sprague, and Rebecca A. Janis*

This study suggests that individuals who identify outside the gender binary (e.g., genderqueer, gender nonconforming) experience more discrimination, victimization, poor mental health outcomes, and suicidality or self-harm than do both trans- and cisgender men and women. It highlights sociocultural factors such as lack of knowledge about genderqueer experiences and pronouns, poor access to legal and medical resources, and systemic discrimination that may be responsible for these trends.

- 396 A Caballo Regalao no se le Mira el Colmillo: Colonial Mentality and Puerto Rican Depression  
*Cristalís Capielo Rosario, Amber Schaefer, Jorge Ballesteros, Roberto Rentería, and E. J. R. David*

The historical and contemporary colonization of Puerto Rico negatively influences the psychological health of mainland Puerto Ricans. Stronger colonial mentality (internalization of the colonized society and culture as inferior while believing the culture and society of the colonizer is superior) was indirectly linked (via acculturative stress) with more depression symptoms. This investigation offers important information that can help psychologists understand depression disparities among mainland Puerto Ricans.

- 409 The Development and Validation of the Emotional Cultivation Scale: An East Asian Cultural Perspective  
*Li-fei Wang, Meifen Wei, Evelyn Yan Yi Koay, Ming-hua Lo, and Ming-Yang Lee*

The current research has provided an East Asian cultural perspective to extend our understanding of the emotion regulation process. Across two studies, a sound psychometric measure of the Emotional Cultivation Scale (ECS) was developed. This scale is not only appropriate for children and adolescents, but can also be a sensitive measure for clinical populations.

- 424 Cognitive and Affective Expectation of Stigma, Coping Efficacy, and Psychological Distress Among Sexual Minority People of Color  
*Staci Ouch and Bonnie Moradi*

Exposure to discrimination is related to sexual minority people of color's psychological distress. Therefore, efforts to reduce discrimination are needed. In addition, helpful interventions could include attending to feelings of worry and anxiety about stigma and developing problem-focused and emotion-focused coping self-efficacy.

(Contents continue)

- 437 **Surviving and Thriving: Voices of Latina/o Engineering Students at a Hispanic Serving Institution**  
*Patton O. Garriott, Rachel L. Navarro, Lisa Y. Flores, Hang-Shim Lee, Ayli Carrero Pinedo, Diana Slivensky, Melissa Muñoz, Ruben Atilano, Ching-Lan Lin, Rebecca Gonzalez, Laura Luna, and Bo Hyun Lee*  
 Latinas in engineering experience intersectional forms of marginalization that must be attended to in the development of interventions to support their success. Hispanic serving institutions and Latina/o students have unique strengths that may be leveraged to promote Latinas/os' persistence in engineering. Findings from this study offer practical interventions for educators and career counselors to facilitate inclusive engineering communities for Latina/o engineering students.
- 449 **Reducing Dysfunctional Career Decision-Making Beliefs: Gender Differences in the Effectiveness of a Group Intervention**  
*Shahar Hechtlinger and Itamar Gati*  
 Dysfunctional career decision-making beliefs are among the most prevalent and severe difficulties individuals face when making a career decision. Men had stronger dysfunctional beliefs than women before a workshop aimed at reducing these beliefs, and the effect of the workshop on women was greater than on men. Interestingly, the workshop's effectiveness was greater for participants whose gender differed from that of the group facilitator.
- 461 **Emotional Abuse Moderates Efficacy of an Ecological Momentary Stress Management Intervention for College Students**  
*Viann N. Nguyen-Feng, Federico N. Romano, and Patricia Frazier*  
 An ecological momentary stress management intervention was feasible in a college student sample. Although the intervention was effective for those with a history of emotional abuse, it did not appear effective for the general student sample and appeared less effective than a web-based version of the intervention.
- 473 **A Review and Meta-Analysis of Perfectionism Interventions: Comparing Face-to-Face With Online Modalities**  
*Hanna Suh, Harim Sohn, Taeyoung Kim, and Dong-gwi Lee*  
 This review and meta-analysis found empirical support for using psychological interventions to reduce perfectionistic tendencies among individuals. Using either face-to-face or online delivery mode yielded comparable benefits in decreasing perfectionism. Incorporating online interventions into clinical practice should be done with prudence and simply substituting face-to-face interventions with online interventions is not recommended.
- 487 **College Alcohol Beliefs: Measurement Invariance, Mean Differences, and Correlations With Alcohol Use Outcomes Across Sociodemographic Groups**  
*P. Priscilla Lui*  
 Believing alcohol plays a central role in college life is linked to greater alcohol consumption and drinking problems among undergraduate students. The College Life Alcohol Salience Scale can be used to assess college alcohol beliefs and detect students' risks for hazardous drinking, but Greek students and some ethnic groups are more likely to endorse permissive college drinking beliefs and practices.
- 496 **The Meaning of Therapists' Hope for Their Clients: A Phenomenological Study**  
*Theodore T. Bartholomew, Brittany E. Gundel, Huaying Li, Eileen E. Joy, Ellice Kang, and Michael J. Scheel*  
 Therapists' hope for their clients has been understudied despite being a valuable concept that could influence how therapists work during treatment. Our results provide an understanding of the phenomenology of therapists' hope not documented elsewhere in literature. Thus, psychologists can draw from the meanings offered by these participants to foster their own reflections on their hope for clients, where this hope originates from, and how fluctuations in their hope may influence the course of care for clients.

(43)

---

**Brief Report**

- 508 Physiological Synchrony and Therapeutic Alliance in an Imagery-Based Treatment  
*Eran Bar-Kalifa, Jessica N. Prinz, Dana Atzil-Slonim, Julian A. Rubel, Wolfgang Lutz, and Eshkol Rafaeli*  
Our findings indicate that clients and their therapists synchronize their physiology during therapy. Furthermore, such synchrony during experiential work may contribute to the therapeutic bond.
- 

**Other**

- 518 Call for Papers on Therapeutic Alliance Rupture and Repair in Groups: A Special Issue of *Group Dynamics: Theory, Research, and Practice*
- 395 Call for Submissions: Special Section of *Rehabilitation Psychology* on "Chronic Pain From a Rehabilitation Psychology Perspective"
- 460 E-Mail Notification of Your Latest Issue Online!
- iv Instructions to Authors
- 436 *Psychotherapy* Call for Papers
- 472 Subscription Order Information

44

Contents

Articles

Young Children's Social Networks in an Informal Urban Settlement in Kenya: Examining Network Characteristics Among Kamba, Kikuyu, Luo, and Maasai Children 639  
*Daniela A. Salinas, Hillary N. Fouts, Carin L. Neitzel, and Denise R. Bates-Fredi*

Parenting Style, Familism, and Youth Adjustment in Mexican American and European American Families 659  
*Nicole E. Mahrer, Lindsay E. Holly, Linda J. Luecken, Sharlene A. Wolchik, and William Fabricius*

How Does Culture Shape Conceptions of Forgiveness? Evidence From Japan and the United States 676  
*Minjoo Joo, Kari A. Terzino, Susan E. Cross, Naomi Yamaguchi, and Ken-ichi Ohbuchi*

The Role of Cultural Values in the Folk Psychiatry Explanatory Framework: A Comparison of Chinese- and Euro-Canadians 703  
*Sylvanna M. Vargas, Jessica Dere, Laura Garcia, and Andrew G. Ryder*

Social Change and Intergenerational Value Differences in a Bedouin Community in Israel 708  
*Turky Abu Aleon, Michael Weinstock, Adriana M. Manago, and Patricia M. Greenfield*

ISA  
University  
hina  
iel  
m, Israel  
y)  
Medical  
any  
ands  
rlands  
gapore  
eritus)

45

CONTENTS

RESEARCH IN ECONOMIC EDUCATION

- 215 The effects of a financial literacy intervention on the financial and economic knowledge of high school students  
*Andrew Gill and Radha Bhattacharya*

ECONOMIC INSTRUCTION

- 230 Teaching students to extend economic models using in-class scaffolding assignments  
*Tamara Lynn Trafton*
- 242 Efficient empiricism: Streamlining teaching, research, and learning in empirical courses  
*Tomas Dvorak, Simon D. Halliday, Michael O'Hara, and Aaron Swoboda*

Symposium: Intermediate Micro and Macro

- 258 Six guidelines for teaching intermediate macroeconomics  
*N. Gregory Mankiw*
- 261 What should students learn in intermediate microeconomics? To think conceptually from the fundamentals of the discipline  
*Thomas J. Nechyba*
- 265 What should we teach in intermediate macroeconomics?  
*Dean Croushore*
- 269 What should we teach in intermediate microeconomics?  
*Austan Goolsbee*

FEATURES AND INFORMATION

- 273 50 years of teaching introductory economics  
*Daniel S. Hamermesh*
- 284 Data literacy in economic development  
*Simon D. Halliday*
- 299 The unequal distribution of economic education: A report on the race, ethnicity, and gender of economics majors at U.S. colleges and universities  
*Amanda Bayer and David W. Wilcox*
- 321 Switching majors – into and out of economics  
*Tisha L. N. Emerson and KimMarie McGoldrick*
- 333 Trends in undergraduate economics degrees, 2001–2018  
*John J. Siegfried*

14/8/19  
अर्थशास्त्र विभाग  
पुस्तकालय और प्रतिलिपि प्रकाशक  
एच १० एच ५० एच ५०  
एच १६ दिल्ली-१६

Journal of

# Educational Psychology®

www.apa.org/pubs/journals/edu

46

July 2019

Volume 111  
Number 5

## Reading

- 751 Pathways to Reading Comprehension: A Longitudinal Study From 4 to 9 Years of Age  
*Hanne Næss Hjetland, Arne Lervåg, Solveig-Alma Halaas Lyster, Bente Eriksen Hagtvet, Charles Hulme, and Monica Melby-Lervåg*

© 2019  
American  
Psychological  
Association

## Learning and Achievement

- 764 The Cognitive Benefits of Learning Computer Programming: A Meta-Analysis of Transfer Effects  
*Ronny Scherer, Fazilat Siddiq, and Bárbara Sánchez Viveros*
- 793 The Power of Imagination and Perspective in Learning From Science Text  
*Claudia Leopold, Richard E. Mayer, and Stephan Dutke*
- 809 The Forward Effects of Testing Transfer to Different Domains of Learning  
*Chunliang Yang, Siew-Jong Chew, Bukuan Sun, and David R. Shanks*
- 827 Does the Track Matter? A Comparison of Students' Achievement in Different Tracks  
*Jonas Dockx, Bieke De Fraine, and Machteld Vandecandelaere*

## Math

- 847 The Cost of Multiple Representations: Learning Number Symbols With Abstract and Concrete Representations  
*Amy Bennett, Matthew Inglis, and Camilla Gilmore*
- 861 Teacher-Student Relationships and Students' Engagement in High School: Does the Number of Negative and Positive Relationships With Teachers Matter?  
*Andrew J. Martin and Rebecca J. Collie*

## Motivation

- 877 Perseverant Grit and Self-Efficacy: Are Both Essential for Children's Academic Success?  
*Ellen L. Usher, Caihong R. Li, Amanda R. Butz, and Joanne P. Rojas*
- 903 The Tenuous Link Between Classroom Perceptions and Motivation: A Within-Person Longitudinal Study  
*Erik A. Ruzek and Katerina Schenke*

2/18/19  
पुस्तकालय और प्रलेखन प्रभाग  
एन सी ५० १० १०  
२६ दिसम्बर-१९

(Contents continue)

---

**Executive Functioning**

- 918 Teachers' Perceptions of Students' Executive Functions: Disparities by Gender, Ethnicity, and ELL Status  
*Elisa B. Garcia, Michael J. Sulik, and Jelena Obradović*

---

**Other**

- 826 Correction to Roembke et al. (2019)  
931 E-Mail Notification of Your Latest Issue Online!  
932 Instructions to Authors  
792 Members of Underrepresented Groups: Reviewers for Journal Manuscripts Wanted  
808 *Subscription Order Information*

Journal of

# Educational Psychology®

www.apa.org/pubs/journals/edu

48  
22/8/19  
प्रलेखन प्रमाण  
पुस्तकालय और प्रलेखन प्रमाण  
श्री श्री १० प्र० प्र०  
१६ दिसंबर-१६

August 2019

Volume 111  
Number 6

## Reading

- 933 The Role of Semantic Information in Children's Word Reading: Does Meaning Affect Readers' Ability to Say Polysyllabic Words Aloud?  
*Devin M. Kearns and Reem Al Ghanem*
- 957 Refutation Texts Compensate for Detrimental Effects of Misconceptions on Comprehension and Metacomprehension Accuracy and Support Transfer  
*Anja Prinz, Stefanie Golke, and Jörg Wittwer*
- 982 Examining Sources and Mechanisms of Reading Comprehension Difficulties: Comparing English Learners and Non-English Learners Within the Simple View of Reading  
*Eunsoo Cho, Philip Capin, Greg Roberts, Garrett J. Roberts, and Sharon Vaughn*

© 2019  
American  
Psychological  
Association

## Mathematics

- 1001 The Effects of Early Numeracy Interventions for Students in Preschool and Early Elementary: A Meta-Analysis  
*Gena Nelson and Kristen L. McMaster*
- 1023 Improving Children's Understanding of Mathematical Equivalence via an Intervention That Goes Beyond Nontraditional Arithmetic Practice  
*Nicole M. McNeil, Caroline Byrd Hornburg, Heather Brletic-Shipley, and Julia M. Matthews*
- 1045 Improving Student Learning of Ratio, Proportion, and Percent: A Replication Study of Schema-Based Instruction  
*Asha K. Jitendra, Michael R. Harwell, Soo-hyun Im, Stacy R. Karl, and Susan C. Slater*

## Science

- 1063 Introducing a Science Interest Network Model to Reveal Country Differences  
*Maijen S. M. Sachisthal, Brenda R. J. Jansen, Thea T. D. Peetsma, Jonas Dalege, Han L. J. van der Maas, and Maartje E. J. Raijmakers*

## Motivation

- 1081 Motivation in Transition: Development and Roles of Expectancy, Task Values, and Costs in Early College Engineering  
*Kristy A. Robinson, You-kyung Lee, Emily A. Bovee, Tony Perez, S. Patrick Walton, Daina Briedis, and Lisa Linnenbrink-Garcia*

(Contents continue)

- 1103 Outcomes and Antecedents of Teacher Depersonalization: The Role of Intrinsic Orientation for Teaching  
*Moti Benita, Ruth Butler, and Limor Shibaz*
- 1119 Seeing Is Believing: Gender Diversity in STEM Is Related to Mathematics Self-Concept  
*Christoph Niepel, Matthias Stadler, and Samuel Greiff*

---

**Other**

- 1044 E-Mail Notification of Your Latest Issue Online!
- iii Instructions to Authors
- 1080 Members of Underrepresented Groups: Reviewers for Journal Manuscripts Wanted

# Journal of Education for Teaching

International research and pedagogy

Volume 44 Number 5 December 2018

50

## Special Issue: Perspectives on Evidence-based Knowledge for Teachers: acquisition, mobilisation and utilisation

Guest Editor: Linda La Velle

### CONTENTS

#### Editorial

- 523 'Perspectives on evidence-based knowledge for teachers: acquisition, mobilisation and utilisation'  
*Peter Gilroy*

#### Introduction

- 524 Perspectives on evidence-based knowledge for teachers: acquisition, mobilisation and utilisation.  
*Linda La Velle and Maria Assunção Flores (England & Portugal)*

#### Articles

- 539 Building learning partnerships between schools and universities: an example from south-west England  
*Rowena Passy, Jan Georgeson and Beth Gompertz (England)*
- 556 The role of teacher educators in developing and disseminating global citizenship education strategies in and beyond US learning environments  
*James G O'Meara, Tonya Huber and Elizabeth R. Sanmiguel (US)*
- 574 Mobilising knowledge through global partnerships to support research-informed teaching: five models for translational research  
*Sarah Younie, Jon Audain, Irma Eloff, Marilyn Leask, Richard Procter and Chris Shelton (England)*
- 590 RETAIN early career teacher retention programme: evaluating the role of research informed continuing professional development for a high quality, sustainable 21st century teaching profession  
*Tanya Ovenden-Hope, Sonia Blandford, Tim Cain and Bronwen Maxwell (England)*
- 608 Massive open online courses as a knowledge base for teachers  
*Smadar Donitsa-Schmidt and Beverley Topaz (Israel)*
- 621 Linking teaching and research in initial teacher education: knowledge mobilisation and research-informed practice  
*Maria Assunção Flores (Portugal)*
- 637 Evidence and its integration into teacher knowledge: foucaultian perspectives to link research knowledge and teaching  
*Clemens Wieser (Denmark)*

- 651 **Book Reviews**

22/11/19  
2019 11 22  
16

51

# The Journal of the Learning Sciences

Volume 28, Number 3

Jul-Aug. 2019

## REPORTS AND REFLECTIONS

Invented Science: A Framework for Discussing a Persistent Problem of Practice . . . . .	279
<i>Rosemary S. Russ and Leema K. Berland</i>	

## ARTICLES

Building on Each Other's Ideas: A Social Mechanism of Progressiveness in Whole-Class Collective Inquiry . . . . .	302
<i>Marc Clarà</i>	

Educating and Measuring Choice: A Test of the Transfer of Design Thinking in Problem Solving and Learning . . . . .	337
<i>Doris B. Chin, Kristen P. Blair, Rachel C. Wolf, Luke D. Conlin, Maria Cutumisu, Jay Pfaffman, and Daniel L. Schwartz</i>	

Lessening the Load of Misconceptions: Design-Based Principles for Algebra Learning . . . . .	381
<i>Christina A. Barbieri, Dana Miller-Cotto, and Julie L. Booth</i>	

Research; Linguistics,  
 five issues per year  
 17331.  
 journal/hlms. This  
 nt) or as part of our  
 m/page/librarians.  
 rwork to a selected  
 e online access and  
 scriptions must be  
 ax: 215-207-0047.  
 ia, PA 19106. Tel:  
 ex, CO3 3LP, UK.  
 d book publishing

iced, stored, trans-  
 p, LLC. Taylor &  
 the sole basis that  
 : Copyright Clear-  
 uthorization does  
 se. The publisher  
 advertising in this  
 ity or value of the

# JEM



## JOURNAL of EDUCATIONAL MEASUREMENT

VOLUME 56 ■ NUMBER 2 ■ Summer 2019

- 217 Examining Differential Rater Functioning Using a Between-Subgroup Outfit Approach  
*Stefanie A. Wind and Stefanie S. Sebok-Syer*
- 251 Use of Data Mining Methods to Detect Test Fraud  
*Kaiwen Man, Jeffrey R. Harring, and Sandip Sinharay*
- 280 Scale Alignment in Between-Item Multidimensional Rasch Models  
*Leah Feuerstahler and Mark Wilson*
- 302 Standard Errors of IRT Parameter Scale Transformation Coefficients: Comparison of Bootstrap Method, Delta Method, and Multiple Imputation Method  
*Zhonghua Zhang and Mingren Zhao*
- 331 Comparing Academic Readiness Requirements for Different Postsecondary Pathways: What Admissions Tests Tell Us  
*Jeffrey T. Steedle, Justine Radunzel, and Krista D. Mattern*
- 361 Effectiveness of Equating at the Passing Score for Exams With Small Sample Sizes  
*Amanda A. Wolkowitz and Keith D. Wright*
- 391 Modeling Partial Knowledge on Multiple-Choice Items Using Elimination Testing  
*Qian Wu, Tinne De Laet, and Rianne Janssen*
- 415 Item Response Models for Multiple Attempts With Incomplete Data  
*Yoav Bergner, Ikkyu Choi, and Katherine E. Castellano*
- 437 Computerized Adaptive Testing in Early Education: Exploring the Impact of Item Position Effects on Ability Estimation  
*Anthony D. Albano, Liuhan Cai, Erin M. Lease, and Scott R. McConnell*
- 452 Use of Adjustment by Minimum Discriminant Information in Linking Constructed-Response Test Scores in the Absence of Common Items  
*Yi-Hsuan Lee, Shelby J. Haberman, and Neil J. Dorans*

Exe

When p  
commo  
fit the e  
examin  
out and  
residua  
Practiti  
uniform  
idence  
real dai  
dardize  
responc  
any ide.

In previo  
numerous i  
stitutes evic  
agreement  
2005; Myfo  
mediated a:  
(DRF), or r  
students in  
2002; Sprir  
Gass, & M  
estimate or  
within a sul  
of potential  
ensure accu  
Research  
bances" or  
of an assess  
threaten the  
Accordingl  
pretation an  
Research A  
tional Coun

© 2019 by



# Journal of Geography

53

July–August, 2019 • Volume 118, Number 4 • National Council for Geographic Education

EDITOR Jerry T. Mitchell <i>University of South Carolina</i>	ARTICLES Do Learning Style Preferences of Preservice Geography Teachers Matter in Self-Directed Learning? <i>Aubrey Golightly</i>	143
ASSOCIATE EDITOR/EDITOR-ELECT Meredith Marsh <i>Lindenwood University</i>	Fostering Environmental Sensitivity by Observing Everyday Environments <i>Minsung Kim</i>	157
ASSOCIATE EDITORS Timothy Hawthorne <i>University of Central Florida</i>  Alex Oberle <i>University of Northern Iowa</i>	Identifying and Removing the Silences of Roma Culture in Polish School Texts <i>Agnes Świątek, Stanley Brunn, and Bożena Wójtowicz</i>	169
BOOK REVIEW EDITOR Virginia Thompson <i>Towson University</i>		
EDITORIAL ASSISTANT Christopher Krause <i>University of South Carolina</i>		

[Cover Image: La Comuna 13, once Medellín, Colombia's most dangerous neighborhood, now caters to tourists by ferrying them up the hillside via escalators. Photo credit: Jerry Mitchell.]

July  
28/8/19  
इतिहास प्रभाग  
पुस्तकालय और प्रलेखन प्रभाग  
एन सी जी १० १० १० १०  
एन सी जी-१६

54

1/8/19

पुस्तकालय और प्रलेखन प्रभाग  
एच 303 310 प्रो पठ  
नई दिल्ली-16

# Journal of Mathematics Teacher Education

Volume 22 · Number 4 · August 2019

**Theoretical and methodological tools in designing and analysing mathematics teacher education practices**

D. Potari 327

**Examining aspects of teachers' posing of problems in response to children's mathematical thinking**

T.J. Land · A.M. Tyminski · C. Drake 331

***It's part of my life and the modelling process***

L. Galligan · T. Axelsen · T. Pennicott · R. Addie · P. Galbraith · G. Woolcott 355

**Designing advanced mathematics courses to influence secondary teaching: fostering mathematics teachers' "attention to scope"**

N.H. Wasserman · K. Weber · T. Fukawa-Connelly · W. McGuffey 379

**Which research can support PD facilitators? Strategies for content-related PD research in the Three-Tetrahedron Model**

S. Prediger · B. Roesken-Winter · T. Leuders 407

Further articles can be found at [link.springer.com](http://link.springer.com)

Indexed/abstracted in SCOPUS, PsycINFO, Google Scholar, EBSCO, Academic OneFile, Contents Pages in Education, Current Abstracts, Educational Research Abstracts Online (ERA), ERIC System Database, ERIH, Gale, MathEDUC, OCLC, SCImago, Summon by Serial Solutions, Vocational Education and Training Abstracts

Instructions for Authors for *J Math Teacher Educ* are available at <http://www.springer.com/10857>

l  
A  
ity,  
ducation (JMTE)  
n of mathematics  
hat promotes  
natics. JMTE  
velopment of  
ators and serves  
, societal and  
ers' learning,  
tical analyses  
t initiatives,  
e populations and  
the main focuses  
are rigorously  
e sections of  
l reflect the  
l above and  
nal interest.  
/orld: these  
ies of  
wider  
t response to a  
ng a theoretical  
to which they  
nce, papers  
ig word  
ords; (3) 3, 000  
reviewed.  
to the main

CONTENTS

Articles

- 133 Women's participation in peace processes: a review of literature  
*Maxwell Adjei*
- 155 Engaging with teachers' difficult knowledge, seeking moral repair: the entanglement of moral and peace education  
*Michalinos Zembylas and Zvi Bekerman*
- 175 Photo-monologues and photo-dialogues from the family album: Arab and Jewish students talk about belonging, uprooting and migration  
*Ya'Ara Gil-Glazer*
- 195 Training for peace, conscientization through university simulation  
*Ludwig Gelot*
- 215 Education provision in the midst of a crisis: the Zimbabwean experience after 1999  
*Mediel Hove and Enock Ndawana*

eritus),  
 ty, USA  
 Australia  
 rtment of  
 ay  
 istria  
 Nicosia  
 ducation  
 earch to  
 :dagogy.  
 ilogically  
 earchers,  
 advance  
 natically  
 om areas  
 ligenous  
 in rights  
 fessional  
 ciliation  
 .edu).

# Journal of Research in Science Teaching

56

Volume 56, Issue 6, August 2019

## CONTENTS

### Research Articles

- "I don't think it's science:" African American girls and the figured world of school science:  
*Katherine Wade-Jaimes and Renee Schwartz*..... 679  
Published online 2 October 2018 in Wiley Online Library
- Elementary teachers' science subject matter knowledge across the teacher career cycle:  
*Ryan S. Nixon, Leigh K. Smith, and Richard R. Sudweeks* ..... 707  
Published online 2 October 2018 in Wiley Online Library
- Evaluating the effects of analogy enriched text on the learning of science: The importance of  
learning indexes: *Stella Vosniadou and Irini Skopeliti* ..... 732  
Published online 11 October 2018 in Wiley Online Library
- Teaching energy in high school by making use of history and philosophy of science:  
*Manuel Bächtold and Valérie Munier* ..... 765  
Published online 2 October 2018 in Wiley Online Library
- Teacher-student negotiations during context-based chemistry reform: A case study:  
*Michelle Overman, Jan D. Vermunt, Paulien C. Meijer, and Mieke Brekelmans* ..... 797  
Published online 23 December 2018 in Wiley Online Library
- Teachers' framing of argumentation goals: Working together to develop individual versus  
communal understanding: *María González-Howard and Katherine L. McNeill*..... 821  
Published online 29 January 2019 in Wiley Online Library

# Language Problems & Language Planning

57

*Handwritten:* 1/18/19  
✓  
©

VOLUME 42 NUMBER 3 2018

*Dec*

SPECIAL ISSUE

**Mediation Strategies**

Edited by Anthony Pym

John Benjamins Publishing Company

## Table of contents

ARTICLES / ARTICULOS / AUFSÄTZ / ARIKOJ

Introduction: Why mediation strategies are important <i>Anthony Pym</i>	255
Language choices and practices of migrants in Germany: An interview study <i>Sabine Fiedler and Agnes Wohlfarth</i>	267
“It’s so vital to learn Slovene”: Mediation choices by asylum seekers in Slovenia <i>Nike K. Pokorn and Jaka Čibej</i>	288
“Do I want to learn a language spoken by two million people?”: Mediation choices by mid-term and long-term migrants <i>Nike K. Pokorn and Jaka Čibej</i>	308
The complementary nature of linguistic mediation in transnational adoption mobility <i>Alice Fiorentino</i>	328
Mediation choice in immigrant groups: A study of Russian speakers in southern Catalonia <i>Nune Ayvazyan and Anthony Pym</i>	344

59

## LIBRARY HERALD

A Peer Reviewed Journal

Vol 57 No 2

June 2019

### CONTENTS

#### Articles

- Subject Mapping of Information Literacy Competency Levels of Social Science Researchers in National Capital Region, India  
RAJESH SINGH AND SHAI LENDRA KUMAR 163
- Emerging Roles of Librarians in Academic Libraries: A Great Leap Forward  
MR SHOYEL AND DR SAMIR KUMAR JALAL 183
- Need of Digitisation of Indigenous Knowledge on Medicinal Plants:  
A Study on the Santals of Birbhum District, West Bengal  
ATANU KUMAR SINHA 195
- Implementation of Radio - Frequency Identification System in Fakiragram  
College:  
A Practical Approach.  
HIRAK JYOTI HAZARIKA AND DR. S RAVI KUMAR 205
- Bibliometrics of Ph D theses accepted by Indian Agricultural Research  
Institute (IARI) during 2011 to 2016  
KC GARG AND RITA PAL 222
- Canons for Ontology  
AISHWARYA VERMA 232
- A Study of Information Resources and Services in the Select Libraries  
of Fine Arts Colleges and Art Galleries in India  
REKHA RANI AND SHAI LENDRA KUMAR 238
- Book Review* 251
- News & Events* 253

# Linguistics and Education

An International Research Journal

Volume 51

June

2019

## Contents

Abstracted/Indexed in: Communication Abstracts; Educational Management Abstracts; Educational Research Abstracts Online; Education Research Index; ERIC; Language Teaching; Linguistics Abstracts Online; LLBA; MLA International Bibliography; Multicultural Education Abstracts; PsycINFO; Uncover. Also covered in the abstract and citation database SCOPUS®. Full text available on ScienceDirect®

Empowering the point: Pains and gains of a writer's traversals between print-based writing and multimodal composing ..... <i>Y. Zhang, K.L. O'Halloran</i>	1	Understanding willingness to communicate as embedded in classroom multimodal affordances: Evidence from interdisciplinary perspectives ..... <i>J.-E. Peng</i>	59
Wuli and stance in a Korean heritage language classroom: A language socialization perspective..... <i>J. Song</i>	12	Which instructional programme (EFL or CLIL) results in better oral communicative competence? Updated empirical evidence from a monolingual context..... <i>J.d.D. Martínez Agudo</i>	69
Scaffolding analytical argumentative writing in a design class: A corpus analysis of student writing..... <i>M.P. Gomez-Laich, R.T. Miller, S. Pessoa</i>	20	A functional perspective on the challenges of teaching English tenses to speakers of other languages: The case of adult speakers of Serbian ..... <i>D. Stosic</i>	79
Disjuncture, modality, and institutional repertoire: (De) colonizing discourses at a tribal school ..... <i>M.M. Engman</i>	31	De-alienating the academy: Multilingual teaching as decolonial pedagogy..... <i>B.E. Antia, C. Dyers</i>	91
Children's sign-making and construction of signifying chains in relation to texts: Book interactions as discursive processes..... <i>J. Ranker</i>	46		



61

पञ्चत्रिंशं वर्षम्, द्वितीयाङ्कः

Vol. 35 No. 2

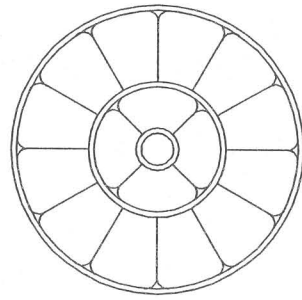
२०१९, अगस्त

Aug. 2019

# लोकसंस्कृतम्

षाण्मासिकपत्रिका

दिव्या संस्कृतभारती सुमहिता स्याद् राष्ट्रभाषापदे  
वाग् मातुः सफलीभवेद् द्रुतमियं भव्ये भविष्येऽन्तिके।  
तेनाविष्कृतमत्र संस्कृतगिरो रूपं सुबोधं बुधा  
लोके राजतु लोकसंस्कृतमिदं षाण्मासिकं शाश्वतम्॥



28/8/19  
प्रलेखन प्रभाग  
पुस्तकालय और प्रलेखन प्रभाग  
ए० पी० आर० प्र० प्र०  
एई दिल्ली-16

संस्कृतकार्यालयः, श्रीअरविन्दाश्रमः, पुदुच्चेरी - ६०५ ००२

लोकसंस्कृतम्, अगस्त २०१९

## विषयसूची

कथा		धारावाहिकलेखा:	
नृपति-दरिद्रयोः मित्रता	... 14	शिशुध्रुवस्य तपस्या (नाटकम्)	... 16
चरित्रनिर्माणस्य अद्भुतप्रेरणा	... 38	शक्ति-सारदम् (नाटकम्)	... 24
		देवीमाहात्म्यम्	... 27
विविधलेखा:		वेदरहस्यम्	... 30
केचित् प्रश्नाः तेषां समाधानं च	... 9	कठोपनिषद्	... 34
झङ्कृतिमुखरा भुवनमेखला	... 22	नलोपाख्यानम्	... 39
हास्यप्रसङ्गाः	... 33	Sanskrit: A Direct Approach	... 43

प्रकाशकः — मनोजदासगुप्तः, प्रकाशनविभागः, श्रीअरविन्दाश्रमः, पुदुच्चेरी।

सम्पादकः — नरेन्द्रः।

वार्षिक-शुल्कम् रू. ३०.०० (त्रिंशत् रूप्यकाणि)

आजीवन-शुल्कम् (विंशतिवर्षपर्यन्तम्) रू. ५००.०० (पञ्चशतं रूप्यकाणि)

प्रकाशनकालः — फरवरी २१, अगस्त १५

मुद्रकः — स्वाधीनचाटार्जी, श्रीअरविन्दाश्रम-मुद्रणालयः, पुदुच्चेरी।

*Please make DD/Cheque in favour of Sanskrit Karyalaya and send your subscription and letters to:*

**Sanskrit Karyalaya**

**Sri Aurobindo Ashram, Pondicherry - 605 002**

E-Mail: [sanskrit@sriaurobindoashram.org.in](mailto:sanskrit@sriaurobindoashram.org.in)

Web: <http://sanskrit.motherandsriaurobindo.com>

Phone No. (0413) - 2233722

**CONTENTS**

<b>SUMIT ARORA</b>	<i>Socio-Economic Profile of People Living with 1 HIV/AIDS: A Sociological Study</i>	
<b>NISHA BHARGAVA AND KETAKI DWIVEDI</b>	<i>Gender Sensitisation &amp; Women Empowerment: A 17 Study of Punjab</i>	
<b>KULWANT SINGH</b>	<i>Subsidised Power Supply and Its Usage in 37 Agriculture: A Study of Haryana</i>	
<b>SONU MADAN AND RITU GOYAL</b>	<i>Outcomes of Labour Market for Informal Workers: 51 An Analysis of Influential Factors in Haryana</i>	
<b>BHASKAR MAJUMDER AND SIMA YADAV</b>	<i>Living Conditions of Households in Slums in 71 Allahabad City, Uttar Pradesh: Some Implications</i>	
<b>RAJEEV K KUMAR</b>	<i>Status of Public Health Services: Availability and 89 Utilization in Bihar</i>	
<b>ANUPAM SARKAR</b>	<i>Rural Sanitation in Jharkhand: an Analysis of Recent 103 Trends</i>	
<b>HALIMA SADIA RIZVI AND MANSI VINAİK</b>	<i>Study of Performance of Indira Awaas Yojana: 131 Comparative Case of Tripura, North-East and India</i>	
<b>RENU SRIVASTAVA AND S K PANT</b>	<i>An Analysis of Central Sponsored Schemes Related to 151 Women Empowerment: A Study of Koraon Block of Allahabad District</i>	
<b>DOCUMENT</b>		
<b>K K PAUL</b>	<i>North East- Constitutional Issues</i>	167
<b>BOOK REVIEW</b>		
<b>DEEPRATAN SINGH KHARA</b>	<i>Domestic Water Consumption Pattern in Urban 171 Areas: Retrospective and Prospective Analysis by Jasdeep Kaur</i>	

# MAN AND LIFE

Vol. 45

Nos. 1-2

Jan-June, 2019

## CONTENTS

Women and gender relations in tribal society: The case study of the Durua in Koraput district, South Orissa	1
<i>S.N. Ratha</i>	
Anthropology in rural development	9
<i>Vijay Prakash Sharma</i>	
Role of education for empowerment of the marginalized: A case study on marginalized communities in Assam	23
<i>Dilip Kumar Bhuyan</i>	
Proximate determinants of fertility among the Sonowal Kacharis of Assam	37
<i>Nitumoni Saikia, Deepanjana Dutta Das</i>	
Political deprivation as a cause of tribal movement in India with special reference to Bastar region	45
<i>Swapan Kumar Kolay</i>	
Caste lineage and power: A study on two villages of Rajasthan	63
<i>TilakBagchi, Anil Kumar Singh</i>	
Book Review	81

*Mathematics Learning*  
*Mathematics Teaching*  
*Issue*

# Contents MT267 Jul. 2019

(65)

Forewords by Paul Killen	4	It makes you think	26
Danny's diary: Working together by Danny Brown	5	Ethics and the mathematics teacher: Part 2 by Paul Ernest	28
Doing it with understanding by Colin Foster	8	Geometric meaningfulness by John Mason and Anne Watson	32
How does a mastery lesson unfold by Jeremy Dawson and Yuqian (Linda) Wang	11	Problem solving with <i>Peg Solitaire</i> by Jenny Forsythe	35
Inventing an algebraic knot theory for eight-year-olds by Dan Ghica	15	Discussions, conjectures, noticing... by Siobhán McKenna	38
A framework for authentic mathematics problems by S. Asli Özgün-Koca, Kenneth Chelst, Thomas Edwards and Jennifer Lewis	17	The Jo Walters Trust mathematics grants by Lucy Johnston	40
Questions and answers by David Fielker	21	In conversation with Helen Williams by Tony Cotton	43
The two worlds of mathematics: A mathematician's view by Alan F. Beardon	24	From the archives: What makes a rich task? 46 by Pete Griffin	46
		Book review by Tony Cotton	49



Plus 1 drawn by Harry Venning.

The cover photograph was taken by Simon Carey. He can be contacted at [sdcarey@gmail.com](mailto:sdcarey@gmail.com).

# CONTENTS

## On the Cover

Astronaut William Anders took the image now known as "Earthrise" during the Apollo 8 lunar orbit mission. A duplicate of Anders's film is stored at Houston's Johnson Space Center, where this frame was photographed.

DAN WINTERS

## EMBARK

# 12

### THE BIG IDEA

#### Let's Send Only Women to Space

If females have the right stuff for long space voyages, why send men at all?

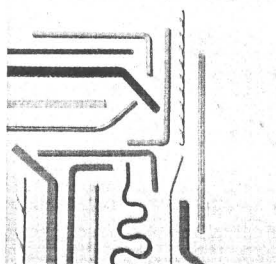
BY NADIA DRAKE

### PLANET OR PLASTIC?

#### Straw Poll

To take plastic drinking straws out of the waste stream, consider metal, silicone—even bamboo.

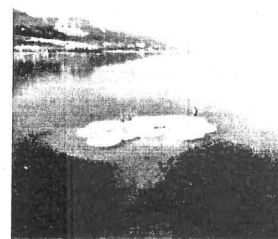
BY SARAH GIBBENS



### ALSO

What Makes Words Funny  
Dandelion in Flight  
Sleep's Repairs

## EXPLORE



# 28

### GETTING THERE

#### A Salty Sea Island

Studying one spot in the Dead Sea involved flying a drone and taking a briny swim.

BY NINA STROCHLIC

### DECODER

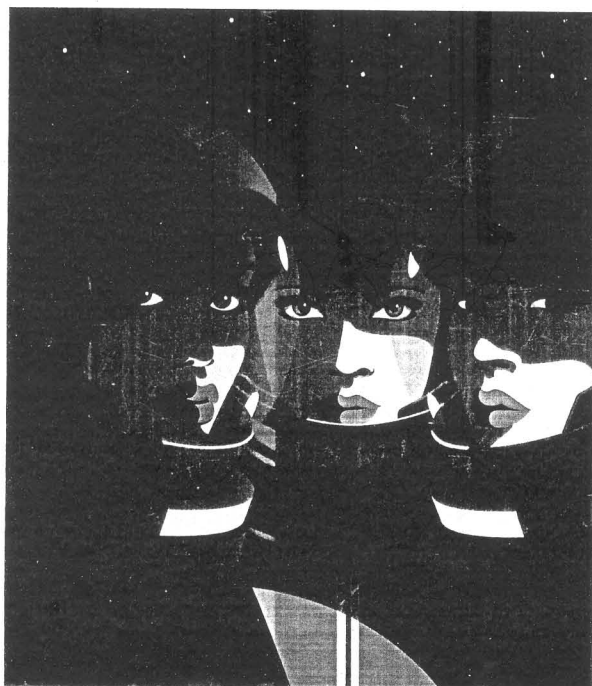
#### New Places to Go

Inventive prototypes of toilets might lead to low-cost, sanitary facilities that can work around the world.

BY MANUEL CANALES

### ALSO

A Legend's Boots  
Octopus Odd Couple  
The Night of Fireflies





**FEATURES**

**How Humans Got to the Moon ...**

Space prowess was built over time: the crews, the hardware, the goals. BY NADIA DRAKE..... P. 34

**... and What's Next**

Today's space race is multinational, moneyed, and ever more crowded. What will its winners get? BY SAM HOWE VERHOVEK PHOTOGRAPHS (BOTH STORIES) BY DAN WINTERS ..... P. 68

**The Mangrove Wall**

How climate change hits this natural defense. BY PETER SCHWARTZSTEIN PHOTOGRAPHS BY ARKO DATTO

..... P. 84

**Desperate Niger**

The West African nation is at risk from the chaos that surrounds it. BY ROBERT DRAPER PHOTOGRAPHS BY PASCAL MAITRE

..... P. 94

**Protecting the Sea at the End of the World**

National Geographic's Pristine Seas project has helped establish marine reserves to protect more than two million square miles of oceans. The project recently laid scientific groundwork for a new marine park off Argentina, with private and government support. PHOTOGRAPHS AND STORY BY ENRIC SALA

..... P. 114

CONTENTS

On the Cover

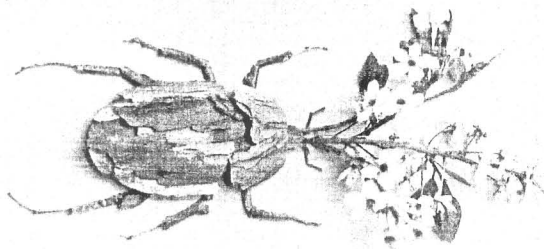
Rohingya refugees fleeing Myanmar by boat often brave rough seas to reach the southern tip of Bangladesh. Some 20 feet from shore, a woman with a baby jumped from the boat and waded the rest of the way.

K M ASAD

Handwritten notes: 6/18/19, 14/8/19

PROOF

प्राचिन प्रमाण  
प्रयोगालय और प्रलेखन प्रमाण  
२०१९ ३१० १०० ५०  
५६ दिल्ली-१६



EMBARK

17

THE BIG IDEA

We Are All Migrants

Through time and space, humans are a migratory species.

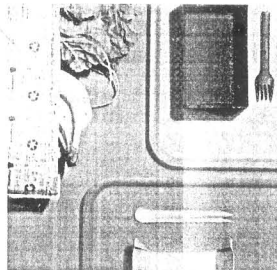
BY MOHSIN HAMID

PLANET OR PLASTIC?

Reducing Plastic Waste From Food Containers

Designers and engineers are developing new food packaging materials.

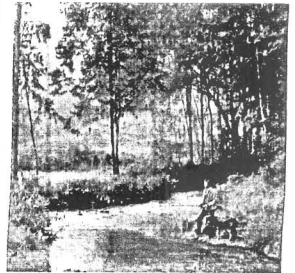
BY ELIZABETH ROYTE



ALSO

Rocks in Crocs  
A Mass of Meteorites  
Secret Pollinator

EXPLORE



30

THROUGH THE LENS

Peace Like a River

For a photographer who's drained after years of covering conflict, fly-fishing offers solace.

BY PETE MULLER

DECODER

From Tank to Table

The sustainable future is now, with fish farms feeding plants that grow without soil.

BY MONICA SERRANO

ALSO

Urban Hot Spots  
Totem Pole Climb  
Surfboard Shaper

10

Building Bugs With Blooms

An artist uses natural materials he finds in his yard and among florists' discards to make lively—and lifelike—portraits of insects.

PHOTOGRAPHS BY RAKU INOUE

cking  
n the  
duo



ns used.



bs



o.in  
ores



**FEATURES**

**Walking With Migrants**

The author falls in step with people driven by circumstance "to leave a familiar world."

BY PAUL SALOPEK  
PHOTOGRAPHS BY JOHN STANMEYER  
.....P. 36

**Born a Refugee**

Rohingya babies start life stateless in a Bangladesh refugee camp.

BY NINA STROCHLIC  
PHOTOGRAPHS BY TURJOY CHOWDHURY  
..... P. 60

**From Africa to Spain**

The migrants' gamble has yet to pay off.

BY CYNTHIA GORNEY  
PHOTOGRAPHS BY AITOR LARA..... P. 68

**Tijuana Portraits**

The border, in faces.

BY NINA STROCHLIC  
PHOTOGRAPHS BY ALEXIA WEBSTER ..... P. 80

**The Birth of Europe**

Genetic tools tell what's in the melting pot.

BY ANDREW CURRY  
PHOTOGRAPHS BY RÉMI BÉNALI ..... P. 88

**The Survivors**

As warming shrinks wolverines' territory, the fierce carnivores battle new threats.

BY DOUGLAS CHADWICK  
PHOTOGRAPHS BY STEVEN GNAM  
.....P. 108

**Rituals of Spirited Rebellion**

Carnivals in the Americas hold cultural resistance and a connection to ancestral roots.

BY JACQUELINE CHARLES  
PHOTOGRAPHS BY CHARLES FRÉGER.... P. 116

(72)

# Natural Language & Linguistic Theory

Volume 37 · No. 3 · August 2019

**Amahuaca ergative as agreement with multiple heads**

Emily Clem 785

**On the relation between speech perception and loanword adaptation: Cross-linguistic perception of Korean-illicit word-medial clusters**

Robert Daland · Mira Oh · Lisa Davidson 825

**Imperatives under coordination**

Ezra Keshet · David J. Medeiros 869

**Verb-phrase ellipsis and complex predicates in Hindi-Urdu**

Emily Manetta 915

**Inverse marking and Multiple Agree in Algonquin: Complementarity and variability**

Will Oxford 955

**The explicative genitive and close apposition**

Kjell Johan Sæbø 997

**Case and number suppletion in pronouns**

Peter W. Smith · Beata Moskal · Ting Xu · Jungmin Kang · Jonathan David Bobaljik 1029

**Upward P-cliticization, accent shift, and extraction out of PP**

Aida Talić 1103

**Absolutive Promotion and the Condition on Clitic Hosts in Choctaw**

Matthew Tyler 1145

# This week's issue

18/19  
72 दिवस-10

## On the cover

- 32 How our minds create time**  
The startling truth about the fourth dimension
- 43 Purr-fect match**  
Why your personality is the same as your pet's



**18 Zero waste unwrapped**  
Does ditching food packaging really help the planet?

**38 Extreme heat**  
What Earth's climate past tells us about its future

**5 Weirdest stars**  
Random light dips baffle astronomers

6 Anti-vax clampdown 12 Bystander effect debunked 17 Veggie crocodiles  
8 CRISPR vs HIV 8 AI that learns like kids

Vol 243 No 3237  
Cover image: Matt Chase

## Coming next week



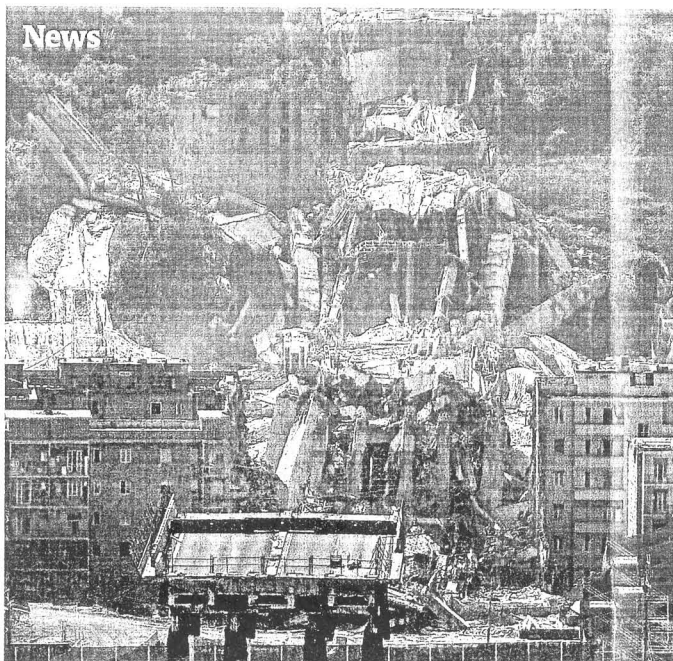
**The moon landings at 50**  
Why we are still obsessed with Earth's iconic satellite

## News

- 6 Mind mapped**  
First complete wiring diagram for an animal's nervous system
- 7 Fossil fuel danger**  
Planned power plants will push us over 1.5°C warming
- 45 Mystery space waves**  
Radio signals traced to an unexpected home galaxy

## Views

- 24 Cornment**  
Effective decision-making means knowing unknowns, says Anne Marthe van der Bles
- 22 The columnist**  
James Wong weighs up the evidence over organic food
- 24 Letters**  
Surely mirror matter would have more effects
- 26 Aperture**  
A pair of lions take to the trees
- 30 Culture columnist**  
Helen Marshall dives into experimental writing in sci-fi



**10 Bridge begone** The Morandi bridge in Genoa has been demolished a year after a deadly disaster

**32 Features**  
"Explain time? Not without explaining existence. Explain existence? Not without explaining time"

## Features

- 32 How our minds create time**  
The fourth dimension is a figment of your imagination
- 38 Extreme heat**  
What can Earth's deep past tell us about our climate future?
- 43 Purr-fect match**  
The science of pet ownership can tell us what makes our best friends tick

## The back pages

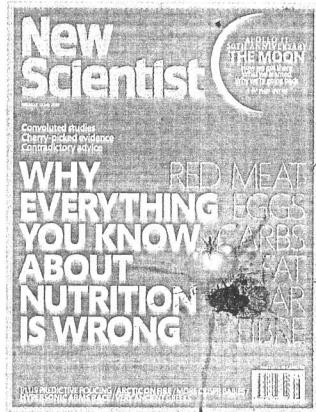
- 51 Maker**  
How to make your own robot
- 52 Puzzles**  
A crossword, a cash conundrum and the quick quiz
- 53 Feedback**  
Calling time on time and slug sacrifices: the week in weird
- 54 Almost the last word**  
Food preferences and flowers in hospitals: readers respond
- 56 Me and my telescope**  
Galaxy-spotter and armour-maker Ashley Spindler

14/27/19

# This week's issue

## On the cover

**32 Why everything you know about nutrition is wrong**  
Convuluted studies  
Cherry-picked evidence  
Contradictory advice



**36 Apollo 11 50th anniversary: The moon**  
How we got there  
What we learned  
Why we're going back

## Coming next week



**Cosmic countdown**  
The universe's fate could be stranger than we thought

46 Predictive policing 44 Arctic on fire 38 More CRISPR babies  
12 Hypersonic arms race 17 Very ancient Greeks

Vol 243 No 3238

## News

**10 Computer genius**  
Software mimics a legendary mathematician's style

**13 Murder in the Palaeolithic**  
Modern forensics identifies an early homicide

**18 China races ahead**  
The nation leads the world when it comes to electric vehicles

## Views

**21 Comment**  
We need to think about how we die, says Clare Wilson

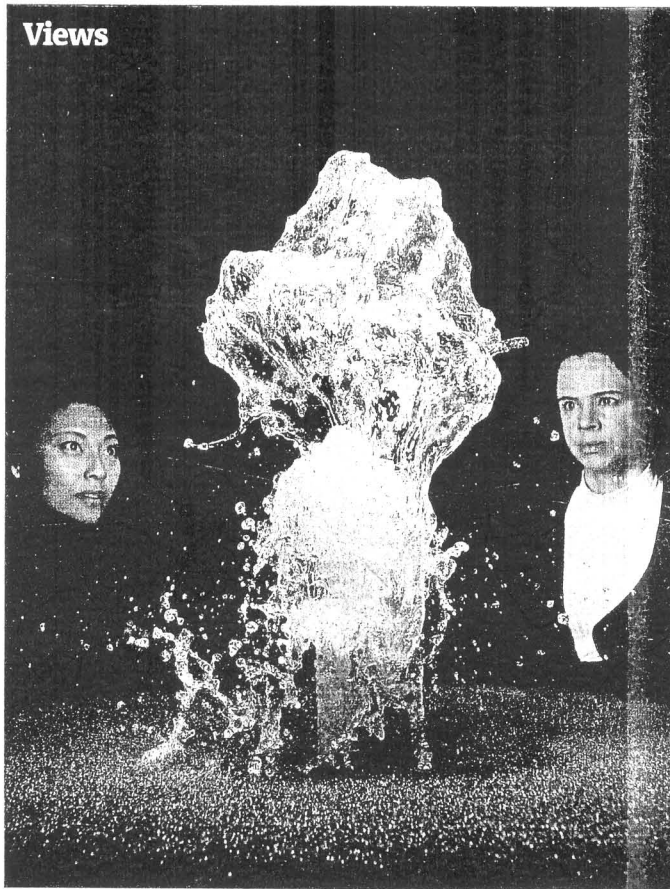
**22 The columnist**  
Chanda Prescod-Weinstein wants to save our helium

**24 Letters**  
Consciousness really does pose a hard problem

**26 Aperture**  
A kitsch celebration of the epic Soviet space dog flights

**30 Culture columnist**  
Simon Ings delights in *The Hummingbird Project*

## Views



**28 Art in the Anthropocene** Olafur Eliasson is returning to Tate Modern

ABOVE: ANDERS SUNE BERG, COURTESY OF THE ARTIST; NEUGERRIEMSCHEIDER, BERLIN; TANYA BONAKDAR GALLERY, NEW YORK/LOS ANGELES © 2014 OLAFUR ELIASSON; TOP RIGHT: DARREN HOPES

## Features

**32 Everything you know about nutrition is wrong**  
Why almost all food advice is fatally flawed

**36 The moon**  
50 years on from the Apollo 11 landing, moon fever is back

**46 Predictive policing**  
The criminologist working to stop crime before it happens

## The back pages

**51 Maker**  
Use electronics to communicate with plants

**52 Puzzles**  
A moon-themed cryptic crossword, puzzles and quiz

**53 Feedback**  
Corr conspiracies and bus building

**54 Almost the last word**  
Readers discuss dinosaur noises and chickpea foam

**56 Me and my telescope**  
Sue Black on tech, women and knitting before it was cool

**On the cover**

**34 The great metamorphosis**  
A mind-blowing new theory on the fate of the universe



**31 Sibling rivalry**  
How birth order shapes your health and personality

**20 Guilt-free flights**  
Does carbon offsetting work?

**38 Super fly**  
Rubbish-eating bug that could save the world

16 An AI triumphs at poker 14 Terraforming Mars  
8 The genetics of anorexia 10 Mega wind farms

Vol 243 No 3239  
Cover image: Karan Singh

14/8/19

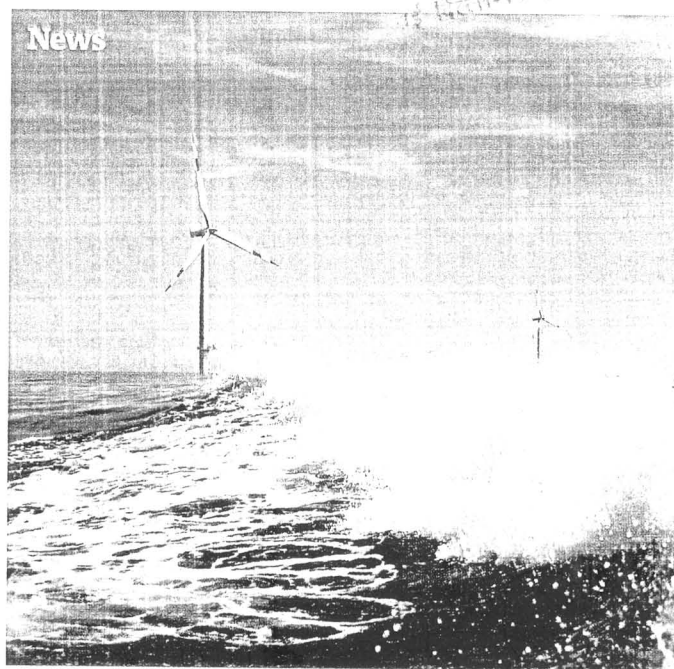
प्रदीपन प्रमान  
प्रोफेसर और प्रोफेसर प्रमान  
10 10 30 30 40  
16 16 16-16

**News**

- 12 **Cosmic mystery**  
Our understanding of the universe is fatally flawed
- 12 **Genetic healthcare**  
Are we really ready to know what our genes say about our health?
- 16 **AI poker champion**  
Artificial intelligence masters Texas Hold 'Em at last

**Views**

- 23 **Comment**  
Don't use fitness trackers to self-screen for heart conditions, argues Margaret McCartney
- 24 **The columnist**  
Graham Lawton on the first ever National Park City
- 26 **Letters**  
Understanding the ninth wonder of the brain
- 31 **Culture**  
Our pick of the best summer reading and listening
- 30 **Aperture**  
Colourful delights of trees

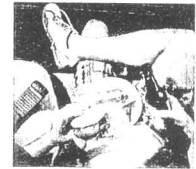


10 **Artificial islands** The plan to build mega wind farms in the North Sea

PAUL LANGRÖCK/ZENIT/GREENPEACE

**34 Features**  
**“The universe may be destined to evolve into a state we don't even have the language to describe”**

**Creating**



**Outsmart yourself**  
A scientific guide to gaming your mind and achieving your goals

**Features**

- 34 **The great metamorphosis**  
Our universe was supposed to last forever. Now a cosmic transformation looms
- 38 **Super fly**  
Meet the edible insect that could solve our food waste crisis
- 42 **Sibling rivalry**  
How much does birth order really shape our lives?

**The back pages**

- 51 **Maker**  
Use electronics to find out if your plant is happy
- 52 **Puzzles**  
The crossword, a snail-paced puzzle and a quick quiz
- 53 **Feedback**  
Grave consequences and quantum queues
- 54 **Almost the last word**  
Galactic distance and menthol cold
- 56 **Me and my telescope**  
Vivian Li is building a mini bowel to fight cancer

# This week's issue

## On the cover

- 34 Outsmart your brain**  
Eight ways to break hard-wired habits... and live a happier, healthier life
- 45 Welcome to the Novacene**  
Visionary scientist James Lovelock on why humanity is entering a new era

### OUTSMART YOUR BRAIN

Eight ways to break hard-wired habits... and live a happier, healthier life



WELCOME TO THE NOVACENE  
Visionary scientist James Lovelock on why humanity is entering a new era  
FULL ON OUR GALAXY: FILL AND OUP IN GALAXY IS SUNSCREEN SAFE? WEAKEN IN SPAC3 ORIGIN OF CELLS: AP14 11 0032 OF A-N-01

**14 Draw like a Denisovan**  
Extraordinary ancient art discovered

**42 Honey, we shrunk the accelerator**  
Physicists learn to think small

**15 Mind-reading tech**  
Elon Musk's plans for thought-controlled gadgets

## Coming next week



**Peak dinosaur**  
The golden age of dino discovery could lie ahead

12 Our galaxy ate another galaxy 20 Is sunscreen safe? 38 Women in space  
7 Origins of cells 12 An AI theory of mind

Vol 243 No 3240

Cover image: Martin León Barreto

## News

- Amazon destruction**  
Satellite data reveals huge increase in deforestation
- AI's theory of mind**  
Artificial intelligence learns to put itself in others' shoes
- Bacteria in the brain**  
A new kind of Alzheimer's treatment shows early promise

## Views

- Comment**  
Adding bioethanol to petrol is a distraction from real climate action, says Michael Le Page
- The columnist**  
Annalee Newitz on the monetisation of emotion
- Letters**  
The different ways people use language about time
- Aperture**  
Whale sharks stuff their faces
- Culture**  
Your garden can be every bit as exciting as the rainforest

## Features

- 34 Outsmart your brain**  
A scientific guide to gaming your mind and achieving your goals
- 38 Women in space**  
Space travel has been a mostly male affair. Can that change?
- 42 Honey, we shrunk the accelerator**  
The age of huge particle smashers may soon be over
- 45 Welcome to the Novacene**  
We are heading into a new era, says visionary James Lovelock

## The back pages

- 51 Maker**  
Create a self-watering plant
- 52 Puzzles**  
Cryptic crossword, puzzle and quiz
- 53 Feedback**  
Precious water and toxic social media: the week in weird
- 54 Almost the last word**  
Lottery strategies and itchy bites
- 56 The Q&A**  
Roma Agrawal, designer of the Shard's spire



**20 Insight** Safety of common sunscreen ingredients called into question

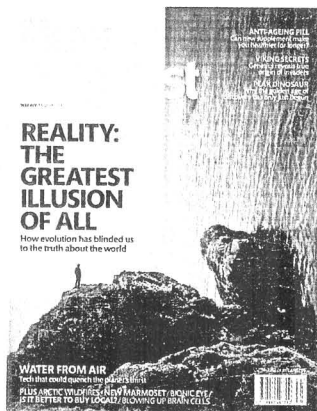
LEFT: SPENCER PLATTIGETTY; TOP: OLEKSIY MAKSYMENKO/IMAGEBROKER/SHUTTERSTOCK

July 28/29 19 (75)

**On the cover**

**34 Reality: The greatest illusion of all**  
How evolution has blinded us to the truth about the world

**38 Water from air**  
Tech that could quench the planet's thirst



**8 Anti-ageing pill**  
Can new supplement make you healthier for longer?

**10 Viking secrets**  
Genetics reveals true origin of invaders

**44 Peak dinosaur**  
Why the golden age of discovery has only just begun

**28 Arctic wildfires** **30 New marmoset** **35 Bionic eye**  
**24 Is it better to buy local?** **42 Blowing up brain cells**

**Vol 243 No 3241**  
Cover image: Alexy Préfontaine

**Coming next week**



**Number hunters**  
The maths enthusiasts seeking the largest primes

**News**

**9 Fact-checking Facebook**  
First look at the site's attempt to crack down on fake news

**12 Placenta microbiome**  
Is the organ sterile? Researchers can't agree

**15 Hawaii telescope row**  
The Thirty Meter Telescope could further desecrate a sacred site, says Haunani Kane

**Views**

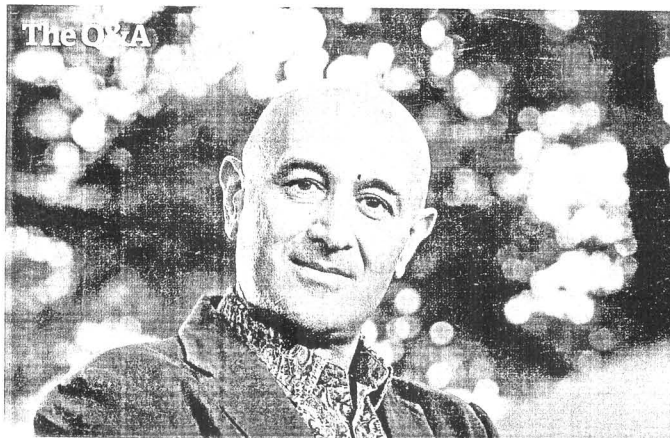
**23 Comment**  
To crack fundamental physics, we must rethink our place in reality, says Richard Webb

**24 The columnist**  
Eating locally isn't always greener, says James Wong

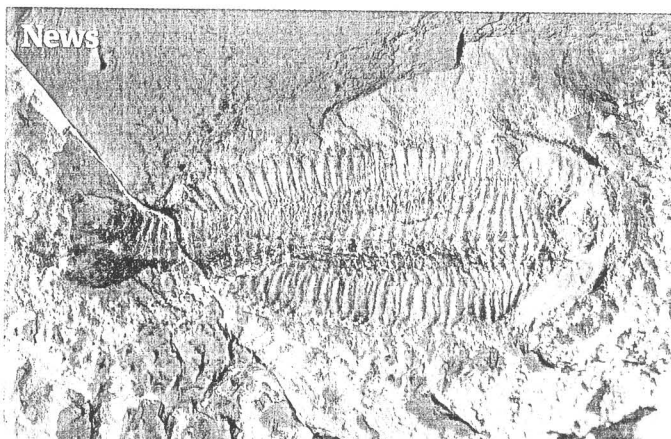
**26 Letters**  
The food advice I needed came from a song

**28 Aperture**  
Record-breaking Arctic fires

**30 Culture**  
Utopians and realists agree the economy is broken



**6 Jim Al-Khalili** The quantum physicist on space-time and oil painting



**6 Early animals** *Shankouia zhengheii* and other fossils go on display

**Features**

**34 Reality: The great illusion**  
Our perceptions may not tell us the truth about the world

**38 Water from air**  
New tech to quench our thirst

**47 Illuminating the brain**  
Ed Boyden's mission to know what thoughts are made of

**44 Peak dinosaur**  
More discoveries are yet to come

**The back pages**

**51 Maker**  
Create a tweeting wildlife camera

**52 Puzzles**  
Quick crossword, a chess puzzle and the quiz

**53 Feedback**  
Alligators on meth and mutant crocs: the week in weird

**54 Almost the last word**  
Readers respond on striking skies and lock security

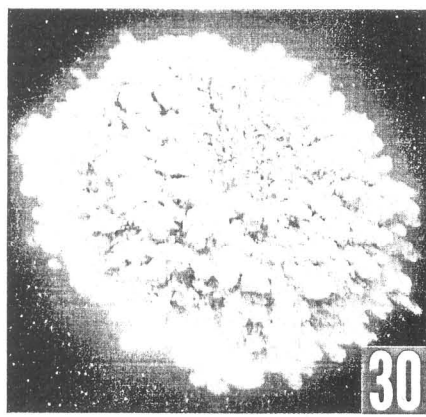
**56 The Q&A**  
Jim Al-Khalili on quantum physics and space-time

76

# PHYSICS TODAY

July 2019 | volume 72 number 7

## FEATURES

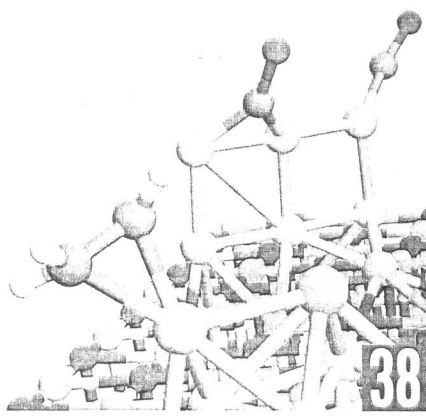


30

### 30 Neutron-rich matter in heaven and on Earth

Jorge Piekarewicz and Farrukh J. Fattoyev

Despite a length-scale difference of 18 orders of magnitude, the internal structure of neutron stars and the spatial distribution of neutrons in atomic nuclei are profoundly connected.

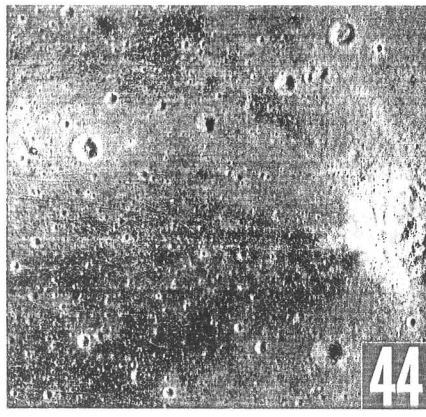


38

### 38 Designing clusters for heterogeneous catalysis

Elisa Jimenez-Izal, Bruce C. Gates, and Anastassia N. Alexandrova

Subnanometer metal clusters offer catalytic properties not possible on bulk or nanoparticle metals.

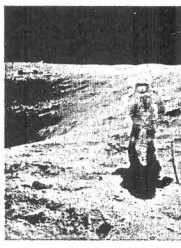


44

### 44 The scientific legacy of the Apollo program

Bradley L. Jolliff and Mark S. Robinson

This month marks the 50th anniversary of the *Apollo 11* Moon landing. Together, the six Apollo landings laid the foundation for modern planetary science.



**ON THE COVER:** Astronaut Charles M. Duke Jr collects lunar samples next to the rim of Plum Crater during the first *Apollo 16* extravehicular activity on 21 April 1972. The parked lunar rover sits in the background. On **page 44**, Brad Jolliff and Mark Robinson discuss the achievements and scientific legacy of the Apollo program. (Photo taken by astronaut John W. Young. Courtesy of NASA.)

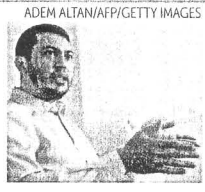
Recently on  
**PHYSICS  
TODAY  
ONLINE**

[www.physicstoday.org](http://www.physicstoday.org)



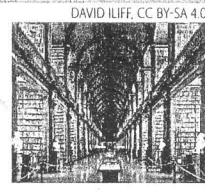
TERRY THRELFALL

► **Melt mystery**  
In 1896 chemist Emil Fischer produced a crystal that sometimes melts at 65 °C and sometimes at 100 °C. It took 123 years to learn how that could happen. David Adam explains how researchers determined that identical crystalline solids can melt into structurally distinct liquids. [physicstoday.org/Jul2019a](http://physicstoday.org/Jul2019a)



ADEM ALTAN/AFP/GETTY IMAGES

► **Serkan Golge**  
On 29 May physicist and dual US–Turkish citizen Serkan Golge was released from prison in Turkey after a nearly three-year incarceration on charges that the US government and human rights organizations called unsubstantiated. Golge talks to *PHYSICS TODAY* about his experience and his desire to return to physics research. [physicstoday.org/Jul2019b](http://physicstoday.org/Jul2019b)



DAVID ILIFF, CC BY-SA 4.0

► **Plan S**  
If implemented, Plan S would require recipients of research grants from a dozen European national funding agencies to publish work in open-access journals. Dalmeet Singh Chawla details recently announced revisions to the controversial policy, including a delay in adoption until 2021. [physicstoday.org/Jul2019c](http://physicstoday.org/Jul2019c)

**PHYSICS TODAY** (ISSN 0031-9228, coden PHTOAD) volume 72, number 7. Published monthly by the American Institute of Physics, 1305 Walt Whitman Rd, Suite 300, Melville, NY 11747-4300. Periodicals postage paid at Huntington Station, NY, and at additional mailing offices. POSTMASTER: Send address changes to **PHYSICS TODAY**, American Institute of Physics, 1305 Walt Whitman Rd, Suite 300, Melville, NY 11747-4300. Views expressed in **PHYSICS TODAY** and on its website are those of the authors and not necessarily those of AIP or any of its member societies.



**Copyright © 2019, American Institute of Physics.** Single copies of individual articles may be made for private use or research. Authorization is given to copy articles beyond the free use permitted under US Copyright Law, provided that the copying fee of \$30.00 per copy per article is paid to the Copyright Clearance Center, 222 Rosewood Dr, Danvers, MA 01923. For articles published before 1978, the copying fee is \$0.25 per article. Authorization does not extend to systematic or multiple reproduction or to republication in any form. In all such cases, specific written permission from AIP must be obtained. Send requests for permission to AIP Office of Rights and Permissions, 1305 Walt Whitman Rd, Suite 300, Melville, NY 11747-4300; phone +1 516 576-2268; email [rights@aip.org](mailto:rights@aip.org).

# PHYSICS TODAY

www.physicstoday.org

77



## DEPARTMENTS

8 From the editor

10 Readers' forum

Commentary: The universe and the university: Physics preparation for academic leadership — *Gregory P. Crawford*  
• Letters

14 Search & discovery

Dark-matter detector observes a rare nuclear decay • A raft of soap bubbles remembers its past • A strain-based antenna paves the way for portable long-range transmitters

22 Issues & events

*Quo vadis*, NASA: The Moon, Mars, or both? • Domestic quarrels cloud future of South Korea's Institute for Basic Science

52 Books

Curating the lunar landing — *Nick Howes* • Getting to know Mileva Marić — *Alberto Martínez* • Exploring light propagation with Fourier and Fresnel — *Martha-Elizabeth Baylor* • New books & media

58 New products

Focus on photonics, spectroscopy, and spectrometry

63 Obituaries

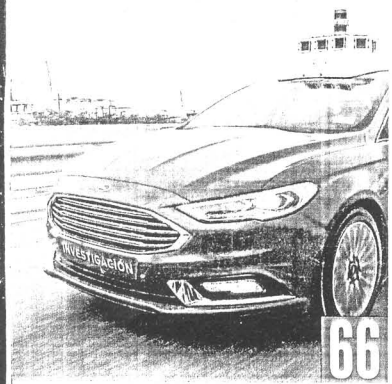
Charles Kuen Kao

66 Quick study

Self-driving cars find their way in the world — *Colin McCormick*

68 Back scatter

Soap halos



### Senior director of news & magazines

Larry Fishbein [lfishbein@aip.org](mailto:lfishbein@aip.org)

### Editor-in-chief

Charles Day [cday@aip.org](mailto:cday@aip.org)

### Managing editor

Richard J. Fitzgerald [rjf@aip.org](mailto:rjf@aip.org)

### Art and production

Donna Padian, art director  
Freddie A. Pagani, art and production associate  
Cynthia B. Cummings, photographer  
Nathan Cromer

### Editors

Melinda Baldwin [mbaldwin@aip.org](mailto:mbaldwin@aip.org)  
Toni Feder [tf@aip.org](mailto:tf@aip.org)  
Martha M. Hanna [mmh@aip.org](mailto:mmh@aip.org)  
Heather M. Hill [hhill@aip.org](mailto:hhill@aip.org)  
David Kramer [dk@aip.org](mailto:dk@aip.org)  
Alex Lopatka [alopatka@aip.org](mailto:alopatka@aip.org)  
Christine Middleton [cmiddleton@aip.org](mailto:cmiddleton@aip.org)  
Johanna L. Miller [jlm@aip.org](mailto:jlm@aip.org)  
Gayle G. Parraway [ggp@aip.org](mailto:ggp@aip.org)  
R. Mark Wilson [rmw@aip.org](mailto:rmw@aip.org)

### Online

Paul K. Guinnessy, director [pkg@aip.org](mailto:pkg@aip.org)  
Andrew Grant, editor [agrant@aip.org](mailto:agrant@aip.org)  
Angela Dombroski [atd@aip.org](mailto:atd@aip.org)  
Greg Stasiewicz [gls@aip.org](mailto:gls@aip.org)

### Assistant editor

Cynthia B. Cummings

### Editorial assistant

Tonya Gary

### Contributing editor

Andreas Mandelis

### Sales and marketing

Christina Unger Ramos [cunger@aip.org](mailto:cunger@aip.org)  
Unique Carter  
Krystal Dell  
Skye Haynes

### Address

American Center for Physics  
One Physics Ellipse  
College Park, MD 20740-3842  
+1 301 209-3100

[pteditors@aip.org](mailto:pteditors@aip.org)

PhysicsToday @physicstoday

**AIP** American Institute of Physics

### Member societies

Acoustical Society of America  
American Association of Physicists in Medicine  
American Association of Physics Teachers  
American Astronomical Society  
American Crystallographic Association  
American Meteorological Society  
American Physical Society  
AVS: Science & Technology of Materials, Interfaces,  
and Processing  
The Optical Society  
The Society of Rheology

### Other member organizations

Sigma Pi Sigma Physics Honor Society  
Society of Physics Students  
Corporate Associates

The American Institute of Physics is a federation of scientific societies in the physical sciences, representing scientists, engineers, educators, and students. AIP offers authoritative information, services, and expertise in physics education and student programs, science communication, government relations, career services, statistical research in physics employment and education, industrial outreach, and history of the physical sciences. AIP publishes PHYSICS TODAY and is also home to the Society of Physics Students and to the Niels Bohr Library and Archives. AIP owns AIP Publishing, a scholarly publisher in the physical and related sciences.

**Board of Directors:** David J. Helfand (Chair), Michael H. Moloney (CEO), Judy R. Dubno (Interim Corporate Secretary), Susan K. Avery, J. Daniel Bourland, Susan Burkett, Jack G. Hehn, John Kent (Treasurer), Kate Kirby, Allison Macfarlane, Kevin B. Marvel, Michael Morgan, Faith Morrison, Elizabeth Nolan, Nathan Sanders, Cheryl R. Stevens.

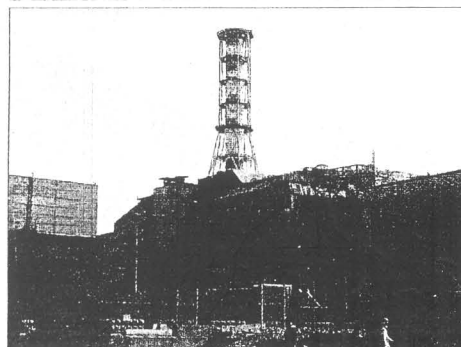
**Officers:** Michael H. Moloney (CEO), Steve Mackwell (DEO), Gigi Swartz (CFAO).

**SUBSCRIPTION QUESTIONS?** +1 800 344-6902 | +1 516 576-2270 | [ptsubs@aip.org](mailto:ptsubs@aip.org)

6 PHYSICS TODAY | JULY 2019

178

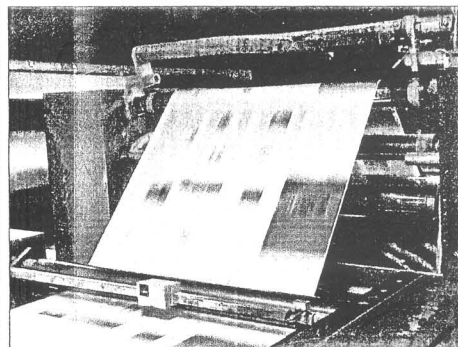
2019/8/19



**Nuclear lessons**  
Analysing the TV show *Chernobyl* 12–13, 17, 46–47



**Equal opportunities**  
Practical ideas to improve equality in physics 34–38



**Green credentials**  
An eye-opening visit to *Physics World's* printer 60

<b>Quanta</b>	<b>3</b>
<b>Frontiers</b>	<b>4</b>
Have we finally made metallic hydrogen? • Tibet detector breaks gamma-ray record • Graphene filter extracts salt from sea water • Queen as you've never heard them before	
<b>News &amp; Analysis</b>	<b>6</b>
Row over German battery institute • Construction halted at giant telescope • Russian X-ray mission launches • New Zealand pulls out of the SKA • STEM gap caused by girls' language skills • Cash for UK quantum technology centres • UK LGBT+ scientists face discrimination • Call for infrared asteroid-hunting mission • Foreigners feel excluded at Max Planck institutes • Richard Wakeford: targeting the effect of low-level radiation • Europe selects comet mission for launch	
<b>Comment</b>	<b>15</b>
Diversity matters • Green challenge	
<b>Forum</b>	<b>17</b>
The real fallout from <i>Chernobyl</i> <i>Una Davies</i>	
<b>Transactions</b>	<b>19</b>
From humble beginnings <i>James McKenzie</i>	
<b>Critical Point</b>	<b>21</b>
China's next big thing <i>Robert P Crease</i>	
<b>Feedback</b>	<b>25</b>
Letters about green labs, interactive figures, fusion and "columnar crystallography"	

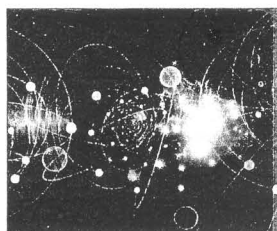
## Features

<b>Ready, set, bake</b>	<b>29</b>
<i>Rahul Mandal</i> , who won TV's <i>Great British Bake Off</i> last year, describes the scientific thinking that inspired his success – and why discussing the science of baking is a useful approach to enthusing school students about science	
<b>Why we need to keep talking about equality in physics</b>	<b>34</b>
<i>Jess Wade</i> and <i>Maryam Zanghalam</i> discuss the implications of poor diversity in physics – and what can be done to create a level playing field in the subject	
<b>The invisibility of length contraction</b>	<b>41</b>
The idea that objects travelling at relativistic speeds will shorten is a widely accepted consequence of Einstein's special relativity. But what, asks <i>David Appell</i> , if you tried to look at such an object?	
<b>Reviews</b>	<b>46</b>
<i>Chernobyl</i> : a drama out of a crisis <i>Hamish Johnston</i> • Reality check <i>Hugh Reynolds</i>	
<b>Careers</b>	<b>52</b>
Brain waves <i>Margaret Harri</i>	
<b>Recruitment</b>	<b>55</b>
<b>Lateral Thoughts</b>	<b>60</b>
Behind the scenes at the printer <i>Kate Gardner</i>	

**On the cover**  
Rahul Mandal on the science behind his *Bake-Off* success 29–32 (iStock/fortyforks)  
Why length contraction can never really be seen 41–45  
How we can boost underrepresented groups 34–38  
The fallout from the *Chernobyl* mini-series 12–13, 17, 46–47

*Physics World* is published monthly as 12 issues per annual volume by IOP Publishing Ltd, Temple Circus, Temple Way, Bristol BS1 6HG, UK

**United States Postal Identification Statement**  
*Physics World* (ISSN 0953-8585) is published monthly by IOP Publishing Ltd and distributed in the USA by UKP Worldwide, 3390 Rand Road, South Plainfield, NJ 07080. Periodicals postage paid at Rahway, NJ and at additional mailing offices. US Postmaster: send address changes to *Physics World*, IOP Publishing, C/O 3390 Rand Road, South Plainfield, NJ 07080.



## Multimedia

Check out the *Physics World Weekly* podcast of 11 July for more on the winner of the Battle of the Elements (see p50)

	Article ID
Adaptive synchronisation of complex networks with non-dissipatively coupled and uncertain inner coupling matrix..... <i>Shuguo Wang</i>	1
Analytical evaluation of cesium emission lines using laser-induced breakdown spectroscopy ..... ..... <i>Manjeet Singh and Arnab Sarkar</i>	2
Analytical behaviour of lump solution and interaction phenomenon to the Kadomtsev–Petviashvili-like equation..... <i>Mohammad Shahriari and Jalil Manafian</i>	3
Pfaffians of B-type Kadomtsev–Petviashvili equation and complexitons to a class of nonlinear partial differential equations in (3+1) dimensions..... <i>Li Cheng, Yi Zhang and Wen-Xiu Ma</i>	4
A new efficient technique for solving fractional coupled Navier–Stokes equations using q-homotopy analysis transform method..... <i>Amit Prakash, P Veerasha, D G Prakasha and Manish Goyal</i>	6
Statistical distribution of adsorption of quantum particles ..... <i>S B Khasare and Shashank S Khasare</i>	7
Monte Carlo simulation of charge transport in disordered organic systems using buffer lattice at the boundary ..... <i>S Raj Mohan, Manoranjan P Singh and M P Joshi</i>	8
Density functional theory of influence of methane adsorption on the electronic properties of a PbS cluster..... <i>A Mosahebfard, R Safaiee and M H Sheikhi</i>	9
Application of mathematical methods on the system of dynamical equations for the ion sound and Langmuir waves..... <i>Aly R Seadawy, Dianchen Lu and Mujahid Iqbal</i>	10
Quantum coupling and electrothermal effects on electron transport in high-electron mobility transistors ..... <i>Ling-Feng Mao</i>	11
Coexistence of attractors in integer- and fractional-order three-dimensional autonomous systems with hyperbolic sine nonlinearity: Analysis, circuit design and combination synchronisation..... <i>Sifeu Takougang Kingni, Justin Roger Mboupda Pone, Gaetan Fautso Kuate and Viet-Thanh Pham</i>	12
Comment on “New optical soliton solutions for nonlinear complex fractional Schrödinger equation via new auxiliary equation method and novel $(G'/G)$ -expansion method” ..... ..... <i>Shoukry El-Ganaini and Elsayed M E Zayed</i>	13

(Continued on inside back cover)

Indexed in CURRENT CONTENTS ISSN 0304-4289

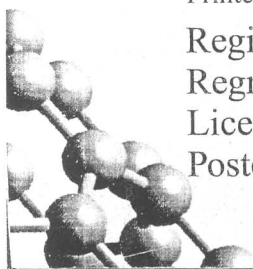
Edited and published by Amitabh Joshi  
for the Indian Academy of Sciences, Bengaluru 560 080  
Printed at Tholasi Prints India Pvt. Ltd., Bengaluru

Registered with Registrar of Newspapers in India, Vide Regn No. 24935/73

Regn. No. KRNA/BGE/337/2018–2020, published on 10/07/2019

Licensed to Post without prepayment No. 49

Posted at Bengaluru PSO, Mysore Road, Bengaluru 560026 16/07/2019



(Continued from back cover)

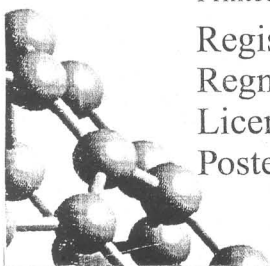
Assessment of the mass attenuation coefficients of granite, basalt, andesite and tuff stones with the Geant4 model of a high-purity germanium detector.....	<i>A Aşkin and M Dal</i>	14
Design of a spiral inflector and transverse beam matching for K130 cyclotron at the Variable Energy Cyclotron Centre.....	<i>A Goswami, Atanu Dutta and Santanu Paul</i>	15
The Weyl equation under an external electromagnetic field in the cosmic string space-time .....	<i>M Hosseini, H Hassanabadi and S Hassanabadi</i>	16
General electrodynamics of non-abelian vector bosons of $SU(2)$ .....	<i>M T Teli</i>	17

## Article ID

<i>Ab initio</i> study of the fundamental properties of $Zn_{1-x}TM_xSe$ (TM=Mn, Co and Fe) .....	18
..... <i>F Soltani, H Baaziz, Z Charifi, F El Haj Hassan and B Hamad</i>	
Extreme multistable synchronisation in coupled dynamical systems.....	19
..... <i>Priyanka Chakraborty and Swarup Poria</i>	
The effect of thermal expansion coefficient on unsteady non-Newtonian supercritical Casson fluid flow past a vertical cylinder .....	20
..... <i>Ashwini Hiremath, Hussain Basha, Bhaskerreddy Kethireddy, G Janardhana Reddy and N S Venkata Narayanan</i>	
Symmetry analysis of some nonlinear generalised systems of space–time fractional partial differential equations with time-dependent variable coefficients.....	21
..... <i>Sachin Kumar and Baljinder Kour</i>	
Asymptotic iteration method applied to new confining potentials.....	22
..... <i>A J Sous</i>	
Modulational instability and dynamics of rational soliton solutions for the coupled Volterra lattice equation associated with $4 \times 4$ Lax pair .....	23
..... <i>Nan Liu and Xiao-Yong Wen</i>	
Analysing the stability of a delay differential equation involving two delays .....	24
..... <i>Sachin Bhalekar</i>	
Tunnel magnetoresistance in the $B_nN_n$ ( $n = 12, 24$ ) cages.....	25
..... <i>Yaghoob Mohammadmoradi and Mojtaba Yaghoobi</i>	
New analytical study of water waves described by coupled fractional variant Boussinesq equation in fluid dynamics.....	26
..... <i>M S Osman</i>	
The propagation of waves in thin-film ferroelectric materials.....	27
..... <i>Abbagari Souleymanou, Khalid K Ali, Hadi Rezazadeh, Mostafa Eslami, Mohammad Mirzazadeh and Alper Korkmaz</i>	
Numerical simulation of space-fractional Helmholtz equation arising in seismic wave propagation, imaging and inversion.....	28
..... <i>Amit Prakash, Manish Goyal and Shivangi Gupta</i>	
Quantum Hamilton–Jacobi route to exceptional Laguerre polynomials and the corresponding rational potentials.....	29
..... <i>S Sree Ranjani</i>	
Alcohol sensor based on gold-coated nanoporous anodic alumina membrane.....	30
..... <i>Saleem Shaik, Anjani Kumar Tiwari and S Anantha Ramakrishna</i>	
Performance of resistance in the variation on a nano thin film flow influenced by thermal deposition: The Buongiorno model .....	31
..... <i>E N Maraj, Z Iqbal and Jamila Bibi</i>	
The synthesis and study of structural, optical and electrical behaviours of tin oxide / polyaniline ( $SnO_2/PANI$ ) nanocomposites .....	32
..... <i>B Singh and B Das</i>	

Indexed in CURRENT CONTENTS ISSN 0304-4289  
 Edited and published by Amitabh Joshi  
 for the Indian Academy of Sciences, Bengaluru 560 080  
 Printed at Tholasi Prints India Pvt. Ltd., Bengaluru

Registered with Registrar of Newspapers in India, Vide Regn No. 24935/73  
 Regn. No. KRNA/BGE/337/2018–2020, published on 10/08/2019  
 Licensed to Post without prepayment No. 49  
 Posted at Bengaluru PSO, Mysore Road, Bengaluru 560026 16/08/2019



1/18/19

82

# Psychological Bulletin®

www.apa.org/pubs/journals/bul

April 2019

Volume 145  
Number 4

---

## Articles

- 339 Aging and Recognition Memory: A Meta-Analysis  
*Scott H. Fraundorf, Kathleen L. Hourihan, Rachel A. Peters, and Aaron S. Benjamin*
- 372 Self-Discrepancy Theory as a Transdiagnostic Framework: A Meta-Analysis of Self-Discrepancy and Psychopathology  
*Tyler B. Mason, Kathryn E. Smith, Allison Engwall, Alisson Lass, Michael Mead, Morgan Sorby, Kayla Bjorlie, Timothy J. Strauman, and Stephen Wonderlich*
- 390 Sex and Gender in Psychopathology: DSM-5 and Beyond  
*Cynthia M. Hartung and Elizabeth K. Lefler*

© 2019  
American  
Psychological  
Association

---

## Target Article

- 410 Perfectionism Is Increasing Over Time: A Meta-Analysis of Birth Cohort Differences From 1989 to 2016  
*Thomas Curran and Andrew P. Hill*

## Peer Commentary

- 430 Are Parents Responsible for the Rise of Perfectionism? Comment on Curran and Hill (2019)  
*Bart Soenens and Maarten Vansteenkiste*

## Response to Commentary

- 433 A Case for Multiple Pathways to Increasing Perfectionism: Reply to Soenens and Vansteenkiste (2019)  
*Andrew P. Hill and Thomas Curran*

---

## Other

- ii Call for Papers for Replication and Reproducibility: Questions Asked and Answered via Research Synthesis
- 371 E-Mail Notification of Your Latest Issue Online!
- ii Instructions to Authors
- 436 Members of Underrepresented Groups: Reviewers for Journal Manuscripts Wanted
- 429 Subscription Order Information

(83)  
A 7/8/19

# Psychological Bulletin®

www.apa.org/pubs/journals/bul

June 2019

Volume 145  
Number 6

---

## Articles

- 537 The Development of Gender Differences in Spatial Reasoning: A Meta-Analytic Review  
*Jillian E. Lauer, Eukyung Yhang, and Stella F. Lourenco*
- 566 The Impact of Affective Information on Working Memory: A Pair of Meta-Analytic Reviews of Behavioral and Neuroimaging Evidence  
*Susanne Schweizer, Ajay B. Satpute, Shir Atzil, Andy P. Field, Caitlin Hitchcock, Melissa Black, Lisa Feldman Barrett, and Tim Dalgleish*
- 610 A Meta-Analysis of the Facial Feedback Literature: Effects of Facial Feedback on Emotional Experience Are Small and Variable  
*Nicholas A. Coles, Jeff T. Larsen, and Heather C. Lench*

© 2019  
American  
Psychological  
Association

---

## Other

- ii Call for Papers for Replication and Reproducibility: Questions Asked and Answered via Research Synthesis
- 651 E-Mail Notification of Your Latest Issue Online!
- ii Instructions to Authors
- 609 Members of Underrepresented Groups: Reviewers for Journal Manuscripts Wanted
- 652 Subscription Order Information

# Psychological Bulletin®

www.apa.org/pubs/journals/bul

Volume 145  
Number 7

84  
7/18/19  
July 2019

## Articles

- 653 The Efficacy of Different Interventions to Foster Children's Executive Function Skills: A Series of Meta-Analyses  
*Zsófia K. Takacs and Reka Kassai*
- 698 Immediate and Long-Term Efficacy of Executive Functions Cognitive Training in Older Adults: A Systematic Review and Meta-Analysis  
*Lan Nguyen, Karen Murphy, and Glenda Andrews*
- 734 Do the Socially Rich Get Richer? A Nuanced Perspective on Social Network Site Use and Online Social Capital Accrual  
*Cecilia Cheng, Hsin-yi Wang, Leif Sigerson, and Chor-lam Chau*

© 2019  
American  
Psychological  
Association

## Other

- ii Call for Papers for Replication and Reproducibility: Questions Asked and Answered via Research Synthesis
- 764 Correction to Stanley, Carter, and Doucouliagos (2018)
- 697 E-Mail Notification of Your Latest Issue Online!
- ii Instructions to Authors

# Psychological Review®

www.apa.org/pubs/journals/rev

July 2019

Volume 126  
Number 4

## Articles

- 455 A Retrieved Context Model of the Emotional Modulation of Memory  
*Deborah Talmi, Lynn J. Lohnas, and Nathaniel D. Daw*
- 486 When Acute Adversity Improves Psychological Health: A Social-Contextual  
Framework  
*Anthony D. Mancini*
- 506 A Double Error Dynamic Asymptote Model of Associative Learning  
*Niklas H. Kokkola, Esther Mondragón, and Eduardo Alonso*
- 550 A Model of the Uncertainty Effects in Choice Reaction Time That Includes a Major  
Contribution From Effector Selection  
*Charles E. Wright, Valerie F. Marino, Charles Chubb, and Daniel Mann*

## Theoretical Note

- 578 Using Response Time Distributions and Race Models to Characterize Primacy and  
Recency Effects in Free Recall Initiation  
*Adam F. Osth and Simon Farrell*

## Other

- 485 E-Mail Notification of Your Latest Issue Online!
- ii Instructions to Authors
- 610 Subscription Order Information

© 2019  
American  
Psychological  
Association

85

AB  
7/18/19

Psychological Review  
July 2019  
Volume 126  
Number 4

# Psychology IN THE SCHOOLS

Volume LVI July 2019 Number 6

## RESEARCH ARTICLES

- Isabella Meneghel, Isabel M. Martinez, Marisa Salanova, and Hans de Witte 875 Promoting academic satisfaction and performance: Building academic resilience through coping strategies
- Ruibei Bai, Yuting Ma, Yiyao Liu, Baoshan Zhang, and Abida Rasool 891 The relationship between cellphone use and achievement goals in junior high school students: A cross-lagged analysis
- Scott B. Greenspan, Sarah A. Fefer, Sara A. Whitcomb, and Jessica M. Kemp 907 Incorporating physical activity-based interventions in school psychology research and practice: A systematic review
- Amori Yee Mikami, Sophie Smit, and Charlotte Johnston 928 Teacher attributions for children's attention-deficit/hyperactivity disorder behaviors predict experiences with children and with classroom behavioral management in a summer program practicum
- Larisa T. McLoughlin, Barbara A. Spears, Carmel M. Taddeo, and Daniel F. Hermens 945 Remaining connected in the face of cyberbullying: Why social connectedness is important for mental health
- Cristin M. Hall, Nicole C. Breeden, and Nicklaus Giacobbe 959 Gone viral: Content characteristics and relative quality of highly shared school psychology-related content on Pinterest
- Shawna Petersen-Brown, Ashlee R. Lundberg, Jannine E. Ray, Iwalani N. Dela Paz, Carrington L. Riss, and Carlos J. Panahon 977 Applying spaced practice in the schools to teach math vocabulary
- Adam B. Lockwood, Thomas J. Gross, Ryan L. Farmer, and Stephen W. Loke 992 Huber Inventory of Trainee Self-efficacy: Assessment of measurement models
- Stephen R. Earl, Ian M. Taylor, Carla Meijen, and Louis Passfield 1004 Young adolescent psychological need profiles: Associations with classroom achievement and well-being
- Hyoyeon In, Hyunhee Kim, and JoLynn V. Carney 1023 The relation of social skills and school climate of diversity to children's life satisfaction: The mediating role of school connectedness
- Sherrie L. Proctor and Courtney Owens 1037 School psychology graduate education retention research characteristics: Implications for diversity initiatives in the profession
- Katharine W. Buek 1053 Early growth trajectories of children's approaches to learning: The contribution of parent and family characteristics

# Psychology IN THE SCHOOLS

Volume LVI August 2019 Number 7

## RESEARCH ARTICLES

- Laetitia Méli ssande Amédée* 1077 Child victims of sexual abuse: Teachers' evaluation of emotion regulation and social adaptation in school  
*Amélie Tremblay-Perreault*  
*Martine Hébert*  
*and Chantal Cyr*
- David M. Hulac* 1089 Content and impact of articles published by school psychology faculty  
*Kathleen Aspiranti*  
*Madeline Jacobson*  
*Maryia Schneider*  
*and Natalie Johnson*
- Diana M. Dumas* 1101 A pilot evaluation of the social validity of a bullying bystander program adapted for high school students  
*Aida Midgett*  
*and April D. Watts*
- Bryan C. Hutchins* 1117 Why some early college high school students do not transition to a 4-year college: An exploration of perceived barriers and schooling experiences on students' transition plans  
*Nina Arshavsky*  
*and Julie A. Edmunds*
- Qi Zhou* 1139 Parent-implemented reading interventions within a response to intervention framework  
*Brad A. Dufrene*  
*Sterett H. Mercer*  
*D. Joe Olmi*  
*and Daniel H. Tingstom*
- Nicole M. McKeve tt* 1157 The influence of data on teachers' judgments of students' early reading and math skills  
*and Allyson J. Kiss*

- Wilhelmina van Dijk* 1173 The relation between classroom management and mathematics achievement: A multilevel structural equation model  
*Nicholas A. Gage*  
*and Nicolette Grasley-Boy*
- Shawna M. Petersen-Brown* 1187 The use of touch devices for enhancing academic achievement: A meta-analysis  
*Erin E. C. Henze*  
*David A. Klingbeil*  
*Jennifer L. Reynolds*  
*Rachel C. Weber*  
*and Robin S. Codd ing*

108  
117

Discover this journal online at  
  
WILEY  
ONLINE LIBRARY  
wileyonlinelibrary.com/journal/pots

28

# Contents

## Articles

A Review of Summarizing and Main Idea Interventions for Struggling Readers in Grades 3 Through 12: 1978–2016 <i>Elizabeth A. Stevens, Sunyoung Park, and Sharon Vaughn</i>	131
An Updated Evidence-Based Practice Review on Teaching Mathematics to Students With Moderate and Severe Developmental Disabilities <i>Fred Spooner, Jenny R. Root, Alicia F. Saunders, and Diane M. Browder</i>	150
Self-Advocacy Instruction to Teach High School Seniors With Mild Disabilities to Access Accommodations in College <i>Debra G. Holzberg, David W. Test, and Dana E. Rusher</i>	166
Special Educators' Experiences of Roles and Responsibilities in Self-Contained Classes for Students With Emotional/Behavioral Disorders <i>Elizabeth Bettini, Jun Wang, Michelle Cumming, Jenna Kimerling, and Sarah Schutz</i>	177

## Information and Announcements

Author Guidelines	192
Conference Calendar	Inside back cover

ms  
28/8/19

प्रतिलिपि प्रमाण  
प्रमाणित प्रति प्रतिलिपि प्रमाण  
सि ११० ५५ ५०  
२६ दिनांक १५



Los Angeles | London | New Delhi  
Singapore | Washington DC | Melbourne

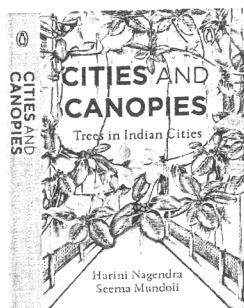
**GENERAL ARTICLES**

- 729 **G N Lewis and Special Relativity**  
*A Little Known Side of a Great Chemist*  
 Rajaram Nityananda
- 735 **Birch and Benkeser Reductions**  
*Application of Electride Salts in Organic Chemistry*  
 Dhatrak N R

**SERIES ARTICLES**

- 741 **How to Design Experiments in Animal Behaviour**  
 4. How Do Bees Estimate the Distance Flown?  
 Raghavendra Gadagkar

771



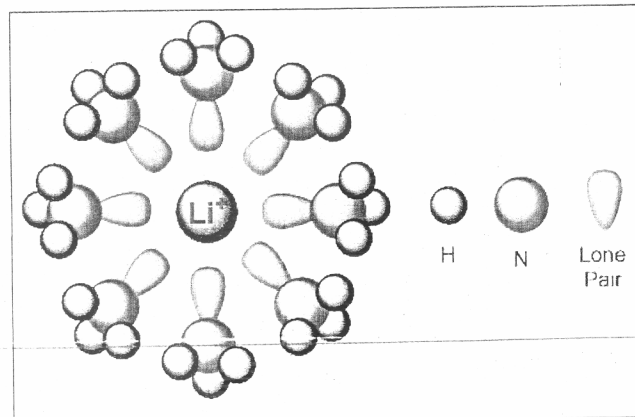
**Inside Back Cover**

Flowering Tree  
 Credit: Abhishek G K Rao

**Follow us on Facebook**

Resonance, Journal of  
 Science Education  
 @Resonance.IASc.Bng

735



**Classroom**

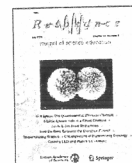
- Some Interesting Consequences of Furstenberg Topology**  
 Fahed Zulfeqarr 755
- Can a Glowing LED Light the Road to Accurate Determination of Planck's Constant?**  
 Chetan Kotabage 767



**Classics**

- The Atom and the Molecule** 793  
 G N Lewis

**Front Cover**



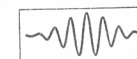
Two Kadamba flowers used to represent the electron densities of two atoms forming a chemical bond.

**Back Cover**



G N Lewis (1875–1946)  
 Illustration: Subhankar Biswas

**DEPARTMENTS**



**Editorial** 719  
*N Sathyamurthy*



**Science Smiles** 721  
*Ayan Guha*

**Article-in-a-Box** 725

G N Lewis (1875–1946)  
 The Quintessential  
 Physical Chemist  
*N Sathyamurthy*

**Book Review** 771

Democratizing Science  
 and Redefining  
 Education  
*Raghavendra Gadagkar*



**Face to Face** 775

Face to Face with  
 Professor C N R Rao

**Errata** 819

89

GENERAL ARTICLES

833



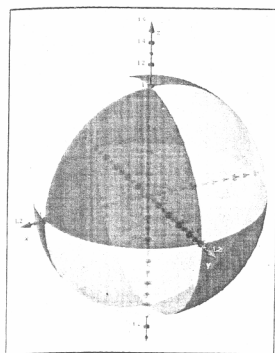
827 **Murray Gell-Mann (1929–2019) and the Story of Strong Interactions**  
G Rajasekaran

803 **Sir Henry Hallet Dale (1875–1968)**  
Andrew Wickens

847 **Influence of Learning Theories on Science Education**  
Sudhakar C Agarkar

861 **Spherical Tiling with GeoGebra**  
*New Results, Challenges and Open Problems*  
Ana Breda and José Dos Santos

861



SERIES ARTICLES

875 **How to Design Experiments in Animal Behaviour**  
*5. How Do Ants Estimate the Distance Walked?*  
Raghavendra Gadagkar

891 **The Sounds of Music: Science of Musical Scales**  
*1. Human Perception of Sound*  
Sushan Konar

Classics



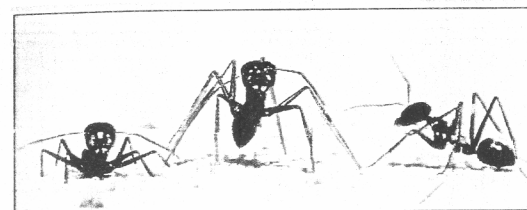
**A Schematic Model of Baryons and Mesons** 923  
M Gell-Mann

Information & Announcements



**Science Undergraduate Research Conference** 929

875



Front Cover



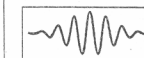
The eightfold way: Octet of particles under  $SU(3)$  symmetry.

Back Cover



Murray Gell-Mann (1929–2019)  
Illustration: Subhankar Biswas

DEPARTMENTS



**Editorial** 821  
N Sathyamurthy



**Science Smiles** 823  
Ayan Guha



**Face to Face** 901  
Face to Face with  
Professor N Mukunda

**Errata** 927

Inside Back Cover

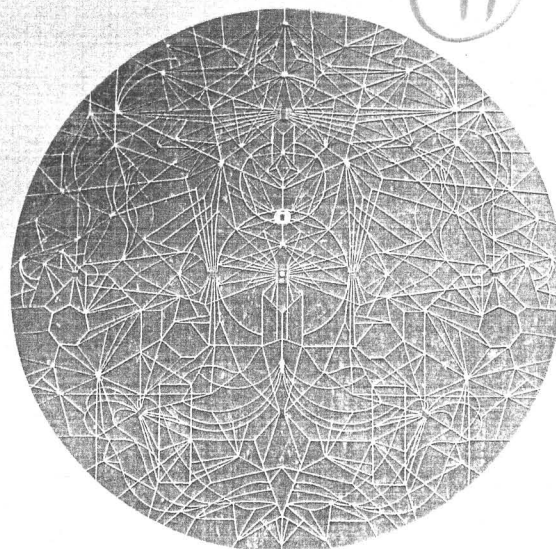
Night Life  
Photo Credit:  
Kalyan Varma  
Text Credit:  
Sindhu Radhakrishna

Follow us on Facebook

Resonance, Journal of  
Science Education  
@Resonance.IASc.Bng

## CONTENTS

No. 313 March/April 2019



Cover image: Microchip synapses 18 – Fusion chamber by Leonardo Ulian  
[www.leonardoulian.com](http://www.leonardoulian.com)

### 1 WELCOME

## FRONTLINE

---

### 4 NEWS

## ECOLOGIST

---

- 10 **THE CIRCULAR ECONOMY**  
Brendan Montague introduces our special investigation
- 12 **FROM THEORY TO PRACTICAL REALITY**  
Ernesto Hartikainen and Samuli Laita report on the Finnish story
- 14 **MAPPING A CIRCULAR ROUTE**  
Ali Moore describes how London Waste and Recycling Board is helping to build a circular economy
- 16 **GOOD AND BAD APPLES**  
Brendan Montague reports on a promise to end the use of materials extracted from the Earth
- 18 **EMULATING THE CIRCLE OF LIFE**  
We need to rethink efficiency in our food system, writes Robert Biel

## KEYNOTES

---

- 20 **REGENERATIVE ECONOMICS FOR A SUSTAINABLE WORLD**  
As climate breakdown accelerates, we must learn from Nature's example to counter entropy, writes Herbert Girardet

## UNDERCURRENTS

---

- 26 **RESTORATION NARRATIVE: THE STORY OF OUR TIME**  
Zion Lights meets author George Monbiot and discovers his insider view of the mainstream media
- 28 **TURNING THE TIDE OF PUBLIC OPINION**  
Anna Turns discusses why some environmental issues appeal more than others

## NEW ONLINE

---

### [www.resurgence.org](http://www.resurgence.org)

Joe Hoare helps overcome fear with laughter yoga

Peter Reason reviews *How to See Nature* by Paul Evans

New gallery feature on artist Gary Cook

Farmer Laurel Foreman talks about creating a sanctuary for people and wildlife on our podcast Resurgence Voices

### [www.theecologist.org](http://www.theecologist.org)

The stories environmentalists across the globe are talking about, plus opinion pieces and reviews. Check for new daily content, including regular analysis of key political issues. Contact: [editor@theecologist.org](mailto:editor@theecologist.org)

### Social Media

Twitter: @Resurgence\_mag  
@the\_ecologist

Facebook: Resurgencetrust  
TheEcologist

Instagram: @resurgencetrust

### Resurgence & Ecologist App

Free access for print members:  
[www.resurgence.org/app](http://www.resurgence.org/app)

Editor Emeritus  
Satish Kumar  
PA to Satish Kumar  
Elaine Green

Magazine Editor  
& Podcasts  
Marianne Brown  
marianne@resurgence.org  
The Ecologist Editor  
Brendan Montague  
brendan@theecologist.org

Designer  
Rachel Marsh

Assistant Editor  
& Picture Researcher  
Emma Randall

Editorial Assistant  
& Marketing Design  
Emily Martin

Sub-editor  
Helen Banks

Poetry Editor  
Peter Abbs

Trust Manager  
Angie Burke

Finance Manager  
Mark Gough

Fundraising Manager  
Sharon Garfinkel  
+44 (0)7435 781842  
sharon@resurgence.org

Membership  
Jeanette Gill  
Mandy Kessell  
+44 (0)1208 841824  
members@resurgence.org

Office Manager  
& Classified Advertising  
Lynn Batten  
info@resurgence.org  
+44 (0)1237 441293  
info@resurgence.org

Advertising Sales  
Dan Raymond-Barker  
+44 (0)7776 361671  
dan@emsm.org.uk

Editorial Office  
Ford House, Hartland,  
Bideford, Devon  
EX39 6EE, UK  
+44 (0)1237 441293  
www.resurgence.org

Resurgence & Ecologist  
is published by The  
Resurgence Trust, a  
registered educational  
charity (no. 1120414)

- 30 **REGENERATION OF LIVES AND THE LAND**  
How Laurel Foreman's organic farm creates a sanctuary
- 32 **UNTIL DOOMSDAY IN THE AFTERNOON**  
Scottish Travellers face exclusion from wider society, writes Davie Donaldson
- 34 **HUMANISING THE 'MACHINERY' OF CARE**  
Charlie Jones and Martin Seager suggest how health-care staff can be more open to spontaneity

## ETHICAL LIVING

- 36 **BREATH OF LIFE**  
Kate Blincoe helps a hedgehog in distress
- 37 **THE ROAD IS YOUR FOOTSTEPS**  
Peter Reason experiences the transience of time on a morning walk
- 38 **RESTING IN PEACE WITH NATURE**  
Catherine Early digs into the rising trend of natural burials
- 40 **LET'S TALK ABOUT DEATH**  
Naomi Canton reports on pop-up cafés tackling a modern taboo
- 42 **DIARY**  
Leo Johnson contemplates the end of the world
- 43 **QWERTY SOMETHING**  
A football team gives Matt Harvey hope for the future
- 44 **CHOICES**  
Our age of excess is destroying us, but there is a simple solution, writes Satish Kumar

## ARTS

- 46 **DRAWING FROM THE WELLSPRING**  
Photographer Susan Derges talks about our relationship with water

- 50 **AT THE EDGE**  
Peter Abbs considers the warning words of poet Lynne Wycherley
- 52 **FROM LITTLE ACORNS**  
Gary Cook shares his deep admiration for oak trees
- 56 **HOW I FELL INTO THE OCEAN**  
Sonia Faruqi writes about the inspiration behind her debut novel

## REVIEWS

- 58 **MATERIAL WORLD**  
Natalie Bennett reviews *The Golden Thread: How Fabric Changed History* by Kassia St Clair
- 59 **THE MEDIUM IS THE MESSAGE**  
Russell Warfield reviews *Climate Justice: Hope, Resilience and the Fight for a Sustainable Future* by Mary Robinson
- 60 **ROOTS OF LOVE**  
Lisa Schneidau reviews *Mesquite: An Arboreal Love Affair* by Gary Paul Nabhan
- 61 **FIRING THE IMAGINATION**  
Giles Hutchins reviews *The Children's Fire: Heart Song of a People* by Mac Macartney
- 62 **ANIMALS WHO ACT LIKE GODS**  
J. P. O'Malley reviews *The Book of Humans: The Story of How We Became Us* by Adam Rutherford
- 64 **WE ARE ECOSYSTEMS**  
Nat Dyer reviews *Symbiotic Earth: How Lynn Margulis Rocked the Boat and Started a Scientific Revolution*
- 65 **CONNECTING WORDS**  
Jini Reddy reviews *England: Poems from a School*

- 66 **MEMBERS' PAGE**
- 67 **SHOP**
- 68 **LETTERS**
- 70 **ADVERTISEMENTS**

# CONTENTS

No. 314 May/June 2019

## 1 WELCOME

## FRONTLINE

### 4 NEWS

## ECOLOGIST

- 10 **GETTING THE LAW IN ORDER**  
Oliver Tickell meets barrister Polly Higgins
- 14 **THE LOST KINGDOM**  
Adam Weymouth follows salmon down the Yukon
- 16 **RESTORING THE GREAT LAKES**  
A photo story by Peter Essick
- 18 **EARTH BEINGS IN THE POLITICAL LANDSCAPE**  
Laurie King looks at non-human-centric worldviews
- 20 **A GLOBAL REBELLION**  
Farhana Yamin reports on activism on the frontline of climate change

## NEW ONLINE

### [www.resurgence.org](http://www.resurgence.org)

Sam Lee introduces the RSPB Let Nature Sing project and explains why we should see birdsong as a barometer for the health of the planet

Satish Kumar reviews *Education for Sustainability* through Internationalisation by Neera Handa  
New gallery feature on printmaker Angie Lewin

For more in-depth interviews subscribe to our podcast **Resurgence Voices**

### [www.theecologist.org](http://www.theecologist.org)

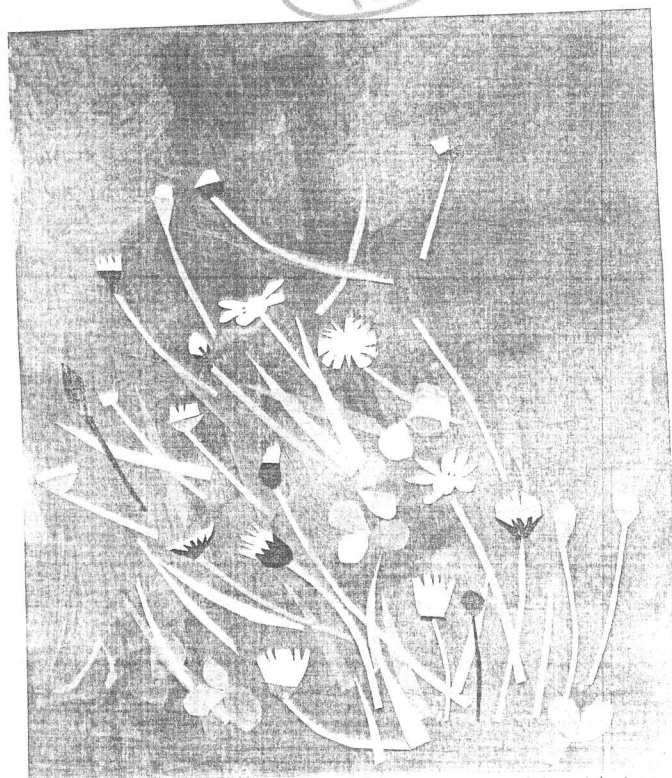
The stories environmentalists across the globe are talking about, plus opinion pieces and reviews. Check for new daily content, including regular analysis of key political issues.  
Contact: [editor@theecologist.org](mailto:editor@theecologist.org)

### Social Media

Twitter: @Resurgence\_mag  
@the\_ecologist  
Facebook: Resurgencetrust  
TheEcologist  
Instagram: @resurgencetrust

### Resurgence & Ecologist App

Free access for print members:  
[www.resurgence.org/app](http://www.resurgence.org/app)



Cover image: Artwork © Clover Robin courtesy of The Bright Agency

## KEYNOTES

- 22 **A CIVIL RIGHTS MOVEMENT TO SAVE THE PLANET**  
Extinction Rebellion proves we're still capable of collective action, writes **Mothiur Rahman**

## UNDERCURRENTS

- 28 **WAKE UP, CONSERVATION MOVEMENT!**  
Marianne Brown speaks to naturalist Chris Packham
- 32 **HOPE FOR A BREAKTHROUGH YEAR**  
We need action at the highest level, urges **Tony Juniper**
- 34 **PUSHING THE RIGHT BUTTONS**  
PL Henderson celebrates the legacy of Greenham Common

94

## ETHICAL LIVING

- 38 **NATURE'S PARENTS**  
Kate Blincoe looks at parenting in the wild
- 39 **PRESENCE**  
Peter Reason savours an encounter on the River Dart
- 40 **WONDER ON THE WING**  
Birdwatching is more than watching birds, says Joe Harkness
- 41 **JUST WHAT THE DOCTOR ORDERED**  
James Szymankiewicz writes about his campaign Naturally Healthy
- 43 **JOINING THE VEGGIE MASSIVE**  
Matt Harvey finds that radicals have infiltrated the rockery
- 44 **ACTIVISM IS A JOURNEY**  
Satish Kumar provides a friend with comforting words

## ARTS

- 46 **FINDING THE PATTERNS OF NATURE**  
Emma Crichton-Miller speaks to printmaker Angie Lewin
- 50 **THE SECRETS OF THE GARDEN**  
Peter Abbs delights in the poetry of Andrew Marvell
- 52 **WRITING THE MEDICINE**  
James Clarke celebrates the work of Walt Whitman
- 54 **THE BIRD OF PASSAGE**  
Malcolm Green explains how he was inspired by a cuckoo
- 57 **THE LITTLE THINGS IN LIFE**  
India Windsor-Clive enjoys the merging of science with crochet

## REVIEWS

- 58 **AN 'ECOLOGICAL CIVILISATION'**  
Ed Davey reviews *Environmental Pollution in China* by Daniel K. Gardner and *The New Silk Roads* by Peter Frankopan
  - 60 **WHY WE SHOULD MAKE LIFE SIMPLE**  
Mark Tully reviews Satish Kumar's book *Elegant Simplicity*
  - 61 **LONDON'S GHOSTS**  
Lucy Anna Scott reviews *Ghost Trees* by Bob Gilbert
  - 62 **TOOLS TO HEAL THE WEALD**  
Jan Goodey reviews *The Land of the Brighton Line* by David Bangs
  - 63 **THE FINAL FINAL COUNTDOWN?**  
Russell Warfield reviews *The End of the End of the Earth* by Jonathan Franzen
  - 64 **POWER TO THE PEDAL PUSHERS**  
Matt Kendall reviews *Building the Cycling City* by Melissa & Chris Bruntlett
  - 65 **HAPPINESS... IT'S A GUT FEELING**  
Rachel Marsh reviews the podcast *All Hail Kale*
- 
- 66 **MEMBERS' PAGE**
  - 67 **SHOP**
  - 68 **LETTERS**
  - 70 **ADVERTISEMENTS**

Editor Emeritus  
Satish Kumar

PA to Satish Kumar  
Elaine Green

Magazine Editor  
& Podcasts  
Marianne Brown  
marianne@resurgence.org

The Ecologist Editor  
Brendan Montague  
brendan@theecologist.org

Designer  
Rachel Marsh

Assistant Editor  
& Picture Researcher  
Emma Randall

Editorial Assistant  
& Marketing Design  
Emily Martin

Sub-editor  
Helen Banks

Poetry Editor  
Peter Abbs

Trust Manager  
Angie Burke

Finance Manager  
Mark Gough

Fundraising Manager  
Sharon Garfinkel  
+44 (0)7435 781842  
sharon@resurgence.org

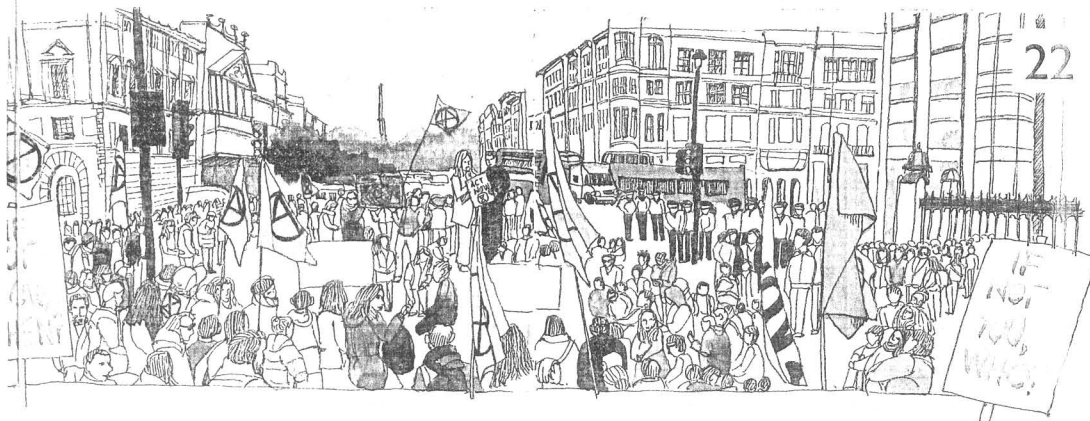
Membership  
& Classified Advertising  
Jeanette Gill  
Mandy Kessell  
+44 (0)1208 841824  
members@resurgence.org

Office Manager  
Lynn Batten  
info@resurgence.org  
+44 (0)1237 441293  
info@resurgence.org

Advertising Sales  
Dan Raymond-Barker  
+44 (0)7776 361671  
dan@emsm.org.uk

Editorial Office  
Ford House, Hartland,  
Bideford, Devon  
EX39 6EE, UK  
+44 (0)1237 441293  
www.resurgence.org

*Resurgence & Ecologist*  
is published by The  
Resurgence Trust, a  
registered educational  
charity (no. 1120414)



## CONTENTS

No. 315 July/August 2019

### 1 WELCOME

## FRONTLINE

---

### 4 NEWS

## ECOLOGIST

---

- 10 **THE END OF NATURE 30 YEARS ON**  
Maurice Frank speaks to Bill McKibben
- 13 **A SONG FOR THE SWALLOW**  
A poem by Jackie Morris
- 14 **DISPOSABLE CULTURE**  
Festivals can be green, writes PL Henderson
- 15 **A JOURNEY OF 'UNLEARNING'**  
Giselle Paulino recalls a trip to Brazil's *favelas*
- 16 **STAYING POWER**  
Zion Lights interviews author George Marshall
- 18 **BRANCHING OUT**  
Trees can inspire community spirit, writes Elizabeth Wainwright

## NEW ONLINE

---

### [www.resurgence.org](http://www.resurgence.org)

The education system is part of the environmental crisis. We need to develop free minds in children that are not enslaved to consumerism, writes Anthony Eldridge-Rogers

Martin Large reports on a pioneering regenerative farming project in Stroud

New gallery feature on artist Jessica Albarn

### [www.theecologist.org](http://www.theecologist.org)

The stories environmentalists across the globe are talking about, plus opinion pieces and reviews. Check for new daily content, including regular analysis of key political issues.  
Contact: [editor@theecologist.org](mailto:editor@theecologist.org)

### Social Media

---

Twitter: [@Resurgence\\_mag](https://twitter.com/Resurgence_mag)  
[@the\\_ecologist](https://twitter.com/the_ecologist)

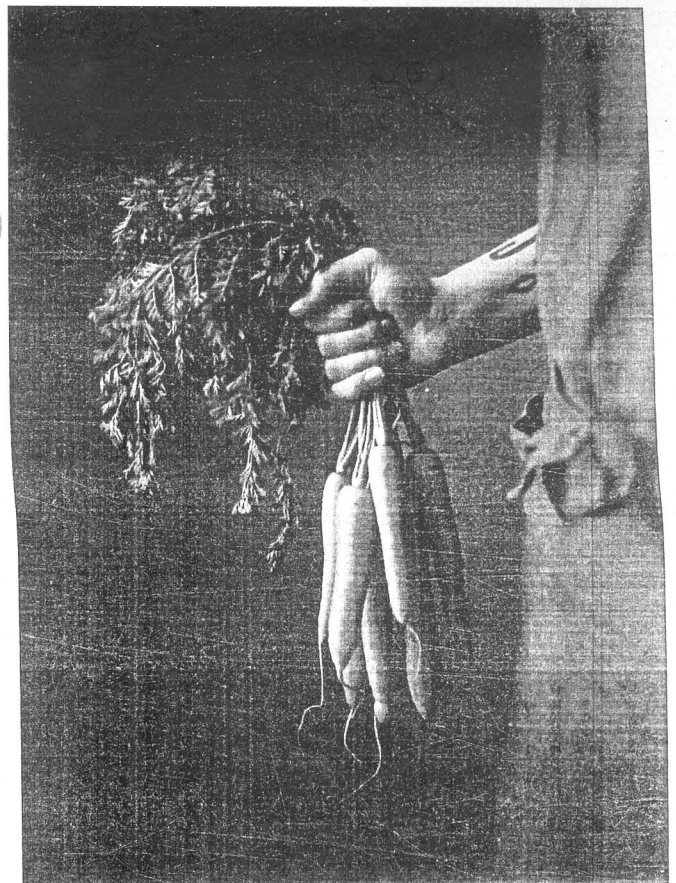
Facebook: [Resurgencetrust](https://www.facebook.com/Resurgencetrust)  
[TheEcologist](https://www.facebook.com/TheEcologist)

Instagram: [@resurgencetrust](https://www.instagram.com/resurgencetrust)

### Resurgence & Ecologist App

---

Free access for print members:  
[www.resurgence.org/app](http://www.resurgence.org/app)



Cover photograph © Our Food Stories [www.ourfoodstories.com](http://www.ourfoodstories.com)

## KEYNOTES

---

- 20 **THE CLIMATE JUSTICE NOW GENERATION**  
Marianne Brown meets Mary Robinson

## UNDERCURRENTS: FARMING

---

- 26 **THE BANANA EFFECT**  
Thembi Mutch reports on a vital and vulnerable crop
- 29 **EATING UP EMISSIONS**  
A new report shows reforesting farmland could slow global warming
- 30 **IMAGINING A BRAVE NEW WORLD**  
Harry Barton considers a post-Brexit farmscape
- 32 **FOOD FORESTS**  
Joe St Clair discovers a new grassroots project

- 34 **RETURN OF THE CRANES**  
Dave Sewell reports on a hopeful revival
- 36 **A BALANCED DIET**  
China's food choices have a global impact, writes Ed Davey

## ETHICAL LIVING

- 38 **RAISING THE BAR**  
Anna Turns meets activist-entrepreneur Geetie Singh-Watson
- 40 **IN THE COMPANY OF COWS**  
Dave Mountjoy reflects on sharing quietness
- 41 **BRINGING IT HOME**  
Photographs by David Spero inspire Catrina Davies
- 42 **LAND IS LIFE**  
Satish Kumar visits a farm in Transylvania
- 44 **CREATING A CHAKRA GARDEN**  
Experts from Findhorn share some tips
- 45 **DEEP WATER**  
Peter Reason is immersed in the presence of a river

## ARTS

- 46 **REFLECTIONS ON NATURE**  
India Windsor-Clive delights in the work of Dale Chihuly
- 50 **MEADOW SWEET**  
Victoria-Anne Tessa asks Jessica Albarn about a budding project
- 53 **VISIONS IN DITCHES**  
Peter Abbs muses on the work of Jeremy Hooker
- 55 **TWILIGHT, THE TRICKSTER**  
Jay Griffiths loses herself at the waking edge of night

## REVIEWS

- 58 **FUTURE FOSSILS**  
Lorna Howarth reviews *Underland: A Deep Time Journey* by Robert Macfarlane
  - 59 **FINDING 'EXTRA' IN ORDINARY**  
Jini Reddy reviews *The Enchanted Life: Unlocking the Magic of the Everyday* by Sharon Blackie
  - 60 **HOME TRUTHS**  
Herbert Girardet reviews *ZEDLife: How to Build a Low-Carbon Society Today* by Bill Dunster
  - 61 **THE POWER OF VULNERABILITY**  
Rachel Marsh reviews *The Bright Sessions* podcast
  - 62 **HIGH AND LOW SEASONS**  
Joe Harkness reviews *The Wild Remedy: How Nature Mends Us – A Diary* by Emma Mitchell
  - 63 **PERMACULTURE FROM THE HEART**  
Helen Iles reviews *Permaculture Design Companion: A Practical Workbook for Integrating People and Place* by Jasmine Dale
  - 64 **WHERE WE CAN GO FROM HERE**  
Colin Tudge reviews *The World Made Otherwise: Sustainable Humanity in a Threatened World* by Timothy J. Gorringer
  - 65 **BIRDWATCHING WITH THE TALIBAN**  
Ros Coward reviews *The Snow Leopard Project: And Other Adventures in Warzone Conservation* by Alex Dehgan
- 
- 66 **MEMBERS' PAGE**
  - 67 **SHOP**
  - 68 **LETTERS**
  - 70 **ADVERTISEMENTS**

Editor Emeritus  
Satish Kumar

PA to Satish Kumar  
Elaine Green

Magazine Editor & Podcasts  
Marianne Brown  
marianne@resurgence.org

The Ecologist Editor  
Brendan Montague  
brendan@theecologist.org

Designer  
Rachel Marsh

Assistant Editor & Picture Researcher  
Emma Randall

Editorial Assistant  
Julia Willan

Sub-editor  
Helen Banks

Poetry Editor  
Peter Abbs

Trust Manager  
Angie Burke

Finance Manager  
Mark Gough

Fundraising Manager  
Sharon Garfinkel  
+44 (0)7435 781842  
sharon@resurgence.org

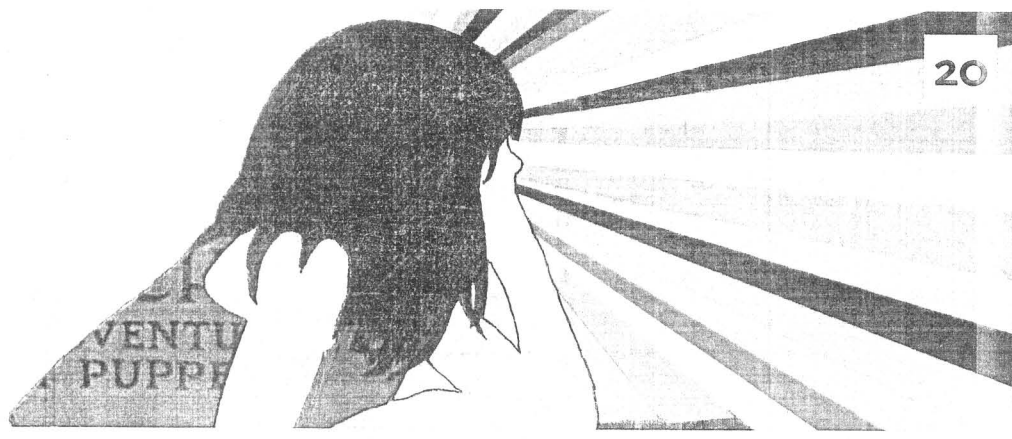
Membership & Classified Advertising  
Jeanette Gill  
Mandy Kessell  
+44 (0)1208 841824  
members@resurgence.org

Office Manager  
Lynn Batten  
info@resurgence.org  
+44 (0)1237 441293  
info@resurgence.org

Advertising Sales  
Dan Raymond-Barker  
+44 (0)7776 361671  
dan@emsm.org.uk

**Editorial Office**  
The Resurgence Centre,  
Fore Street, Hartland,  
Bideford, Devon  
EX39 6AB, UK  
+44 (0)1237 441293  
www.resurgence.org

*Resurgence & Ecologist*  
is published by The  
Resurgence Trust, a  
registered educational  
charity (no. 1120414)



# Review of Educational Research

18/19  
97

Volume 89

Number 3

June 2019

## CONTENTS

- 335 A Bibliometric Review of Research on Educational Administration: Science Mapping the Literature, 1960 to 2018  
*Philip Hallinger and Jasna Kovačević*
- 370 Is Teacher Qualification Associated With the Quality of the Early Childhood Education and Care Environment? A Meta-Analytic Review  
*Matthew Manning, Gabriel T. W. Wong, Christopher M. Fleming, and Susanne Garvis*
- 416 Multicultural Education Professional Development: A Review of the Literature  
*Hillary Parkhouse, Chu Yi Lu, and Virginia R. Massaro*
- 459 The Relation Between Mathematics Anxiety and Mathematics Performance Among School-Aged Students: A Meta-Analysis  
*Jessica M. Namkung, Peng Peng, and Xin Lin*

## शैक्षणिक संदर्भ

अंक-65 (मूल अंक-122), मई-जून 2019

— इस अंक में —

- 04 | आपने लिखा
- 07 | हम और हमारे सूक्ष्मजीव  
चारुदत्त नवरे
- 15 | एक शिक्षक से सहजकर्ता की ओर  
प्रज्ञा कदम
- 26 | जीन्स से तय होता है मलेरिया का जोखिम  
अथुलाप्रभा मूर्ति
- 32 | किताब के बहाने  
अनुराधा अनन्या
- 38 | कठपुतलियों की किस्सागोई  
मोहम्मद उमर
- 48 | छाया रंगीन, आखिर कैसे?  
अवनीश शुक्ला
- 53 | खजूर के फल शुष्क क्षेत्रों में ही क्यों पकते हैं  
अतुल चन्द्र
- 59 | भारतीय भाषाएँ व संविधान: भाग-1  
रमाकान्त अग्निहोत्री
- 65 | समाजिक एवं राजनीतिक सत्ता  
मेहमूद खान
- 77 | जंग और बादल  
अज्ञात
- 84 | समुद्र का पानी खारा क्यों होता है?  
सवालीराम

1/8/19

99

CONTENTS

Articles

- 301 Higher Educational Attainment for Growth: The MRW Model for Iceland  
*Mariya Neycheva and Kári Joensen*
- 317 State Control and Governance of Schooling and Their Effects on French, German, and Spanish Learning in Swedish Compulsory School, 1996–2011  
*Jörgen Tholin*
- 333 Upper Secondary Schools and Sparsity: The Case of Northern Sweden  
*Tommy Lind*
- 347 The Folk High School: A Contemporary Educational Pathway for Swedish Parliamentarians?  
*Henrik Nordvall and Charlotte Fridolfsson*
- 363 Comparing Collective and Personal Professional Theories of Experienced Practitioners  
*Antoine C. M. van den Bogaart, Marco Mazereeuw, Hans G. K. Hummel and Paul A. Kirschner*
- 378 Theoretical Dimensions of Bullying and Inappropriate Behaviour among Faculty Members  
*Matti Meriläinen and Kristi Köiv*
- 393 Professional Development in the Use of Data: From Data to Knowledge in Data Teams  
*Kim Schildkamp, Maaïke Smit and Ulf Blossing*
- 412 Finnish Mothers' and Fathers' Constructions of and Emotions in Their Daily Lives  
*Marja Leena Böök and Johanna Mykkänen*
- 427 Changes in Children's Agency Beliefs and Control Expectancy in Classes With and Without a Special Emphasis in Finland from Grade Four to Grade Six  
*Satu Koivuhovi, Mari-Paullina Vainikainen, Mira Kalalahti and Markku Niemivirta*
- 443 Fostering the "Intercultural Reader"? An Empirical Study of Socio-Cultural Approaches to EFL Literature  
*Hild Elisabeth Hoff*
- 465 Assessing Children's Social Functioning and Reading Proficiency: A Systematic Review of the Quality of Educational Assessment Instruments Used in Norwegian Elementary Schools  
*Anne Arnesen, Johan Braeken, Terje Ogden and Monica Melby-Lervåg*

ditor,  
your

and

ment  
ndex;  
racts;  
ation  
tional  
or the  
; MLA  
iences  
phies;  
emier;

100

# SCANDINAVIAN JOURNAL OF EDUCATIONAL RESEARCH

VOLUME 63 NUMBER 5 AUGUST 2019

## Articles

- Contributions of the Home Literacy Environment and Underlying Language Skills to Preschool Invented Writing  
*Hilde Hofslundsengen, Jan-Eric Gustafsson and Bente Eriksen Hagtvet* 653
- PISA Country Rankings Valid? Results for Canada and Finland  
*James McIntosh* 670
- Tensions and the Teacher's Role in Student Teacher Identity Development in Primary and Subject Teacher Curricula  
*Tiina Anspal, Äli Leijon and Erika Löfström* 679
- A Perspective of Group Size on Children's Conditions for Wellbeing, Learning and Development in Preschool  
*P. Williams, S. Sheridan and I. Pramling Samuelsson* 696
- The Role of School Climate in Explaining Changes in Social Trust Over Time  
*Erik Lundberg and Ali Abdelzadeh* 712
- Performative Technology Intensity and Teacher Subjectivities  
*Hans Englund, Magnus Frostenson and Kristina S. Beime* 725
- The Relation between Teacher Specialization and Student Reading Achievement  
*Eva Myrberg, Stefan Johansson and Monica Rosén* 744
- Making Sense and Use of Assessments  
*Jennie Sivenbring* 759
- To Read or Not to Read: A Qualitative Study of Students' Justifications for Document Selection in Task-Oriented Reading  
*Tonje Stenseth and Helge I. Strømsø* 771
- Community, Self and the Other: Learning Processes in Norwegian Folk High Schools  
*Johan Lövgren* 789
- A "Deleterious" Driver: The "First Teacher" Reform in Sweden  
*Ian Hardy and Karin Rönnerman* 805

# Contents



**School Science Review** June 2019, 100(373)

- 5 Editorial
- 6 Science notes
- 6 **The 'pink milk' experiment: factors affecting enzyme action** *Charles Gill*
- 9 **Reactivity series, activity series and electrochemical series** *Christopher Talbot*
- 13 **Catalase activity in immobilised yeast**  
*Kate Andrews, Paul Beaumont and Margaret Louis*  
Illustrating the design of an investigation in biology suitable to use for practical assessments in classes aged 14–16 or 16–19
- 17 **Making the mathematics in science enjoyable**  
*Minoru Ito*  
An exercise in understanding very large numbers
- 19 **Using career contexts to teach science**  
*Carol Davenport*  
Exploring the benefits of using career contexts in teaching science content
- 22 **Philosophy for science education**  
*Ellie Cripps, Ellie Hart and Louisa Aldridge*  
The University of Bristol's *Thinking Science* resources are designed to promote philosophical thinking and discussion in science lessons and are used to develop students' thinking skills and scientific literacy
- 25 **Are teachers gaining from educational trials? A question of evidence-based practice**  
*Ewan MacRae*  
Within the last ten years, a third of schools in England have been part of an educational trial; the role of the teacher in evidence-based practice is receiving increasing attention
- 29 **Chimera – an A-level biology enrichment drama**  
*Richard Spencer*  
Finding out how paternity tests may not always tell the truth led a group of students to create an award-winning drama
- 31 **How to train your woodlice**  
*Alexandra Myers Annett and student authors*  
A student investigation of whether woodlice can be trained using a stimulus and reward procedure
- 36 **Going bananas for GCSE science**  
*Robbie Kirkman and Ed Walsh*  
An exploration of how work at the Eden Project and the University of Exeter supports the concept of food security and demonstrates working scientifically in live research
- 42 **A quantum leap: the value of science symposiums for students and teachers**  
*Sam Green*  
An account of a school visit to an exhibition featuring particle accelerators, lasers and X-ray equipment to illustrate careers options in modern science
- 44 **Promotional feature: SPLATS**
- 48 **Chemistry in the comics: molecular marvels of Iron Man**  
*Yann Brouillette and William D. Lubell*  
Chemical evidence is provided to illuminate the innovative armour and marvellous prowess of Iron Man as described in the Marvel comic-book and cinematic universe
- 55 **How do traditionally successful pupils experience inquiry-oriented science instruction? Lessons from a teacher-developed unit**  
*Jeffrey Nordine*  
Designing inquiry-oriented instruction is difficult, and students accustomed to traditional pedagogy may resist; this article explores students' reactions to a teacher-designed inquiry unit in a high school advanced physics course

**60 How do you develop research-informed practice?***Alastair Gittner and Chris Harrison, on behalf of the ASE Research Committee*

Championing research-informed teaching through exploration of the EEF Improving Secondary Science guidance and ways of implementing research into practice

**69 'I'm sad that it's gone': a case study of teachers' views on teaching the nature of science at key stage 4***Richard Brock and Keith S. Taber*

This small-scale case study reports the views of six teachers in one science department on teaching about the nature of science in the current English key stage 4 curriculum

**75 The 'Structured Lesson' and 'Structured Revision'***Kenneth Rotheram*

Designing lesson plans to improve learning by including revision within lessons on a continual basis

**84 Reviews****90 Science websearch****93 Index to Volume 100****96 SSR special issues****96 Advertisers index**

## Health & Safety

For all practical procedures described in *SSR*, we have attempted to ensure that:

- all recognised hazards have been identified;
- appropriate precautions are suggested;
- where possible procedures are in accordance with commonly adopted model risk assessments;
- if a special risk assessment is likely to be necessary this is highlighted.

However errors and omissions can be made, and employers may have adopted different standards. Therefore, before any practical activity, teachers should always check their employer's assessment. Any local rules issued by their employer must be obeyed, whatever is recommended in *SSR*.

Unless the context dictates otherwise it is assumed that:

- practical work is conducted in a properly equipped laboratory;
- any mains-operated and other equipment is properly maintained;
- any fume cupboard operates at least to the standard of CLEAPSS Guide G9;
- care is taken with normal laboratory operations such as heating substances or handling heavy objects;
- good laboratory practice is observed when chemicals or living organisms are handled;
- eye protection is worn whenever there is any recognised risk to the eyes;
- fieldwork takes account of any guidelines issued by the employer;
- pupils are taught safe techniques for such activities as heating chemicals or smelling them, and for handling microorganisms.

Readers requiring further guidance are referred to:

*Hazcards* (CLEAPSS, 2016 and updates)

*Topics in Safety*, 3rd edn (ASE, 2001; updates available at [www.ase.org.uk/resources/topics-in-safety](http://www.ase.org.uk/resources/topics-in-safety))

*Safeguards in the School Laboratory*, 11th edn (ASE, 2006)

*Preparing COSHH Risk Assessments for Project Work in Schools* (SSERC, 1991)

SSERC hazardous chemicals database ([www.sserc.org.uk/health-safety/chemistry-health-safety/hazchem\\_database-2/](http://www.sserc.org.uk/health-safety/chemistry-health-safety/hazchem_database-2/))

*Be Safe! Health and Safety in School Science and Technology for Teachers of 3- to 12-Year-olds*, 4th edn (ASE, 2011)

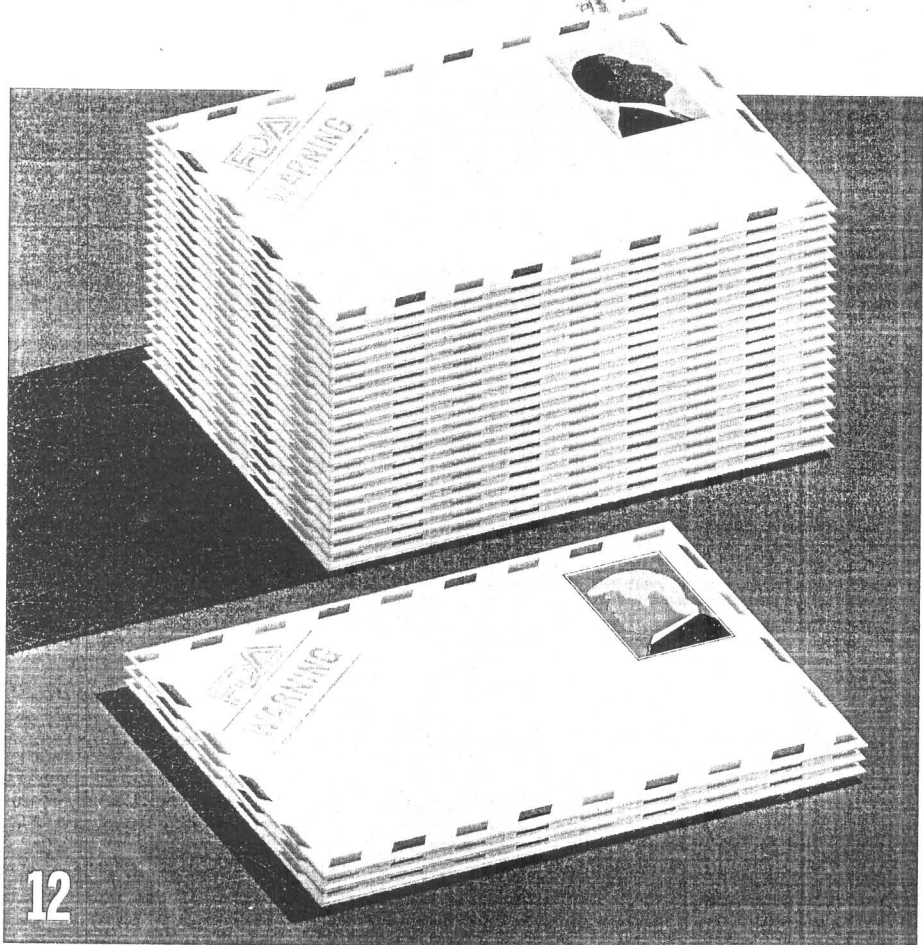
103

# CONTENTS

5 JULY 2019 • VOLUME 365 • ISSUE 6448



94  
Committees  
expecting coffee



12

## NEWS

### IN BRIEF

10 News at a glance

### IN DEPTH

#### 12 FDA ENFORCEMENT ACTIONS PLUMMET UNDER TRUMP

Agency is sending many fewer warning letters *By C. Piller*

#### 14 DETAILS REVEALED ON NIH PROBE OF FOREIGN TIES

Official overseeing inquiry reveals undisclosed firings and returned funds from universities *By J. Mervis*

#### 15 NASA TO FLY DRONE ON TITAN

Dragonfly quadcopter will scout saturnian moon for life *By P. Voosen*

#### 15 CRISPR PATENT FIGHT REVIVED

U.S. patent office issues new interference declaration *By J. Cohen*

#### 16 EPIGENETICS COMES TO RNA

Chemical tags on RNA drive cancer or enhance memory *By K. Garber*

#### 17 DNA REVEALS EUROPEAN ROOTS OF THE ANCIENT PHILISTINES

3000-year-old burials identify the enemies of the biblical Israelites and shore up legends of Bronze Age migration *By A. Gibbons*

► SCIENCE ADVANCES RESEARCH ARTICLE BY M. FELDMAN ET AL. 10.1126/sciadv.aax0061

### FEATURES

#### 18 QUEST FOR FIRE

Rob McGinnis aims to use renewable energy to turn carbon dioxide and water into gasoline *By R. F. Service*

► PODCAST

## INSIGHTS

### LETTERS

#### 22 NEXTGEN VOICES: PITHY BURNOUT PREVENTION

### PERSPECTIVES

#### 24 RESTORING FORESTS AS A MEANS TO MANY ENDS

An urgent need to replenish tree canopy cover calls for holistic approaches

*By R. Chazdon and P. Brancalion*

► REPORT P. 76

#### 25 INSERTING DNA WITH CRISPR

Inserting large DNA segments with CRISPR holds great promise for genetic engineering

*By Z. Hou and Y. Zhang*

► RESEARCH ARTICLE P. 48

#### 27 SEAWEED, SEAWEED EVERYWHERE

Floating *Sargassum* seaweed species are spreading in the Atlantic Ocean

*By J. Gower and S. King*

► REPORT P. 83

#### 28 INTEGRATING STRESS RESPONSES AND IMMUNITY

Stress is required to assemble immune signaling complexes during infection *By P. Pierre*

► RESEARCH ARTICLE P. 47

#### 29 FINANCIAL TEMPTATION INCREASES CIVIC HONESTY

Altruism and self-image, not selfishness, drive surprising findings *By S. Shalvi*

► REPORT P. 70

#### 30 PROCESSING MAGNESIUM AT ROOM TEMPERATURE

In situ microscopy experiments show how pyramidal slip increases magnesium's ductility *By G. Proust*

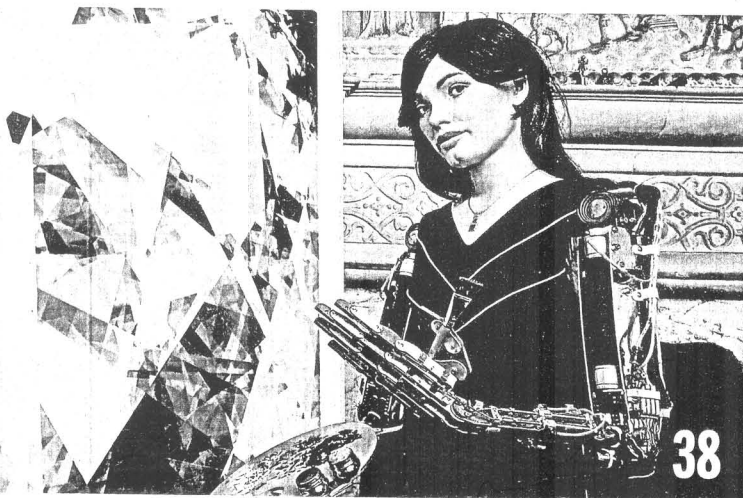
► REPORT P. 73

#### 32 TARGETING MICROGLIA IN BRAIN DISORDERS

The heterogeneity of brain immune cells could be exploited therapeutically

*By J. Priller and M. Prinz*

ILLUSTRATIONS (FROM TOP): ROBERT NEUBECKER; STEPHAN SCHMITZ/REUTERS/GETTY IMAGES



POLICY FORUM

34 REGULATING GENETIC BIOHACKING

Emphasize community engagement, not perfect compliance *By P. J. Zettler et al.*

BOOKS ET AL.

37 THE GRAND STORY OF CARBON

A geologist offers a melodic meditation on one of Earth's most abundant elements *By N. Pohl*

38 UNSETTLING ROBOTS AND THE FUTURE OF ART

An AI-driven artist's exhibition hints at, but never fully explores, the ethics of algorithms *By C. Ambrosio*

RESEARCH

IN BRIEF

40 From *Science* and other journals

RESEARCH ARTICLES

43 METASURFACES

Matrix Fourier optics enables a compact full-Stokes polarization camera *N. A. Rubin et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aax1839](https://doi.org/10.1126/science.aax1839)

44 AFRICAN GENETICS

Ancient DNA reveals a multistep spread of the first herders into sub-Saharan Africa *M. E. Prendergast et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aaw6275](https://doi.org/10.1126/science.aaw6275)

45 PROTEIN STABILITY

A glycine-specific N-degron pathway mediates the quality control of protein N-myristoylation *R. T. Timms et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aaw4912](https://doi.org/10.1126/science.aaw4912)

46 NEURODEVELOPMENT

Structured spike series specify gene expression patterns for olfactory circuit formation *A. Nakashima et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aaw5030](https://doi.org/10.1126/science.aaw5030)

47 CELL BIOLOGY

The heme-regulated inhibitor is a cytosolic sensor of protein misfolding that controls innate immune signaling *M. Abdel-Nour et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aaw4144](https://doi.org/10.1126/science.aaw4144)

▶ PERSPECTIVE P. 28

48 CRISPR BIOLOGY

RNA-guided DNA insertion with CRISPR-associated transposases *J. Strecker et al.*

▶ PERSPECTIVE P. 25

53 CELL BIOLOGY

A COPII subunit acts with an autophagy receptor to target endoplasmic reticulum for degradation *Y. Cui et al.*

61 PROTEIN DYNAMICS

Proton uptake mechanism in bacteriorhodopsin captured by serial synchrotron crystallography *T. Weinert et al.*

REPORTS

65 BIOCHEMISTRY

Conserved N-terminal cysteine dioxygenases transduce responses to hypoxia in animals and plants *N. Masson et al.*

70 BEHAVIORAL ECONOMICS

Civic honesty around the globe *A. Cohn et al.*  
▶ PERSPECTIVE P. 29

73 LIGHT METALS

Large plasticity in magnesium mediated by pyramidal dislocations *B.-Y. Liu et al.*  
▶ PERSPECTIVE P. 30

76 RESTORATION ECOLOGY

The global tree restoration potential *J.-F. Bastin et al.*  
▶ PERSPECTIVE P. 24

79 CHEMICAL PHYSICS

Direct mapping of curve-crossing dynamics in IBr by attosecond transient absorption spectroscopy *Y. Kobayashi et al.*

83 MARINE ECOLOGY

The great Atlantic *Sargassum* belt *M. Wang et al.*  
▶ PERSPECTIVE P. 27

DEPARTMENTS

9 EDITORIAL

Chinese scientists and security *By Elias Zerhouni*

94 WORKING LIFE

One Ph.D., hold the pastries *By Kate Bredbenner*

ON THE COVER



The bacterial CRISPR system is an adaptive immune defense mechanism. A new subtype of CRISPR is now shown to be co-opted by transposons to achieve their insertion into the targeted regions of the genome.

This powerful CRISPR-Cas12k system can be programmed to achieve precise and efficient targeted gene insertion, which holds great potential in genome editing applications. See pages 25 and 48.

Image: *Stephan Schmitz/Folio Art*

Science Staff ..... 6  
New Products ..... 88  
Science Careers ..... 89

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. 484460) 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.

105

# CONTENTS

12 JULY 2019 • VOLUME 365 • ISSUE 6449

Vol. 365 Issue 6449  
12 July 2019

PHOTO: ERIK MELLAARD

The palm oil boom has consumed orangutan habitat. But some ecologists think better farming practices could help preserve biodiversity.

## NEWS

### IN BRIEF

104 News at a glance

### IN DEPTH

**106 POLIO ERADICATION CAMPAIGN LOSES GROUND**  
Surging cases in Pakistan and Africa have dashed hopes of defeating the virus this year *By L. Roberts*

**107 CALIFORNIA'S STEM CELL RESEARCH FUND DRIES UP**  
Researchers hope a planned ballot initiative will renew funding in 2020 *By J. Kaiser*

**108 SOLAR PLUS BATTERIES IS NOW CHEAPER THAN FOSSIL POWER**  
Falling prices help utilities start to decarbonize *By R. F. Service*

**109 GUT MICROBES MAY HELP MALNOURISHED CHILDREN**  
Commonplace foods restore bacteria that can improve health *By E. Pennisi*  
► RESEARCH ARTICLES PP. 139 & 140

**110 PSYCHOLOGIST AIMS TO STUDY DIVERSE MINDS, NOT WEIRDOS**  
Daniel Haun wants his fellow psychologists to study people outside of rich, Western societies *By K. Kupferschmidt*

**111 WAS OUR SPECIES IN EUROPE 210,000 YEARS AGO?**  
Skepticism greets startling conclusion from skull fragment found in Greek cave *By L. Wade*

### FEATURES

**112 MAKING PEACE WITH OIL PALM**  
Some scientists are helping make palm plantations greener. Others say that doing so legitimizes a destructive industry *By D. Rochmyaningsih*

## INSIGHTS

### PERSPECTIVES

**116 SEABIRD CLUES TO ECOSYSTEM HEALTH**  
Seabird monitoring provides essential information on the state of marine ecosystems *By E. Velarde et al.*  
► PODCAST

**118 PROTECTING FETAL DEVELOPMENT**  
Control of cell fusion in the placenta affects the balance between health and harm *By P. Kellam and R. A. Weiss*  
► REPORT P. 176

**119 BOOSTING ENGINEERED T CELLS**  
Vaccines augment the antitumor activity of cellular therapy *By N. Singh and C. H. June*  
► REPORT P. 162

**120 MAPPING GLOBAL PROTEIN CONTACTS**  
Genome-scale coevolution experiments expand bacterial protein interactomes *By S. Vajda and A. Emili*  
► REPORT P. 185

**122 STROMAL DIRECTIVES CAN CONTROL CANCER**  
Could reprogramming the pretumor microenvironment transform cancer care? *By T. D. Tlsty and P. Gascard*

**124 SUPRAMOLECULAR CAGES TRAP PESKY ANIONS**  
Carbon-hydrogen bonds in a cryptand cage boost chloride entrapment to ultrahigh affinity *By K. Bowman-James*  
► REPORT P. 159

**126 STRONGER ARTIFICIAL MUSCLES, WITH A TWIST**  
Tailored fiber-shaped actuators with twisted and coiled designs have high energy densities *By S. Tawfik and Y. Tang*  
► REPORTS PP. 145, 150, & 155

### POLICY FORUM

**127 CERTIFY REPRODUCIBILITY WITH CONFIDENTIAL DATA**  
A trusted third party certifies that results reproduce *By C. Pérignon et al.*

### BOOKS ET AL.

**129 THWARTING AND EXPLOITING NAZI SCIENCE**  
A thrilling tale of wartime derring-do meets a richly researched story of postwar intellectual exploitation *By C. Hall*

106



**130 AMERICAN ADVENTURE AND AUTONOMOUS CARS**

What will become of U.S. car culture in the age of self-driving vehicles?  
By *L. Vinsel*

**LETTERS**

**133 CONSERVATION: BEYOND POPULATION GROWTH**

By *T. Weldemichel et al.*

**133 RESPONSE**

By *J. O. Ogutu et al.*

**134 POLAND'S CONFLICTING ENVIRONMENTAL LAWS**

By *G. Grzywaczewski and I. Kitowski*

**134 TECHNICAL COMMENT ABSTRACTS**

**RESEARCH**

**IN BRIEF**

**135** From *Science* and other journals

**REVIEW**

**138 ANTHROPOLOGY**

Late Pleistocene exploration and settlement of the Americas by modern humans *M. R. Waters*

REVIEW SUMMARY; FOR FULL TEXT:  
dx.doi.org/10.1126/science.aat5447

**RESEARCH ARTICLES**

**MICROBIOTA**

**139** Effects of microbiota-directed foods in gnotobiotic animals and undernourished children

*J. L. Gehrig et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: dx.doi.org/10.1126/science.aau4732

**140** A sparse covarying unit that describes healthy and impaired human gut microbiota development

*A. S. Raman et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: dx.doi.org/10.1126/science.aau4735

► NEWS STORY P. 109

**141 NEUROSCIENCE**

A sense of space in postrhinal cortex

*P. A. LaChance et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: dx.doi.org/10.1126/science.aax4192

**REPORTS**

**142 SURFACE CHEMISTRY**

Molecular structure elucidation with charge-state control *S. Fatayer et al.*

**ARTIFICIAL MUSCLES**

**145** Strain-programmable fiber-based artificial muscle *M. Kanik et al.*

**150** Sheath-run artificial muscles

*J. Mu et al.*

**155** Shape memory nanocomposite fibers for untethered high-energy microengines *J. Yuan et al.*

► PERSPECTIVE P. 125

**159 HOST-GUEST CHEMISTRY**

Chloride capture using a C-H hydrogen-bonding cage *Y. Liu et al.*

► PERSPECTIVE P. 124

**162 IMMUNOTHERAPY**

Enhanced CAR-T cell activity against solid tumors by vaccine boosting through the chimeric receptor *L. Ma et al.*

► PERSPECTIVE P. 119

**168 INORGANIC CHEMISTRY**

Characterization of hydrogen-substituted silylium ions in the condensed phase *Q. Wu et al.*

**173 CATTLE DOMESTICATION**

Ancient cattle genomics, origins, and rapid turnover in the Fertile Crescent *M. P. Verdugo et al.*

**176 REPRODUCTION**

IFITM proteins inhibit placental syncytiotrophoblast formation and promote fetal demise *J. Buchrieser et al.*

► PERSPECTIVE P. 118

**180 NEUROSCIENCE**

Posterior parietal cortex plays a causal role in perceptual and categorical decisions *Y. Zhou and D. J. Freedman*

**185 PROTEIN NETWORKS**

Protein interaction networks revealed by proteome coevolution *Q. Cong et al.*

► PERSPECTIVE P. 120

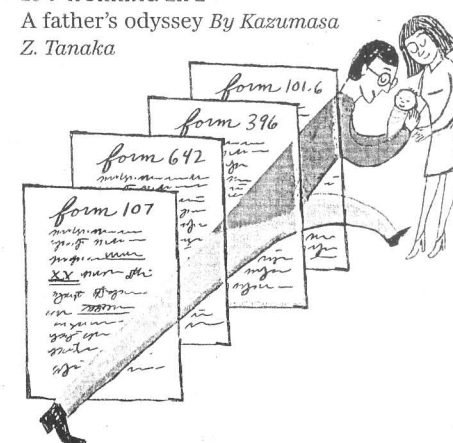
**DEPARTMENTS**

**101 EDITORIAL**

Balancing science and security  
By *Mary Sue Coleman*

**194 WORKING LIFE**

A father's odyssey By *Kazumasa Z. Tanaka*



**ON THE COVER**



Upon heating, a strain-programmable fiber-based artificial muscle composed of thermoplastic and elastomer layers actuates a miniature printed arm and lifts a dumbbell 650 times its own weight.

These fiber-based muscles, fabricated at lengths of hundreds of meters, are highly tunable in terms of power and lateral dimensions and thus may offer opportunities in robotics and prosthetics. See pages 125, 145, 150, and 155.

Photo: *Ken Richardson*

New Products.....190  
Science Careers.....191

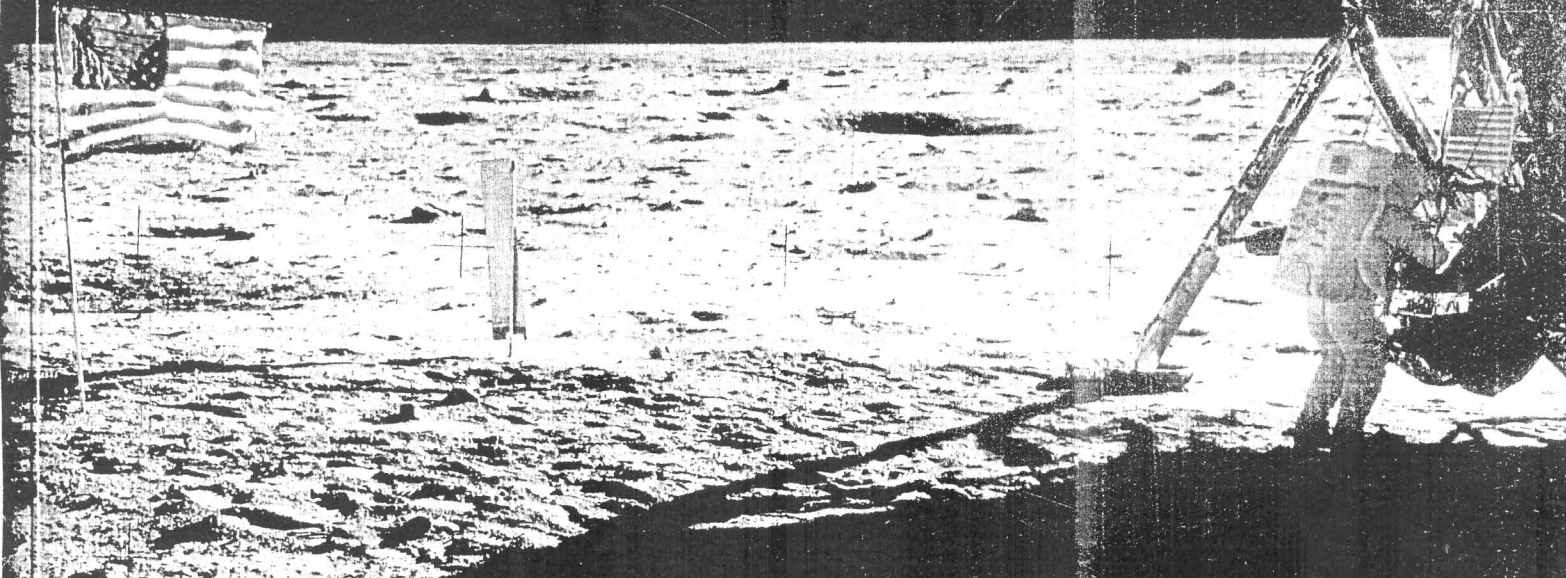
SCIENCE (ISSN 0036-8075) is published weekly on Friday, except last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 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.

CREDITS: (PHOTO) INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH; (ILLUSTRATION) ROBERT NEUBECKER

107

# CONTENTS

19 JULY 2019 • VOLUME 365 • ISSUE 6450



## SPECIAL SECTION

# MOON LANDING AT 50

### INTRODUCTION

**232** Shooting for the Moon

### NEWS

**234** Moon gazing: Nearly 50 years ago, NASA put a telescope on the Moon. Astronomers have been trying to return ever since *D. Clery* ▶ VIDEO

### POLICY FORUM

**238** China's present and future lunar exploration program *C. Li et al.*

### REVIEW

**240** Analysis of lunar samples: Implications for planet formation and evolution *R. W. Carlson*

### ON THE COVER



Neil Armstrong's shadow cast on the surface of the Moon. This image was taken by Armstrong on 21 July 1969, as part of a panorama of the Apollo 11 landing site, while Buzz Aldrin deployed scientific instruments. The Sun was directly behind Armstrong, producing

the appearance of a bright halo around his helmet. Black crosses were introduced by the camera optics for distortion calibration. See page 232. *Credit: NASA*

SEE ALSO ▶ EDITORIAL P. 203; BOOKS ET AL. P. 226

## NEWS

### IN BRIEF

**204** News at a glance

### IN DEPTH

#### **207 BANANA FUNGUS PUTS LATIN AMERICA ON ALERT**

Apparent detection of a devastating *Fusarium* strain in Colombia threatens exports *By E. Stokstad*

#### **208 UNIVERSITY OF ALASKA BRACES FOR DRACONIAN BUDGET CUTS**

Arctic science programs could suffer, faculty fear *By M. Price*

#### **209 PINPOINT BRAIN STIMULATION PROBES PERCEPTION**

Triggering a handful of neurons in a mouse brain may conjure a visual experience

*By K. Servick*

▶ RESEARCH ARTICLE BY MARSH ET AL. 10.1126/SCIENCE.AAW5202

#### **210 GENOMICS GUIDES HELP FOR DWINDLING SPECIES**

Long-term studies, modeling help clarify how to do genetic rescue

*By E. Pennisi*

#### **211 CENSUS CITIZENSHIP QUESTION IS DROPPED, BUT CHALLENGES LINGER**

Methods for filling in missing data will get major test *By J. Mervis*

### FEATURES

#### **212 A PAINFUL LEGACY**

Mice hint at how one generation's trauma may affect the biology of their descendants *By A. Curry*

▶ PODCAST

## INSIGHTS

### PERSPECTIVES

#### **216 HOW TO MAKE INTERLOCKED NANOCARBONS**

Interlocked nanocarbon rings have promising properties for molecular machines *By J. M. Van Raden and R. Jasti*

▶ REPORT P. 272

PHOTO: NASA

**218 POLARONS LEAVE A TRACE**

Spin and charge interplay leads to stringlike excitations in the 2D Hubbard model *By P. Schauss*  
▶ RESEARCH ARTICLE P. 251

**219 AN ATTRACTIVE, RESHAPABLE MATERIAL**

Jamming the nanoparticles of a ferrofluid on droplet surfaces creates a soft ferromagnet *By R. Dreyfus*  
▶ REPORT P. 264

**220 MAKING PRECISION MEDICINE PERSONAL FOR CYSTIC FIBROSIS**

Molecular defects in the cystic fibrosis gene prompt creative approaches to treatment *By C. Manfredi et al.*

**222 TONGUES UNTIED**

Fossil evidence reveals how jaws, ears, and tongues evolved in mammals and their relatives *By S. Hoffmann and D. W. Krause*  
▶ REPORT P. 276

**223 THE VASCULAR SIDE OF ALZHEIMER'S DISEASE**

Protein aggregates restrict cerebral blood flow, which causes neural injury *By A. Liesz*  
▶ RESEARCH ARTICLE P. 250

**224 STRESS SIGNALING IN PAIN CONTROL**

Endoplasmic reticulum stress can drive chronic pain, revealing a new target *By T. Avril and E. Chevet*  
▶ RESEARCH ARTICLE P. 248

**BOOKS ET AL.**

**226 APOLLO, IN CONTEXT**

Two tomes paint vivid historical portraits of Apollo 11 *By A. Siddiqi*  
▶ MOON LANDING AT 50 SECTION P. 232

**228 THE ETHICS OF OPIOIDS**

A bioethicist's harrowing encounter with prescription painkillers highlights systemic health care problems *By D. Z. Buchman*

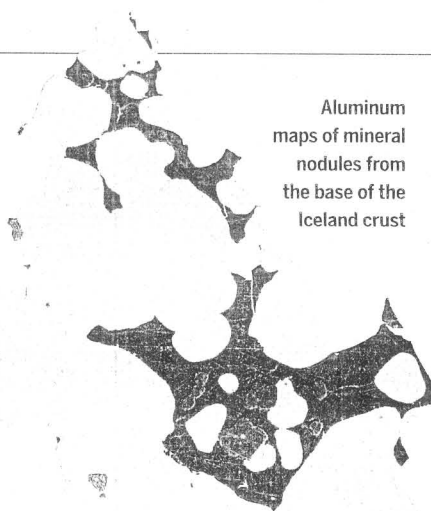
**LETTERS**

**229 FIGHTING PLANT PATHOGENS TOGETHER**

*By C. Hong*

**229 STATES LACK ENDANGERED SPECIES REPORTING**

*By C. Bennett and M. W. Schwartz*



Aluminum maps of mineral nodules from the base of the Iceland crust

260

**230 REPLICABLE DATA FOR DIGIT RATIO DIFFERENCES**

*By S. M. Breedlove*

**230 TECHNICAL COMMENT ABSTRACTS**

**RESEARCH**

**IN BRIEF**

245 From *Science* and other journals

**RESEARCH ARTICLES**

**248 INFLAMMATORY PAIN**

IRE1 $\alpha$ -XBP1 signaling in leukocytes controls prostaglandin biosynthesis and pain *S. Chopra et al.*  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aau6499](https://doi.org/10.1126/science.aau6499)  
▶ PERSPECTIVE P. 224

**249 COMPARATIVE GENETICS**

Conservation, acquisition, and functional impact of sex-biased gene expression in mammals *S. Naqvi et al.*  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aaw7317](https://doi.org/10.1126/science.aaw7317)

**250 ALZHEIMER'S DISEASE**

Amyloid  $\beta$  oligomers constrict human capillaries in Alzheimer's disease via signaling to pericytes *R. Nortley et al.*  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aav9518](https://doi.org/10.1126/science.aav9518)  
▶ PERSPECTIVE P. 223

**251 QUANTUM SIMULATION**

String patterns in the doped Hubbard model *C. S. Chiu et al.*  
▶ PERSPECTIVE P. 218

**REPORTS**

**257 METASURFACES**

Temporal color mixing and dynamic beam shaping with silicon metasurfaces *A. L. Holsteen et al.*

**260 VOLCANOLOGY**

Millennial storage of near-Moho magma *E. J. F. Mutch et al.*

**264 MAGNETIC MATERIALS**

Reconfigurable ferromagnetic liquid droplets *X. Liu et al.*  
▶ PERSPECTIVE P. 219; PODCAST

**268 QUANTUM GASES**

Quantum scale anomaly and spatial coherence in a 2D Fermi superfluid *P. A. Murthy et al.*

**272 MOLECULAR KNOTS**

Topological molecular nanocarbons: All-benzene catenane and trefoil knot *Y. Segawa et al.*  
▶ PERSPECTIVE P. 216

**276 PALEONTOLOGY**

New Jurassic mammaliaform sheds light on early evolution of mammal-like hyoid bones *C.-F. Zhou et al.*  
▶ PERSPECTIVE P. 222

**280 NATURAL PRODUCTS**

Use of a scaffold peptide in the biosynthesis of amino acid-derived natural products *C. P. Ting et al.*

**284 MARINE MANAGEMENT**

Seasonal to multiannual marine ecosystem prediction with a global Earth system model *J.-Y. Park et al.*

**DEPARTMENTS**

**203 EDITORIAL**

A child of Apollo *By Jeremy Berg*  
▶ MOON LANDING AT 50 SECTION P. 232

**294 WORKING LIFE**

Livestreaming science *By S. Hussain Ather*

Science Staff .....	202
New Products.....	290
Science Careers .....	291

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. 484460) 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.



## CONTENTS

### BOOKS ET AL.

**328 DEADLY CATS DOWN UNDER**  
Science meets the great cat debate  
By *J. B. Losos*

**329 SMALL WONDERS**  
The curious and vital role of insects  
takes center stage in three new tomes  
By *L. Dicks*  
▶ NEWS STORY P. 310

### LETTERS

**332 CHINA'S EARLY WARNING  
SYSTEM PROGRESS**  
By *J. Ji et al.*

**332 UNHELPFUL INFLATION  
OF THREATENED SPECIES**  
By *M. J. Costello*

**333 VIETNAM'S FISH KILL  
REMAINS UNEXAMINED**  
By *K. V. Dinh*

## RESEARCH

### IN BRIEF

**337** From *Science* and other journals

### RESEARCH ARTICLES

**340 IMMUNOMETABOLISM**  
T cell-mediated regulation of the  
microbiota protects against obesity  
*C. Petersen et al.*

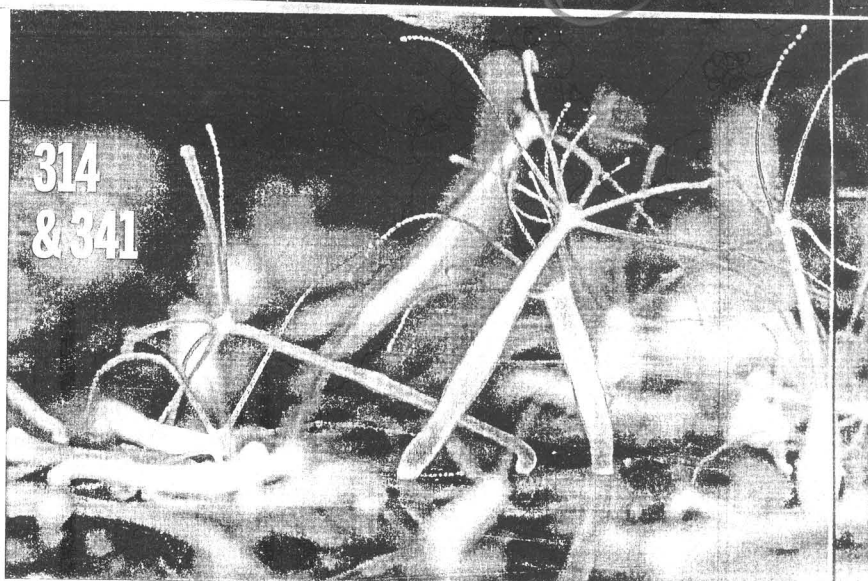
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.1219351](https://doi.org/10.1126/science.1219351)  
▶ PERSPECTIVE P. 316

**341 DEVELOPMENTAL BIOLOGY**  
Stem cell differentiation trajectories in  
*Hydra* resolved at single-cell resolution  
*S. Siebert et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.1219314](https://doi.org/10.1126/science.1219314)  
▶ PERSPECTIVE P. 314

**342 QUALITY CONTROL**  
The nucleolus functions as a phase-  
separated protein quality control  
compartment *F. Frottin et al.*

**347 EVOLUTION**  
Cryptic genetic variation accelerates  
evolution by opening access to diverse  
adaptive peaks *J. Zheng et al.*  
▶ PERSPECTIVE P. 318



*Hydra* can regenerate their whole body from only a small piece of tissue.

**343 MOLECULAR BIOLOGY**  
Resetting histone modifications  
during human parental-to-zygotic  
transition *W. Xia et al.*

**346 ORGANIC CHEMISTRY**  
Organic semiconductor  
photocatalyst can bifunctionalize  
arenes and heteroarenes  
*I. Ghosh et al.*  
▶ PERSPECTIVE P. 320

### REPORTS

**367 ELECTROCHEMISTRY**  
Molecular electrocatalysts can  
mediate fast, selective  
CO<sub>2</sub> reduction in a flow cell  
*S. Ren et al.*

**369 GLACIOLOGY**  
Direct observations of  
submarine melt and subsurface  
geometry at a tidewater glacier  
*D. A. Sutherland et al.*

**374 METASURFACES**  
Spatiotemporal light control with  
frequency-gradient metasurfaces  
*A. M. Shaltout et al.*

**377 MAGNETISM**  
Singular angular magnetoresistance  
in a magnetic nodal semimetal  
*T. Suzuki et al.*  
▶ PERSPECTIVE P. 324

**382 BIOTECHNOLOGY**  
A cytosine deaminase for  
programmable single-base RNA  
editing *O. O. Abudayyeh et al.*

**386 METABOLIC DISEASE**  
Targeting a ceramide double bond  
improves insulin resistance and  
steatosis *B. Chaurasia et al.*  
▶ PERSPECTIVE P. 319

**393 PLANT SCIENCE**  
A rice gene that confers broad-s  
resistance to  $\beta$ -triketone herbici  
*H. Maeda et al.*

### DEPARTMENTS

**301 EDITORIAL**  
Quo vadis, Mexican science?  
By *Antonio Lazcano*  
▶ NEWS STORY P. 305

**402 WORKING LIFE**  
Take the leap *By Lerys del Moral*

### ON THE COVER



Submarine mel  
of ice at the lea  
edge of glaciers  
discharge into t  
is happening fa  
than expected.  
' section of an ic  
calved from Let  
Glacier in south  
Alaska illustrates one of the consequ  
of this process, which helps drive m  
destabilizes ice sheets, and leads to  
rates of sea level rise. See page 369.  
*Photo: Mark Galer*

AAAS News & Notes.....  
New Products.....  
Science Careers.....

*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. Postage (publication No. 484460) 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. 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 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 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.

New  
scier  
subs

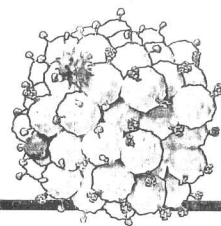
Establi  
(NEB)  
of enzy  
offers t  
enzyme  
product  
sample  
biology

For mor

One or more of  
For more informa  
The use of these  
© Copyright 201



JB  
22/8/19



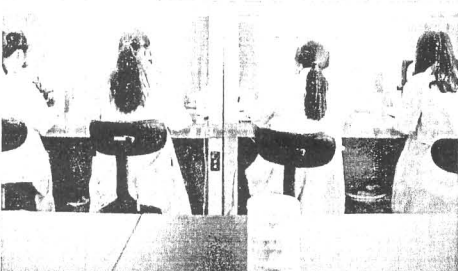
438

Stopping the spread of cancer

# CONTENTS

2 AUGUST 2019 • VOLUME 365 • ISSUE 6452

## CHINA'S CRISPR REVOLUTION



### FEATURES

#### 420 INTRODUCTION

By J. Cohen and N. Desai

#### 422 FIELDS OF DREAMS

China bets big on genome editing of crops  
By J. Cohen

#### 426 THE CRISPR ANIMAL KINGDOM

China has used the genome editor more aggressively, on more species, than any other country  
By J. Cohen

#### 430 INSIDE THE CIRCLE OF TRUST

The scientist who created the first gene-edited babies did not hide his plans from all—but regulations and colleagues failed to stop him  
By J. Cohen

#### 436 The long shadow of a CRISPR scandal

By J. Cohen

### ON THE COVER



A tomato seedling engineered with the genome editor CRISPR to resist a bacterial disease sprouts in a Beijing laboratory. China is at the forefront of applying CRISPR to

improve crops, and its scientists also are creating disease models in several species, as well as pig organs for transplantation into people. Another use, editing human embryos, triggered an international scandal. See page 420.

Photo: Syngenta Beijing Innovation

## NEWS

### IN BRIEF

412 News at a glance

### IN DEPTH

#### 414 NIH FETAL TISSUE RESEARCH REQUIREMENTS RAISE WORRIES

Biomedical studies on Zika virus, AIDS, and more imperiled  
By J. Kaiser and M. Wadman

#### 415 U.S. SUSPICIONS RANKLE CHINESE SCIENTISTS

Many academics dismiss conspiracy claims and worry about impacts on research  
By D. Normile

#### 416 BRINGING MACHINE LEARNING TO THE MASSES

Scientists without coding skills adopt easy-to-use artificial intelligence software  
By M. Hutson

#### 417 FOSSILS SHOW LARGE PREDATOR PROWLED CAMBRIAN SEDIMENTS

"Millennium Falcon" stirs up ideas about ecosystems at the dawn of animal life, 500 million years ago  
By J. Sokol

#### 418 BREXIT BACKER BORIS JOHNSON STOKES FEARS FOR U.K. SCIENTISTS

Prime minister's hardline stance increases odds of a "no-deal" divorce from the European Union  
By E. Stokstad

#### 419 BRAZILIAN PRESIDENT ATTACKS DEFORESTATION DATA

Scientists rush to defend space institute after Jair Bolsonaro calls its numbers "a lie"  
By H. Escobar

## INSIGHTS

### PERSPECTIVES

#### 438 TARGETING TRANSMISSIBLE CANCERS IN ANIMALS

New understanding of Tasmanian devil facial tumors informs therapy and prevention  
By A. Patchett and G. Woods

#### 440 CANCER CELL EVOLUTION THROUGH THE AGES

A transmissible dog cancer that has been evolving for 6000 years rapidly reached its optimal state  
By C. C. Maley and D. Shibata

► RESEARCH ARTICLE P. 464

#### 442 EMBRYONIC SELF-FRACKING

Mammalian embryos use controlled hydraulic fracturing to sculpt their shape

By M. Arroyo and X. Trepat

► RESEARCH ARTICLE P. 465

#### 443 FISHING FOR ANSWERS

Naturally existing genetic variation promotes rapid evolution under strong anthropogenic selection

By C. Jørgensen and K. Enberg

► REPORT P. 487

#### 444 WALK ON THE WILDLING SIDE

Wild microbiota in inbred mice is a new tool for preclinical studies of human disease

By S. P. Nobs and E. Elinav

► RESEARCH ARTICLE P. 461

#### 446 A FRESH SLATE FOR 3D BIOPRINTING

Greater structural complexity has been achieved in additive manufacturing of biomaterials

By Q. Dasgupta and L. D. Black III

► REPORT P. 482

#### 447 HOW DIATOMS HARVEST LIGHT

Light-harvesting systems in a group of microalgae differ from those in plants

By C. Büchel

► RESEARCH ARTICLE P. 463

### POLICY FORUM

#### 449 A GREENER PATH FOR THE EU COMMON AGRICULTURAL POLICY

It's time for sustainable, environmental performance

By G. Pe'er et al.

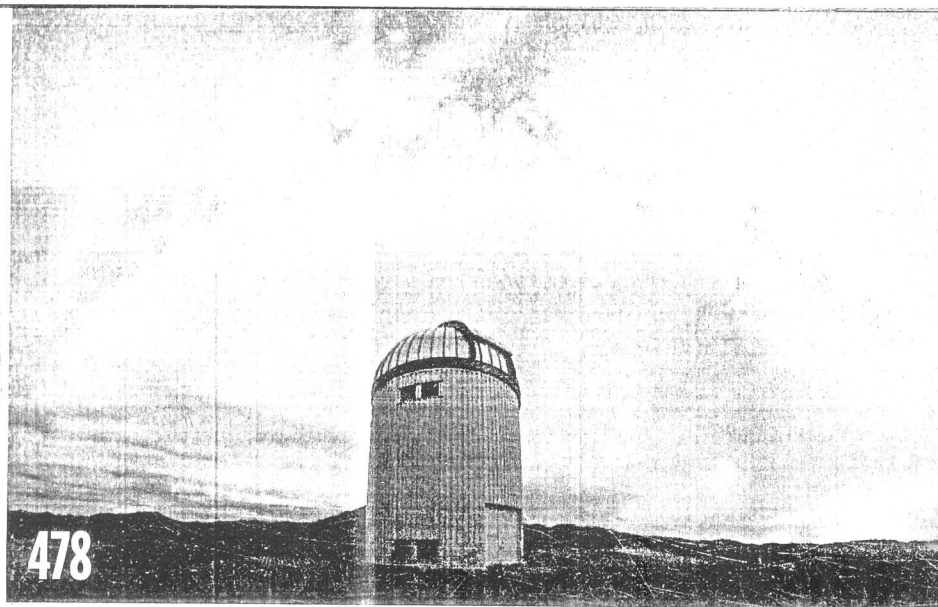
### BOOKS ET AL.

#### 452 THE DARK SIDE OF THE MOON—AND SCIENCE

Tales of the 28 lunar craters named for women offer a chance to reflect on women's struggle for scientific recognition  
By E. K. Gibson

CREDITS: (GRAPHIC) A. KITTERMAN/SCIENCE; (PHOTO) STEFEN CHOW

112



**453 THE WORLD MOSQUITOES BUILT**  
A new tome traces the outsized effects  
the tiny insect has had on human  
history *By J. Hemingway*

**LETTERS**

**454 LAND RECLAMATION THREATENS  
SANDPIPERS**  
*By Q. Fu et al.*

**454 REGULATE GM FUNGI TO PROTECT  
ECOSYSTEMS**  
*By K. E. French*

**455 RESPONSE**  
*By R. St. Leger et al.*

**PRIZE ESSAY**

**456 OPTICAL MODULATION GOES  
DEEP IN THE BRAIN**  
Nanoparticle-mediated optogenetics  
enables minimally invasive deep brain  
modulation *By S. Chen*

**RESEARCH**

**IN BRIEF**

**458** From *Science* and other journals

**RESEARCH ARTICLES**

**461 IMMUNOLOGY**  
Laboratory mice born to wild mice have  
natural microbiota and model human  
immune responses *S. P. Rosshart et al.*  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.aaw4361](https://doi.org/10.1126/science.aaw4361)  
▶ PERSPECTIVE P. 444

**462 STRUCTURAL BIOLOGY**  
Substrate processing by the Cdc48  
ATPase complex is initiated by ubiquitin  
unfolding *E. C. Twomey et al.*  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.aax1033](https://doi.org/10.1126/science.aax1033)  
▶ REPORT P. 502

**463 PHOTOSYNTHESIS**  
The pigment-protein network of a  
diatom photosystem II-light-harvesting  
antenna supercomplex *X. Pi et al.*  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.aax4406](https://doi.org/10.1126/science.aax4406)  
▶ PERSPECTIVE P. 447

**464 CANCER EVOLUTION**  
Somatic evolution and global expansion  
of an ancient transmissible cancer  
lineage *A. Baez-Ortega et al.*  
RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.aau9923](https://doi.org/10.1126/science.aau9923)  
▶ PERSPECTIVE P. 440; PODCAST

**465 DEVELOPMENTAL BIOLOGY**  
Hydraulic fracturing and  
active coarsening position the  
lumen of the mouse blastocyst  
*J. G. Dumortier et al.*  
▶ PERSPECTIVE P. 442

**469 ANCIENT OCEANS**  
The geologic history of seawater oxygen  
isotopes from marine iron oxides  
*N. Galili et al.*

**REPORTS**

**473 SOLAR CELLS**  
Stabilizing halide perovskite surfaces for  
solar cell operation with wide-bandgap  
lead oxyalts *S. Yang et al.*

**MILKY WAY**

A three-dimensional map of the  
Milky Way using classical Cepheid  
variable stars *D. M. Skowron et al.*

**482 BIOMEDICINE**

3D bioprinting of collagen to rebuild  
components of the human heart  
*A. Lee et al.*  
▶ PERSPECTIVE P. 446

**487 EVOLUTION**

Contrasting genomic shifts  
underlie parallel phenotypic  
evolution in response to fishing  
*N. O. Therikildsen et al.*  
▶ PERSPECTIVE P. 443

**491 BIOMEDICINE**

Transcutaneous ultrasound  
energy harvesting using  
capacitive triboelectric technology  
*R. Hinchet et al.*

**495 THERMOELECTRICS**

High thermoelectric cooling  
performance of n-type Mg<sub>3</sub>Bi<sub>2</sub>-based  
materials *J. Mao et al.*

**498 PLANT SCIENCE**

Isochorismate-derived biosynthesis  
of the plant stress hormone  
salicylic acid *D. Rekhter et al.*

**502 STRUCTURAL BIOLOGY**

Structure of the Cdc48  
segregase in the act of unfolding  
an authentic substrate  
*I. Cooney et al.*  
▶ RESEARCH ARTICLE P. 462

**505 VACCINES**

A proof of concept for structure-based  
vaccine design targeting RSV in humans  
*M. C. Crank et al.*

**DEPARTMENTS**

**411 EDITORIAL**  
Time's up, CO<sub>2</sub>  
*By Marcia McNutt*

**514 WORKING LIFE**  
Seeing my science clearly  
*By Gohar Manzar*

Science Staff ..... 410  
New Products ..... 510  
Science Careers ..... 511

PHOTO: K. ULACZYK/J. SKOWRON/OGLE/ASTRONOMICAL OBSERVATORY, UNIVERSITY OF WARSAW

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. 484460) 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 Education

### CONTENTS

#### GENERAL SECTION

719/ Gendered genetics: How reading about the genetic basis of sex differences in biology textbooks could affect beliefs associated with science gender disparities

*Brian M. Donovan, Molly A. M. Stuhlsatz, Daniel C. Edelson, and Zoë E. Buck Bracey*

Published Online 18 February 2019

750/ Language and cognitive interference: How using complex scientific language limits cognitive performance

*Bryan A. Brown, Brian Donovan, and Andrew Wild*

Published Online 13 March 2019

770/ Fostering agency to overcome barriers in college science teaching: Going against the grain to enact reform-based ideas

*Julie A. Birt, Mojtaba Khajeloo, Christine C. Rega-Brodsky, Marcelle A. Siegel, Tamara S. Hancock, Keala Cummings, and Phuong D. Nguyen*

Published Online 30 March 2019

799/ What are we talking about when we talk about STEM education? A review of literature

*Tobías Martín-Páez, David Aguilera, Francisco Javier Perales-Palacios, and José Miguel Vilchez-González*

Published Online 08 April 2019

#### SCIENCE TEACHER EDUCATION

823/ What do core practices offer in preparing novice science teachers for equitable instruction?

*Hosun Kang and Doron Zinger*

Published Online 12 March 2019

854/ Language ideologies in science education

*Catherine Lemmi, Bryan A. Brown, Andrew Wild, Lynne Zummo, and Quentin Sedlacek*

Published Online 12 March 2019

875/ Kindling the fire: Fueling preservice science teachers' interest to teach in high-needs schools

*Meredith W. Kier and Jason A. Chen*

Published Online 02 April 2019

#### SCIENCE LEARNING IN EVERYDAY LIFE

900/ Emerging and developing situational interest during children's tablet-mediated biology learning activities at a nature center

*Yong Ju Jung, Heather Toomey Zimmerman, and Susan M. Land*

Published Online 22 March 2019

923/ Towards an effective use of language to explain light in the museum

*Susana Afonso, Ana Sofia Afonso, and Francisco Rodrigues*

Published Online 04 April 2019

#### ERRATUM

947/ Erratum

Published Online 02 May 2019

7/18/19

पुस्तकालय और प्रतिलिपि कक्षा  
एन सी ई आर सी ई  
एन सी ई आर सी ई  
एन सी ई आर सी ई

ISSUES AND TRENDS

Focus on Epistemic Tools in Science Education

948/ Introduction to special issue: Epistemic tools in science education

*David Stroupe, Jean Moon, and Sarah Michaels*

*Published Online 25 March 2019*

952/ Supporting knowledge construction in elementary engineering design

*Kristen B. Wendell, Chelsea J. Andrews, and Patricia Paugh*

*Published Online 25 March 2019*

979/ Opening up curricula to redistribute epistemic agency: A framework for supporting science teaching

*Mon-Lin Monica Ko and Christina Krist*

*Published Online 24 March 2019*

1011/ Engineering for sustainable communities: Epistemic tools in support of equitable and consequential middle school engineering

*Edna Tan, Angela Calabrese Barton, and Aerin Benavides*

*Published Online 24 March 2019*

1047/ Representational gesturing as an epistemic tool for the development of mechanistic explanatory models

*Nitasha Mathayas, David E. Brown, Robert C. Wallon, and Robb Lindgren*

*Published Online 24 March 2019*

1080/ Epistemic tools in engineering design for K-12 education

*Gregory J. Kelly and Christine M. Cunningham*

*Published Online 24 March 2019*

1112/ Epistemic tools for science classrooms: The continual need to accommodate and adapt

*John Settlage and Sherry A. Southerland*

*Published Online 25 March 2019*

115

JST

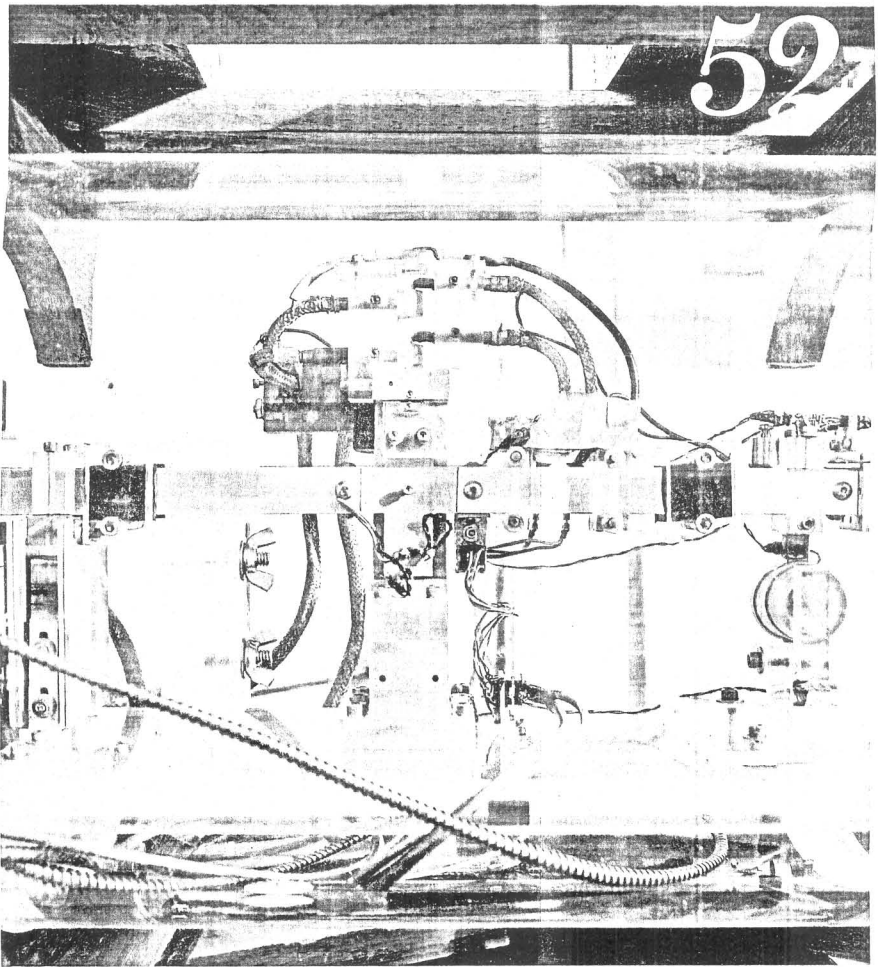
AUGUST 2019

VOLUME 321, NUMBER 2

# SCIENTIFIC AMERICAN

12/19/19

Handwritten notes and stamps in the top left corner.



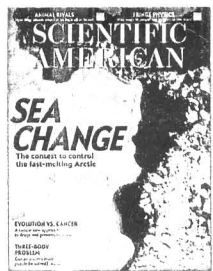
- 20 Arctic Ambitions**
- 22 Divide or Conquer**  
Five nations are using science to assert rights to vast, overlapping portions of the Arctic Ocean seafloor.  
*By Mark Fischetti*
- 28 Setting Boundaries**  
*By Katie Peek*
- 31 A New Reality**  
Climate change is dramatically altering life at the top of the world.  
*By Mark Fischetti*
- 32 Land of Change**  
*By Katie Peek*
- 34 Is Confrontation Inevitable?**  
Political tensions are rising, but cooperation could still prevail.  
*By Kathrin Stephen*
- 38 The Busy North**  
*By Katie Peek*

- ANIMAL BEHAVIOR
- 40 When Animals Fight**  
Conventional wisdom holds that the ability to assess a rival's fighting ability is universal in the animal kingdom. Recent research has shown otherwise.  
*By Gareth Arnott and Robert W. Elwood*

- MEDICINE
- 46 Darwin's Cancer Fix**  
Principles of evolution and natural selection drive a radical new drug approach and prevention strategies.  
*By James DeGregori and Robert Gatenby*

- PHYSICS
- 52 The Good Kind of Crazy**  
Traditional rockets won't get us to the stars. With NASA backing, some scientists are pushing against the edges of physics to find out what far-fetched ideas will.  
*By Sarah Scoles*

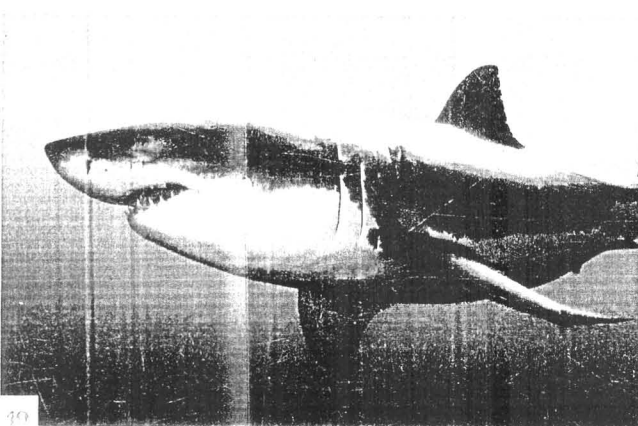
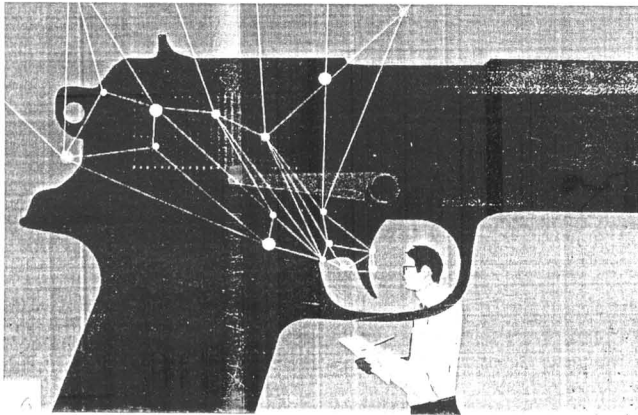
- MATHEMATICS
- 60 The Three-Body Problem**  
Mathematicians know they can never fully "solve" this ancient puzzle. That hasn't stopped them from studying it—and making intriguing discoveries along the way.  
*By Richard Montgomery*



**ON THE COVER**  
Sea ice breaks apart on June 6, 2019, in the Amundsen Gulf, far into the Arctic Ocean above Canada's Northwest Territories. The thawing seas have inspired Arctic states and other countries to vie for seafloor rights to oil and natural gas deposits, shipping lanes and even military positioning in the high north. Photograph by NASA Earth Observing System Data and Information System (<https://worldview.earthdata.nasa.gov>)

116

# SCIENTIFIC AMERICAN



### 3 From the Editor

### 4 Letters

### 6 Science Agenda

Give researchers the resources they need to find solutions to the gun violence epidemic. *By the Editor*

### 8 Forum

A wild fix for climate change that just might work. *By Rob Jackson and Pep Canadell*

### 10 Advances

What makes great white sharks afraid. Reporting sex harassment comes at a cost. Predicting space weather blackouts. A breathing bag that could save lives.

### 18 The Science of Health

Preventing allergies in children. *By Claudia Wallis*

### 19 Ventures

We must match the breakneck speed of 20th-century world-changing technologies. *By Wade Rouse*

### 68 Recommended

Air pollution kills. A dream of the periodic table of elements. The Ebola saga continues. *By Andrea Gawrylenko*

### 69 The Intersection

Kids shouldn't necessarily learn to code. *By Zeynep Tufekci*

### 70 Anti Gravity

Can we do physics with math alone? *By Steve Mirsky*

### 71 50, 100 & 150 Years Ago

### 72 Graphic Science

Viruses are thriving in Arctic waters. *By Mark Fischetti and Jen Christiansen*

### ON THE WEB

#### Water, Water Everywhere

The closer scientists look at Mars, the more evidence they find that this freeze-dried world once harbored aqueous abundance. But just how much water exists on the Red Planet today?

Go to [www.ScientificAmerican.com/aug2019/water-on-mars](http://www.ScientificAmerican.com/aug2019/water-on-mars)

Scientific American (ISSN 0036-8733), Volume 321, Number 2, August 2019, published monthly by Scientific American, a division of Springer Nature America, Inc., 1 New York Plaza, Suite 4600, New York, N.Y. 10004-1399. Periodicals postage paid at New York, N.Y., and at additional mailing offices. Canada Post International Publications Mail (Canadian Distribution) Sales Agreement No. 40012504. Canadian BN No. 127387652RT; TVQ1218055. TQ0001. Publication Mail Agreement #40012504. Return undeliverable mail to Scientific American, P.O. Box 819, Stn Main, Markham, ON L3P 8A2. Individual Subscription rates: 1 year \$49.99 (USD), Canada \$59.99 (USD), International \$69.99 (USD). Institutional Subscription rates: Schools and Public Libraries: 1 year \$84 (USD), Canada \$89 (USD), International \$96 (USD). Businesses and Colleges/Universities: 1 year \$399 (USD), Canada \$405 (USD), International \$411 (USD). Postmaster: Send address changes to Scientific American, Box 3187, Harlan, Iowa 51537. Reprints inquiries: (212) 451-8415. To request single copies or back issues, call (800) 333-1199. Subscription inquiries: U.S. and Canada (800) 333-1199; other (515) 248-7684. Send e-mail to [scacustserv@cdsfulfillment.com](mailto:scacustserv@cdsfulfillment.com). Printed in U.S.A. Copyright © 2019 by Scientific American, a division of Springer Nature America, Inc. All rights reserved.

Scientific American is part of Springer Nature, which owns or has commercial relations with thousands of scientific publications (many of them can be found at [www.springernature.com/us](http://www.springernature.com/us)). Scientific American maintains a strict policy of editorial independence in reporting developments in science to our readers. Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Seminar

# 720

## HOW INDIA VOTED

a symposium on

the results of the

2019 general election

symposium participants

Aug. 2019

10	<b>THE PROBLEM</b> Posed by <b>Rahul Verma</b> , Fellow, Centre for Policy Research, Delhi
12	<b>MAKING SENSE OF THE 2019 ELECTION</b> A discussion with <b>Yogendra Yadav</b> , <b>Vandita Mishra</b> , <b>Tariq Thachil</b> , <b>Shekhar Gupta</b> and <b>G. Sampath</b>
18	<b>THE BJP, ITS OPPOSITION AND PARTY SYSTEM FLUIDITY</b> <b>K.K. Kailash</b> , Department of Political Science, University of Hyderabad
24	<b>MODI WAS THE MESSAGE</b> <b>Shivam Vij</b> , Contributing Editor, 'The Print', Delhi
30	<b>THE VICTORY OF AN IDEOLOGICAL VISION?</b> <b>Swadesh Singh</b> , Satyawati College, Delhi University
34	<b>WINNING BACK THE RURAL HEARTLAND</b> <b>Neelanjan Sircar</b> , Senior Visiting Fellow, CPR and Assistant Professor, Ashoka University, Sonipat and <b>Roshan Kishore</b> , Political Economy Editor, 'The Hindustan Times', Delhi
38	<b>HOW NATIONALISM HELPED THE BJP</b> <b>Pranav Gupta</b> , PhD student, University of California, Berkeley, and <b>Dishil Shrimankar</b> , Teaching Fellow, University of Nottingham
43	<b>DID WELFARE WIN VOTES?</b> <b>Jyoti Mishra</b> and <b>Vibha Attri</b> , Researchers, Lokniti-CSDS, Delhi
47	<b>HOW THE BJP BREACHED THE EASTERN FRONT</b> <b>Shoaib Daniyal</b> , Assistant Editor, 'Scroll.in'
52	<b>SUBALTERN HINDUTVA</b> <b>Abhinav Prakash Singh</b> , Assistant Professor, Delhi University
56	<b>THE MYTH OF A HINDU BLOC</b> <b>Sajjan Kumar</b> , Independent Researcher, Delhi
60	<b>WHY DALITS VOTED FOR THE BJP</b> <b>Snigdha Poonam</b> , National Affairs Editor, 'The Hindustan Times', and <b>Dhrubo Jyoti</b> , journalist, 'The Hindustan Times'; and <b>Guru Prakash</b> , Assistant Professor, Patna University and Fellow, India Foundation
65	<b>WOMEN VOTERS MAKE POLITICAL PARTIES TAKE NOTICE</b> <b>Rukmini S.</b> , independent data journalist, Chennai
70	<b>DEMYSTIFYING THE MUSLIM VOTE</b> <b>Hilal Ahmed</b> , Associate Professor, CSDS, Delhi
75	<b>THE USE OF SOCIAL MEDIA</b> <b>Joyjeet Pal</b> , University of Michigan Ann Arbor
80	<b>THE RESILIENCE OF DYNASTICISM</b> <b>Gilles Verniers</b> , Assistant Professor and Co-Director, Trivedi Centre for Political Data, Ashoka University; and <b>Sofia Ammassari</b> , TCPD, Sonipat
84	<b>THE FUTURE OF THE CONGRESS PARTY</b> A conversation between <b>Yamini Aiyar</b> , President and CEO, Centre for Policy Research, <b>Zoya Hasan</b> , Professor Emerita, Jawaharlal Nehru University, and <b>Rahul Verma</b> , Fellow CPR
89	<b>INDIA'S NEW FOURTH PARTY SYSTEM</b> <b>Milan Vaishnav</b> , Senior Fellow and Director, South Asia Programme, Carnegie Endowment for International Peace, Washington, DC; and <b>Jamie Hintson</b> , James C. Gaither Junior Fellow at Carnegie
97	<b>COMMENT</b> Received from <b>Harsh Sethi</b> , former Consulting Editor, 'Seminar'
	<b>COVER</b> Designed by <a href="http://www.designosis.in">www.designosis.in</a>

118

# UNIVERSITY NEWS

A Weekly Journal of Higher Education

Vol. 57 No. 29

July 22-28, 2019

Special Issue  
on the Occasion of

AIU Round Table on

Review of Draft National Education Policy—2019

12/8/19  
17/8/19  
UNIVERSITY NEWS  
PUBLISHED BY THE  
UNIVERSITY OF DELHI  
110007

**Editorial Committee Chairperson :** Dr (Ms) Pankaj Mittal

**Editorial Committee :** Dr Baljit Singh Sekhon

: Dr Amarendra Pani

: Dr Youd Vir Singh

**Editor :** Dr Sistla Rama Devi Pani

# Table of Contents

	PAGE
<b>Editorial:</b> Let's Rejuvenate Higher Education for Our Own Sake — <i>Sistla Rama Devi Pani</i>	5
1. Key Points on Higher Education in Draft National Education Policy-2019 — <i>Government of India</i>	7
2. Get, Set, Go: Off the Blocks with the New Education Policy — <i>Hema Raghavan</i>	12
3. Creating a Quality and Purpose Driven Educational Organization — <i>Mariamamma A Varghese</i>	16
4. Indian Education Rejuvenation — <i>Chhaya Goel and Devraj Goel</i>	19
5. Comments on Draft National Education Policy-2019 Report — <i>Om Vikas</i>	24
6. Perceptions on Draft National Education Policy-2019 — <i>Madan Mohan Goel</i>	27
7. Draft National Education Policy-2019: A Review — <i>Sunil Behari Mohanty</i>	29
8. National Research Foundation : Major Feather in Draft National Education Policy-2019 — <i>Ved Parkash Kumar</i>	37
9. Creativity and Innovation in B-Schools: Potential Areas for Development — <i>K Renuka Raju, Shakeel Ahmad and A Ramachandra Aryasri</i>	39
10. Draft National Education Policy-2019: Comments on Teacher Education — <i>Sunil Kumar Singh</i>	43
11. Vocational Education: A Step towards Sustainability through Draft National Education Policy-2019 — <i>Payal Bhatia and Arti Bhatti</i>	48
<b>Convocation:</b> Tamil Nadu National Law University, Tiruchirappalli, Tamil Nadu Good Education System: An Inevitable Tool for Overall Development of the Nation — <i>Justice Vijaya Kamlesh Tahilramani</i>	52
<b>Campus News</b>	55
<b>Theses of the Month (Humanities)</b>	63
<b>Advertisements</b>	65

---

Opinions expressed in the articles are those of the contributors and do not necessarily reflect the views and policies of the Association

---

120

# UNIVERSITY NEWS

Vol. 57 July 29-  
No. 30 August 04, 2019  
Price Rs. 25.00

A Weekly Journal of Higher Education  
Published by the Association of Indian  
Universities

### In This Issue

ITEMS	PAGE
<b>Articles</b>	
The Language Conundrum: English Language at Higher Education	3
Innovation Eco System in Indian Higher Education Institutions	11
The 5 G State of Art Education: Need of the Hour for India	16
Futuristic Perspectives of Adaptive Learning	22
<b>Convocation</b>	
KLE Academy of Higher Education and Research, Belagavi, Karnataka	27
<b>Campus News</b>	
29	
<b>Theses of the Month</b>	
(Science & Technologies)	35
<b>Advertisements</b>	
	40

### The Subscription Tariff

	Inland		Foreign	
	Institutions	Academics/ Students	Airmail	Surface Mail
	<i>(at residential address only)</i>			
	Rs.	Rs.	US \$	US \$
1 year	950.00	375.00	210.00	170.00
2 years	1700.00	700.00	400.00	300.00

Subscription is payable in advance by Bank Draft/MO only in favour of Association of Indian Universities, New Delhi.

Opinions expressed in the articles are those of the contributors and do not necessarily reflect the views and policies of the Association.

#### Editorial Committee Chairperson:

Dr (Ms) Pankaj Mittal

#### Editorial Committee :

Dr Baljit Singh Sekhon  
Dr Amarendra Pani  
Dr Youd Vir Singh

#### Editor :

Dr Sistla Rama Devi Pani

## The Language Conundrum: English Language at Higher Education

Ramanujam Meganathan\*

Metamorphosis of English language from library language to language of upward mobility (Meganathan, 2011) and the 'political response to social demand' for the (English) language (NCERT, 2005) has resulted in language-in-education policy crisis both in school and higher education in India. The demand for the language both as a language and as a medium is huge that no system is able to cater to it fully (Graddol, 2010). With the advent of liberalisation of Indian economy in the 1990s and growth of private institutions in education, the role and place of English has been redefined. As Tickoo (1996, 2004) points out that English language education in India is an impressively large and highly complex phenomenon endowed with major strengths along with equally large failures and limitations. How English language education needs to be planned for complementing and supplementing Indian languages in a multilingual country (NCERT, 2006a) and the demand for upward mobility is seen as a challenge given the diversity in curriculum planning for school and higher education. This paper discusses English language education situation at the university in terms of typologies of teaching-learning situations, contents of English language core and communication oriented courses at the undergraduation level in general science, humanities and in technology courses, besides traversing through research on status and needs of English language education at the univeristy level. It proposes changes in the English language curriculum balancing between textbased designs to language based courses.

### Typology of Schooling and Collegiate Education

There is an alingment between the typology of schooling and college education affiliated to universities in the way English language education is planned and operates in the curriculum and the ambience of the school and college. While the majority of courses in higher education are conducted in English medium, majority of schools are Indian languages (vernacular) medium schools, though there is a shift towards English medium. Typology of schooling and the quality of English language teaching could be seen from the determinants of English language environment in schools and colleges, the English language teacher and her proficiency, and (pedagogical) processes of the classroom (Kurien, 1997; Nag-Arulmani, 2000, 2005; NCERT 2006a). Adding to this is the life on campus in colleges and universities. Life in the sense both in and out side classroom interactions between peers and between learners and teachers, the happenings on the campus-academic, social and cultural events in which languages play a role. These create hierarchies in the way the schools 'deliver' English language education. Salai Selvam and Geetha (2009) trace the 'class perspective' in English language education

\*Professor of English, Department of Education in Languages, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi- 110016

Handwritten signature and date: 07/8/19  
A circular stamp with text: 3

121

# UNIVERSITY NEWS

Vol. 57 August 05-11,  
No. 31 2019  
Price Rs. 25.00

A Weekly Journal of Higher Education  
Published by the Association of Indian  
Universities

### In This Issue

ITEMS	PAGE
<b>Articles</b>	
A Critique on the Draft National Education Policy—2019	3
The Draft National Education Policy—2019: Expectations and Concerns	10
The New Accreditation Framework of National Assessment and Accreditation Council: Simplified for Non-accredited Institutions	15
Developing Teachers as Facilitators: Strategic Mission for New Age Teacher Education	20
<b>Convocation</b>	
Indian Institute of Management, Kolkata	31
<b>Campus News</b>	34
<b>Theses of the Month</b>	
(Science & Technologies)	41
<b>Advertisements</b>	45

### The Subscription Tariff

	Inland		Foreign	
	Institutions	Academics/ Students	Airmail	Surface Mail
	<i>(at residential address only)</i>			
	Rs.	Rs.	US \$	US \$
1 year	950.00	375.00	210.00	170.00
2 years	1700.00	700.00	400.00	300.00

Subscription is payable in advance by Bank Draft/MO only in favour of Association of Indian Universities, New Delhi.

Opinions expressed in the articles are those of the contributors and do not necessarily reflect the views and policies of the Association.

#### Editorial Committee Chairperson:

Dr (Ms) Pankaj Mittal

#### Editorial Committee :

Dr Baljit Singh Sekhon

Dr Amarendra Pani

Dr Youd Vir Singh

#### Editor :

Dr Sistla Rama Devi Pani

## A Critique on the Draft National Education Policy—2019

K Viyyanna Rao\*

### Background

After a protracted dilly-dallying on the finalization of the Policy on Education, the present Government had braved to place it on the public domain for discussion. As a matter of fact, it was in 2015 that an attempt was made to collate the ideas of the present Government in its First Term of office under the stewardship of the then Minister for HRD, Ms. Smriti Irani and this led to the appointment of the Committee under the Chairmanship of T S R Subramanian, the former Cabinet Secretary, Government of India. Though the Committee has submitted its report in May 2016, nothing substantial had taken place. The Government again felt that there was the need to revisit the entire issue, keeping in view of the gamut of comments and remarks on the report of the Subramanian Committee, constituted another panel under the Chairmanship of K. Kasturirangan (June, 2017). This Committee was asked to prepare the Draft National Education Policy (NEP) and the same was prepared and submitted in May, 2019. This was the Draft NEP that was placed for comments till June 30, 2019 in the public domain.

### Issues of Focus

Matters pertaining to Higher Education were included under part two of the Draft, with a specific focus on the following:

- Quality initiatives for reorienting the vision of the institutions towards making them more forward looking.
- Institutional Restructuring and Consolidation.
- Provision of Liberal education to energize undergraduate and postgraduate programs.
- Creating Optimal Learning Environments with the special focus on innovative and responsible curriculum and pedagogy.
- Putting faculty back into the heart of Higher Educational Institutions (HEIs).
- Establishing a new National Research Foundation (NRF) to build and enhance research capability among HEIs and creating beneficial linkages among the Government, industry and researchers.
- Overhauling the Teacher Education (TE) and restoring integrity in the system.
- Strengthening the base of Professional Education, covering professions like Engineering, Law, Agriculture and Healthcare.
- Promoting leadership through empowered Governance.
- Transforming the Regulatory System by focusing on its design and architecture.

\*Former Vice Chancellor, Acharya Nagarjuna University. Presently Director, South East Asian Group of Institutions, Virgonagar, K R Puram, Bangalore 560049. kondativrao@gmail.com

Handwritten notes and stamps at the bottom right corner, including a date stamp '14/8/19' and some illegible text.

122

# UNIVERSITY NEWS

Vol. 57 August 12-18,  
No. 32 2019  
Price Rs. 25.00

A Weekly Journal of Higher Education  
Published by the Association of Indian  
Universities

### In This Issue

ITEMS	PAGE
<b>Articles</b>	
The Seven Steps Towards Excellence	3
Teacher Education in the Draft National Education Policy—2019: Some Professional Concerns	7
Emerging Knowledge Society and the Open and Distance Education in India: Required Initiatives in National Education Policy—2019 to Bridge the Gap	12
Study APP: A Gateway to Build a Brighter and Stronger India	21
<b>Convocation</b>	
IIT Kanpur	29
<b>Campus News</b>	31
<b>Theses of the Month</b> (Social Sciences)	35
<b>Advertisements</b>	39

### The Subscription Tariff

	Inland		Foreign	
	Institutions	Academics/ Students	Airmail	Surface Mail
	(at residential address only)			
	Rs.	Rs.	US \$	US \$
1 year	950.00	375.00	210.00	170.00
2 years	1700.00	700.00	400.00	300.00

Subscription is payable in advance by Bank Draft/MO only in favour of Association of Indian Universities, New Delhi.

Opinions expressed in the articles are those of the contributors and do not necessarily reflect the views and policies of the Association.

#### Editorial Committee Chairperson:

Dr (Ms) Pankaj Mittal

#### Editorial Committee :

Dr Baljit Singh Sekhon

Dr Amarendra Pani

Dr Youd Vir Singh

#### Editor :

Dr Sistla Rama Devi Pani

## The Seven Steps Towards Excellence

Shirish Chindhade\*

I had a ringside view of the mainstream higher education (that is, Arts, Science, and Commerce streams) as a National Assessment and Accreditation Council (NAAC) Assessor (Peer Team Member and Coordinator) in the country. It improved and enriched my perception of the field. The clear impression one carries after a close view of the situation is one of mediocrity, which is also proved in our presence (or, in fact, absence) in the international ranking of our institutions of higher education. This article is an outcome of these observations.

One of our myths tells us that God Vishnu, in his shrunk *avatar* as Batu Vamana, encompassed the entire universe in just three steps. I am tempted to apply a little extended version of this myth to our higher education today. In my understanding, seven steps are required to encompass the whole universe of excellence in the area of higher education. The steps can be identified as follows:

- Interdisciplinarity
- Choice Based Credit System (CBCS)
- Addressing Resource Crunch
- Quality Faculty
- Quality Research, Patents, and Citation
- Equity and Inclusiveness
- Autonomous Status

These aspects are often discussed and are self-explanatory but the efforts to put them into practice are not adequate. However, recapitulation is always beneficial as it does not allow the crucial issues to be out of sight and hence out of mind also. It also helps to bring some clarity in perception.

### Interdisciplinarity

The vertical structure of our education system, namely, primary, secondary and tertiary, shows that we are eventually trained to be some kind of 'specialists' in one academic discipline or the other. The various branches in our Arts, Science, Commerce (mainstream) faculties offer ample proof of the straight orientation. As a result, a hermetically sealed compartmentalization is imposed in which minds are groomed to be one-track. The writer C P Snow calls it, 'the two cultures': scientists and others; writers and others; Doctors and others; engineers and others; Management experts and others; technologists and others, and so forth. Consequently, education becomes a blind-folding process in which one department has no clue of what the other department is about. Often its unwanted fallout is overt or muffled hatred and suspicion for the 'other' disciplines. The secret of excellence of institutions like the Harvard lies

\*Former Principal, Res: 7 Neelambari, Opposite Mehendale Garage, Erandwane, Pune-411004  
shirishvchindhade@yahoo.co.in

22/8/19  
3

123

# UNIVERSITY NEWS

Vol. 57 August 19-25,  
No. 33 2019  
Price Rs. 25.00

A Weekly Journal of Higher Education  
Published by the Association of Indian  
Universities

### In This Issue

ITEMS	PAGE
<b>Articles</b>	
Achieving Excellence in Higher Education Institutions	3
Theory and Practice of Integral Education— Part-I*	11
Higher Education in India in the Age of Neo-liberalism	17
The Joys and Challenges of Entrepreneurship	23
<b>Convocation</b>	
The Tamil Nadu Dr Ambedkar Law University, Chennai	25
<b>Campus News</b>	
Theses of the Month (Humanities)	34
Advertisements	36

## Achieving Excellence in Higher Education Institutions

N Sundararajan\*

In the last few decades, human society has experienced dramatic change. Contemporary society world-wide has high expectations of the contribution that universities can make in helping people learn to live with change, to lead change, to manage change, and to support improvement in all spheres of life. The global community seeks 'excellence' across all Higher Education roles: community engagement and leadership, research and innovation, and teaching and learning. However, universities are not always regarded as effective in fulfilling the needs of students, business, or communities as well.

In Higher Education, the notion of 'excellence' suffers from an inflationary usage — not the least because many Higher Education Institutions (HEIs) are striving for 'excellence'. A closer look reveals, however, that these attempts and correlated initiatives and activities almost exclusively focus on research matters, and only very rarely on learning and teaching. We think that this reductionist bias to research excellence should be counterbalanced by adequately taking into account all vision and mission of Higher Education. Thereby demonstrating the 'diversity of excellences', namely acquiring knowledge and know-how in subject fields, developing a skill for job, but also developing the full potential of the person i.e. creating more active citizenship, enhancing social cohesion, and fostering multicultural dialogue. Moreover, from a student perception of excellence, greater attention must be given to teaching quality (and learning quality), innovation and the social inclusiveness of education.

Whereas, the excellence debate was first connected to research, the link between excellence and teaching and learning is now considered important as well. The reasons for this are diverse. The importance of quality teaching is linked to various changes in Higher Education. Quality teaching has become an issue of importance as the landscape of Higher Education has been facing continuous changes: increased international competition, increasing social and geographical diversity of the student body, increasing demands of value for money, introduction of information technologies, student mobility, etc.

Additionally, the importance of education for economic success and the need to raise the status of teaching next to research are reasons for the link between excellence and teaching. Since the status of teaching is often lower than the status of research, motivations to invest in teaching from an organizational and individual perspective are secondary. Policies and structures have to be established in order to change this situation at universities. Elton (1998) argues that if teaching quality should be preserved or increased, 'teaching excellence' has to be rewarded in order

### The Subscription Tariff

	Inland		Foreign	
	Institutions	Academics/ Students	Airmail	Surface Mail
	<i>(at residential address only)</i>			
	Rs.	Rs.	US \$	US \$
1 year	950.00	375.00	210.00	170.00
2 years	1700.00	700.00	400.00	300.00

Subscription is payable in advance by Bank Draft/MO only in favour of Association of Indian Universities, New Delhi.

Opinions expressed in the articles are those of the contributors and do not necessarily reflect the views and policies of the Association.

#### Editorial Committee Chairperson:

Dr (Ms) Pankaj Mittal

#### Editorial Committee :

Dr Baljit Singh Sekhon

Dr Amarendra Pani

Dr Youd Vir Singh

#### Editor :

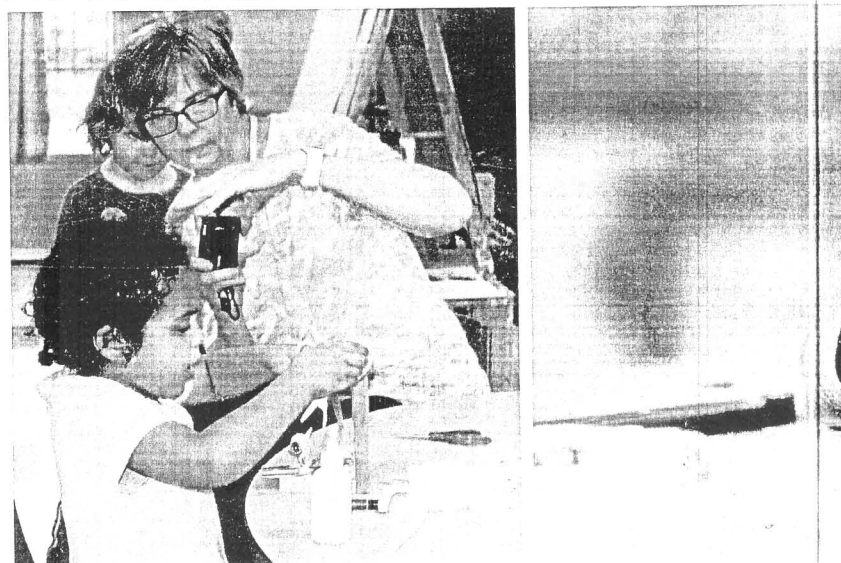
Dr Sistla Rama Devi Pani

\*Vice Chancellor, Jain University, #.319, 17th Cross, 25th Main  
J P Nagar, 6th Phase, J C Road, Bangalore- 560078  
(Karnataka) vc@jainuniversity.ac.in

26/8/19  
3

## Intentional and Supportive: Appropriate Uses of Early Assessments

- 4 **Introduction**
- 6 **Assessment in Kindergarten: Meeting Children Where They Are**  
*Amy D. Blessing*
- 14 **Anecdotal Records: Practical Strategies for Taking Meaningful Notes**  
*Celeste C. Bates, Stephanie Madison Schenck, and Hayley J. Hoover*
- 20 **What's Next? How Learning Progressions Help Teachers Support Children's Development and Learning** *Peter L. Mangione, Tamarra Osborne, and Heidi Mendenhall*
- 26 **Photographs and Learning Progressions: Supports for Intentional Assessment and Instruction in Mathematics**  
*Sarah A. Roller, Elizabeth Petit Cunningham, and Katherine Ariemma Marin*
- 34 **Assessing Opportunities to Support Each Child: 12 Practices for Quality Inclusion**  
*Camille Catlett and Elena P. Soukakou*
- 44 **Unlocking the Potential of Data-Driven Coaching: Child Assessment Evidence as a Guide for Informing Instructional Practices**  
*Christine M. Snyder and Holly P. Delgado*



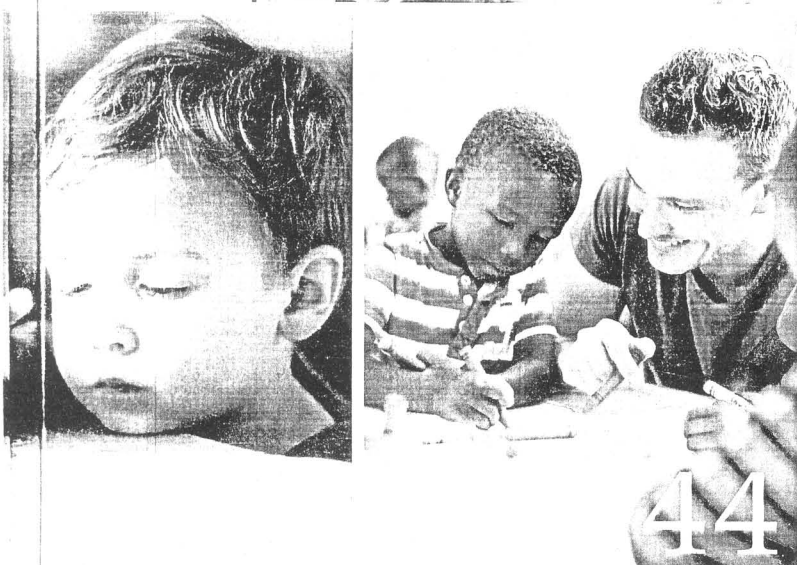
YC Staff  
**Lisa Hansel** Editor in Chief  
**Catherine Cauman** Senior Editor  
**Sharone Carmona** Senior Editor  
**Henrique Siblesz** Senior Creative Design Manager  
**Joellyn Powers** Assistant Managing Editor  
**Mabel Yu** Associate Editor  
**Julia Minano** Advertising Manager  
  
**Rhian Evans Allvin** Chief Executive Officer  
**Susan Friedman** Senior Director for Publishing and Professional Learning  
**Nicole Zuchetto** Senior Director for Member Experience and Market Solutions

YC-Young Children (ISSN 1538-6619) is published five times a year (mailing in the months of March, May, July, September, and November) by the National Association for the Education of Young Children (NAEYC), 1313 L Street, NW, Suite 500, Washington, DC 20005-4101.

Through its publications program, NAEYC provides a forum for discussion of major issues and ideas in our field. We hope to provoke thought and promote professional growth. The views expressed or implied are not necessarily those of the Association. Acceptance of advertising does not represent NAEYC's endorsement of any product or service, nor is NAEYC responsible for representations made by advertisers.

Connect & Converse

See an article you would like to discuss? Start a conversation with educators from all over on [hello.naeyc.org](https://hello.naeyc.org).



### NAEYC News

- 54 From Our President **Change: We Can Make It Happen** *Amy O'Leary*  
Making Connections **A Victory for DC Children, Parents, and Caregivers** *Rhian Evans Allvin*  
NAEYC Member Spotlight  
NAEYC Governing Board and Leadership

### Voices of Practitioners

- 64 **Collaborative Exploration of Classroom Discourse** *Diane Santori, with Keri Ven and Kelly Hennessey*

### Feature Articles

- 73 **Learning Mathematics through Everyday Play Activities: Enhancing Exposure and Mastery** *Sarah C. Good and Jennifer Riggie Ottley*
- 79 **To Pin or Not to Pin? Choosing, Using, and Sharing High-Quality STEM Resources** *Sherri Peterson, Cindy Hoisington, Peggy Ashbrook, Beth Dykstra Van Meeteren, Rosemary Geiken, Sonia Akiko Yoshizawa, Sandy Chilton, and Joseph B. Robinson*

### Columns

- 86 **Rocking and Rolling Reading with Babies Matters!** *Linda Gillespie*
- 89 **Our Proud Heritage Betsey Stockton, Pioneer Early Childhood Teacher** *Larry Prochner*
- 94 **The Reading Chair** *Isabel Baker and Miriam Baker Schiffer*

44

**NAEYC Membership** [NAEYC.org/membership](https://naeyc.org/membership)  
[membership@naeyc.org](mailto:membership@naeyc.org) 800-424-2460 or 202-232-8777

**Subscriptions** [NAEYC.org/publications/subscribe](https://naeyc.org/publications/subscribe)  
**Purchasing (single issues)** [NAEYC.org/shop](https://naeyc.org/shop)  
**Submission guidelines** [NAEYC.org/resources/pubs/yc/writing](https://naeyc.org/resources/pubs/yc/writing)  
**Permissions** [NAEYC.org/resources/permissions](https://naeyc.org/resources/permissions)

**Advertising rates/media kit** [NAEYC.org/about/advertise](https://naeyc.org/about/advertise)  
202-232-8777 or 800-424-2460, ext. 8880  
[advert@naeyc.org](mailto:advert@naeyc.org)

Copyright © 2019 by NAEYC unless otherwise noted. All rights reserved.  
Cover photo © Getty Images

**Periodicals postage paid** at Washington, DC, and at additional mailing offices.  
Printed in Pewaukee, Wisconsin.

**Postmaster:** Send address changes to *YC-Young Children*  
NAEYC Member Services  
1313 L Street, NW, Suite 500  
Washington, DC 20005-4101

### Index of Advertisers

continued	<b>Cover 4</b>
Exchange Magazine	<b>33</b>
Kaplan	<b>13</b>
School Outfitters	<b>Cover 2</b>
University of Alabama	<b>88</b>