

EDUDOC SERVICES: CURRENT CONTENT



CURRENT CONTENTS

October to December – 2021

Volume: II, (N-Z)



LIBRARY AND DOCUMENTATION DIVISION

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Compiled By

J.P. Anand

Introduction

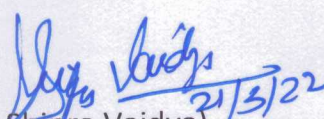
“Current Contents” prepared by Library and Documentation Division aims to identify the articles published in the learned journals received by the library in the month of October-December 2021.

Current Contents are arranged alphabetically (Volume:II, N-Z) 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. Shipra Vaidya) 21/3/22
Head, LDD, NCERT,
New Delhi

Sr. No.	Name of Journals	Vol.	Issue	Month	Year	Pages
❖	Economics					
1.	Quarterly Journal of Economics	136	1 3	Feb Aug	2021	288-289
❖	Education					
2.	Prospects	47	4	Dec	2017	279
❖	Educational Research					
3.	शैक्षणिक संदर्भ	77	134	May-Jun	2021	299
4.	Review of Educational Research	91	4 5	Aug Oct	2021	297-298
5.	Scandinavian Journal of Educational Research	65	5 6	Aug Oct	2021	300-302
❖	Educational Technology					
6.	Science, Technology and Society: An International Journal	26	3	Nov	2021	37
7.	Technology; Pedagogy and Education	30	3 4	Jun Sep	2021	365-366
❖	Environmental Education					
8.	Resurgence & Ecologist		326 328	May-Jun Sep-Oct	2021	293-296
❖	Geography					
9.	National Geographic Magazine	8 9	7 8 9 10 11 3 4	Feb Mar Apr May Jun Oct Nov	2021	239-252
❖	Linguistics					
10.	Natural Language and Linguistic Theory	39	4	Nov	2021	253
❖	Mathematics Education					
11.	School Science and Mathematics	121	6	Oct	2021	309

❖	Physics					
12.	Physics Education	56	5	Sep	2021	265-266
13.	Physics Today	74	9 10 11	Sep Oct Nov	2021	267-272
14.	Physics World	34	9 10 11	Sep Oct Nov	2021	273-275
❖	Psychology					
15.	Psychological Bulletin	147	4 5	Jan Feb	2021	280-281
16.	Psychological Review	128	5	Oct	2021	282-283
17.	Psychology in the Schools	58	10 11	Oct Nov	2021	284-287
❖	Science					
18.	New Scientist	251	3350 3351 3352 3353 3354 3355 3356 3357 3358 3359 3360	4 Sep 11 Sep 18 Sep 25 Sep 2 Oct 9 Oct 16 Oct 23 Oct 30 Oct 6 Nov 13 Nov	2021	254-264
19.	Science	373	6560 6561 6562 6563 6564 6565 6566 6567 6568 6569	10 Sep 17 Sep 24 Sep 1 Oct 8 Oct 15 Oct 22 Oct 29 Oct 5 Nov 12 Nov	2021	311-330
20.	Science and Culture	87	1-2 3-4 5-6 7-8	Jan-Feb Mar-Apr May-Jun Jul-Aug	2021	331-334
❖	Science Education					
21.	Resonance: Journal of Science Education	26	<u>10</u> <u>11</u>	<u>Oct</u> <u>Nov</u>	<u>2021</u>	291-292
22.	Science Education	105	5 6	Sep Nov	2021	335-336

23.	Scientific American	325	4 5 6	Oct Nov Dec	2021	338-343
24.	School Effectiveness and School Improvement	32	3	Sep	2021	310
25.	School Science	54	1 2&3 4	Mar Jun-Sep Dec	2016	303-308
26.	Studies in Science Education	57	2	Sep	2021	350
❖ Social Science						
27.	Seminar	745 747 748		Sep Nov Dec	2021	344-346
28.	Social Scientist	49	7-8	jul-Aug	2021	347
29.	Sociology of Education	94	3 4	Jul Oct	2021	348-349
30.	Yojana	65	10 11 12	Oct Nov Dec	2021	67-369
31.	Young Children	76	1	Spring	2021	370-371
❖ Special Education						
32.	Remedial and Special Education	42	4	Aug	2021	290
❖ Teacher Education						
33.	The Primary Teacher	42	1 2	Jan Apr	2017	277-278
34.	Teaching and Teacher Education: An International Journal of Research and studies	100 101 102 103 104 105 106 107 108		Apr May Jun Jul Aug Sep Oct Nov Dec	2021	352-363

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On the Cover

Mimivirus is one of the largest and most complex viruses known. Scientists hope that studying it will shed light on viruses' origins and proliferation.

ILLUSTRATION BY MARKOS KAY

EXPLORE

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THE BIG IDEA

Born to Wander

After months pinned down by the pandemic, the author is even more certain: Exploring the planet is an essential activity for humans.
BY ERIC WEINER

INNOVATOR

Attention to Turtles

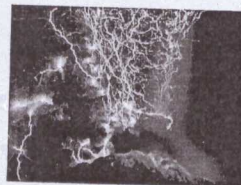
The reptiles originated in Africa but now are neglected there, says a conservationist who aims to remedy that.
BY ANNIE ROTH

ALSO

Rain on the Wing
Eyes Deter Attacks
New Space Toilet

जुब 22/11/21

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DECODER

Volcanic Voltage

How do volcanic eruptions spark lightning?
BY JASON TREAT AND
IRENE BERMAN-VAPORIS

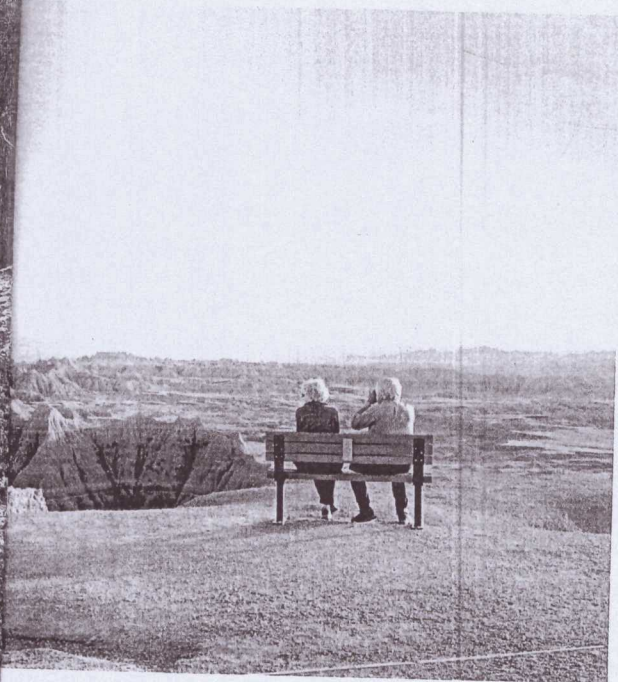
BEING THERE

Norwegian Cool

Have wet suit, will winter surf in 41° water.
BY LOLA AKINMADE
ÅKERSTRÖM; PHOTO BY
ANDREA FRAZZETTA

ALSO

Life by Zip Line
Portugal's Tiles



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FEATURES

A World of Viruses

Yes, the coronavirus is a killer. But viruses can be beneficial too.

BY DAVID QUAMMEN
PHOTOGRAPHS BY
CRAIG CUTLER

..... P. 28

Women on the Move

In 2019, 130 million women were living in countries not of their birth, migration data show. And in that year alone, tens of millions of them were forced—by disease, natural disaster, violence, or poverty—to move either within their countries or abroad.

BY AURORA ALMENDRAL
PHOTOGRAPHS BY THE
EVERYDAY PROJECTS

..... P. 56

Reclaiming History

Anti-racism protests spur removal of Confederate monuments.

BY PHILLIP MORRIS
PHOTOGRAPHS BY
KRIS GRAVES

..... P. 88

▲ **Preserving Paradise**

In Costa Rica an oasis of biodiversity feels COVID-19's effects.

BY JAMIE SHREEVE
PHOTOGRAPHS BY
CHARLIE HAMILTON JAMES

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On the Cover

Over the years rovers such as NASA's Curiosity, which landed on the planet in 2012, have driven the search for microbial Martians.

MOSAIC OF 57 IMAGES BY NASA/JPL/MICHAEL RAVINE, MALIN SPACE SCIENCE SYSTEMS

PROOF

EXPLORE



10

The 'Train Ladies' of Ukraine

A tradition as old as rail travel in Ukraine, these safety signal officers work in tiny houses at rail crossings, and help keep things on track.

PHOTOGRAPHS BY SASHA MASLOV

17

THE BIG IDEA

Natural Disasters?

Maybe climate change harms should be called what they are: *man-made* natural disasters.

BY ELIZABETH KOLBERT



ALSO

Ancient Amphibian Plants in Disguise
Moonlit Line Walk



FEATURES

Our Obsession With Mars Missions

Since sky-watchers in the third millennium B.C. described it as a "wandering star," Mars has fascinated people on Earth. It so intrigues us that by this month, 11 spacecraft and rovers are expected to be on or near the red planet.

BY NADIA DRAKE
PHOTOGRAPHS BY
CRAIG CUTLER AND
SPENCER LOWELL

P. 30

Imprisoned While Innocent

Thanks to scrutiny of the actions of prosecutors, public defenders, and police, as well as advances in DNA analysis and other sorts of forensic testing, 182 people have been found innocent and exonerated from death row since 1972.

BY PHILLIP MORRIS
PHOTOGRAPHS BY
MARTIN SCHOELLER

P. 58

A Line in the Mountains

The story behind boundaries on the world's highest battlefield.

BY FREDDIE WILKINSON
PHOTOGRAPHS BY CORY
RICHARDS

P. 86

Greyhound Racing

Critics of the dogs' treatment spur the end of tracks, race betting.

BY CRAIG PITTMAN
PHOTOGRAPHS BY
ERIKA LARSEN

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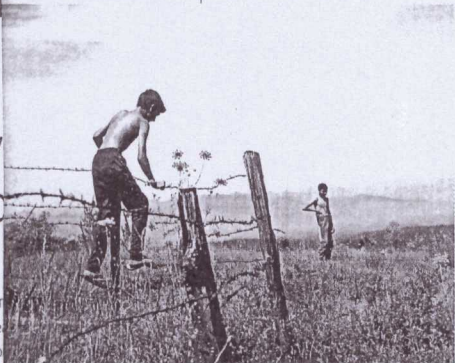
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The air in Ulaanbaatar, the capital of Mongolia, is polluted in part by burning fossil fuels, as from this coal-fired power plant near the edge of the city.

MATTHIEU PALEY

PROOF



EXPLORE

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THE BIG IDEA

The Legacy of Land
To Black American families, soil has never been simple. It represents dreams, loss, injustice, self-reliance.

BY NATALIE BASZILE

THROUGH THE LENS

My Everest Photo
I had a dim view of Everest ascents—until I made one. What I found surprised me.

BY MARK SYNNOTT



ALSO

Turtle Anatomy
Parakeet Invasions
Octopus Elasticity

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CLOSER LOOK

A Perfumed History
In the "perfume capital of India," an ancient alchemy distills petals into fragrance.

BY RACHNA SACHASINH

ADVENTURE

Wild Alaska
America's least visited national park boasts nearly 8.5 million acres of rugged beauty.

BY JENNA SCHNUER
PHOTO BY KILIII YÜYAN

ALSO

Tea and Diplomacy
Video Call Fallout
Beetle Meets Bottle

10

Kashmir's Children In A Long Lockdown

Kids in the state face a mental health crisis as a result of military restrictions and the COVID-19 quarantine.

PHOTOGRAPHS BY SHOWKAT NANDA

Mini
that lets you
live stream

and Conferences
as a built-in hardware streamer
internet connection. This me
book and Teams in much b
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compact design!

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FEATURES

The Deadly Cost of Dirty Air

Pollution causes millions of premature deaths.

BY BETH GARDINER
PHOTOGRAPHS BY
MATTHIEU PALEY

P. 40

Return of the Florida Panther

Development imperils this cat's comeback.

BY DOUGLAS MAIN
PHOTOGRAPHS BY
CARLTON WARD, JR.

P. 68

The Bugs Up High

A novel study looks at insect life far above the Amazon forest floor.

BY HALEY COHEN GILLILAND; PHOTOGRAPHS
BY CRAIG CUTLER AND
BRIAN BROWN..... P. 84



Aretha's Genius

From her start in a Detroit church choir, Aretha Franklin (below) rose to global fame. Cynthia Erivo (above) plays the singing star in the Nat Geo series that debuts March 21.

BY DENEEN L. BROWN

P. 102



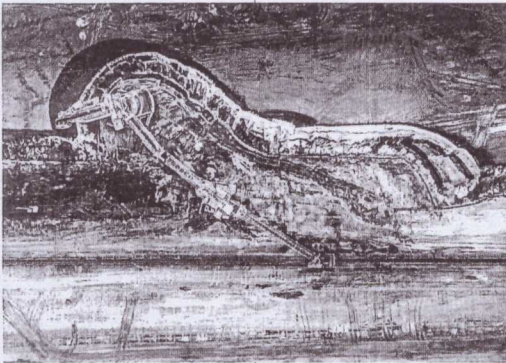
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In South Pacific waters, a humpback whale calf focuses on photographer Brian Skerry, and vice versa. Skerry has spent years observing the distinctive behaviors and traditions of many cetacean species.

BRIAN SKERRY

EARTH DAY | SPECIAL REPORT



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PROOF

Mining Marks a Landscape

Viewing mines from above, a photographer captures the results of extracting coal to fuel electric power plants.

PHOTOGRAPHS BY TOM HEGEN

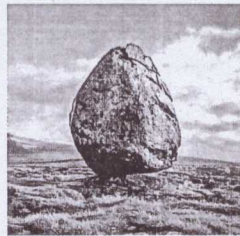
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THE BIG IDEA

Conservation's Popularity Contest

Wildlife funding and advocacy focus most on charismatic species. Is it time to rethink that approach?

BY CHRISTINE DELL'AMORE



ALSO

Wandering Rocks
Earth Day Inspirations



22

EARTH DAY

Bridging Cultures, Causes With Music

Cellist Yo-Yo Ma pairs concerts with activist events on environmental and other issues.

BY CLAUDIA KALB

THROUGH THE LENS

Fleeing the Flood

As waters threatened rare giraffes' habitat, former enemies joined forces to move them via a modern-day ark.

BY ANNIE ROTH

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FEATURES

Secrets of the Whales

Some dolphins and whales have their own cultural traditions and dialects, characteristics once thought to be unique to humans.

BY CRAIG WELCH
PHOTOGRAPHS BY BRIAN SKERRY
..... P. 32

Planet Ocean

About 70% of Earth's surface is ocean. This is how it's connected.

BY MATTHEW W. CHWASTYK
AND IRENE BERMAN-VAPORIS
..... P. 68

Rescuing Reefs

Images made years apart show how warming oceans harm corals.

BY JENNIFER S. HOLLAND
PHOTOGRAPHS BY DAVID DOUBILET AND JENNIFER HAYES
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28 Days Under the Sea

Diving on the floor of the Mediterranean, four explorers found amazing life-forms.

STORY AND PHOTOGRAPHS BY LAURENT BALLESTA
..... P. 94

Searcher of the Deep

Decades after locating the wreck of the *Titanic*, Robert Ballard still hunts for cultural and scientific treasures.

BY RACHEL HARTIGAN
..... P. 118

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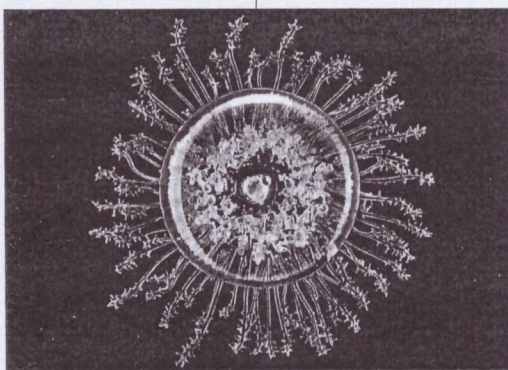
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On the Cover

Ready for combat, a heavily armed Thraex holds up his shield and *sica*, a short sword with a curved blade, in the amphitheater at Pompeii.

ART BY FERNANDO G. BAPTISTA

PROOF



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Glass Sea Menagerie

Two 19th-century glass artists made detailed models of sea life, for use in research. Today they're collector's items and the objects of a still life odyssey.

PHOTOGRAPHS BY GUIDO MOCAFICO

EXPLORE

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THE BIG IDEA

A Fan Letter to My Favorite Spacecraft

The Fermi Gamma-ray Space Telescope sees a cosmos so different from what our eyes see.

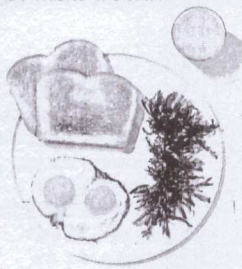
BY LIZ KRUESI

BREAKTHROUGH

'Bacon of the Sea'?

Aquaculturists say this marine alga is rich in protein—and when fried, pretty bacon-y.

BY HICKS WOGAN



ALSO

- Regrowing Joints?
- Bug Takes a Beating

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ADVENTURE

Tunnel Vision

Water whittled the cliffs and canyons of Utah's Zion National Park.

BY NORIE QUINTOS
PHOTOGRAPH BY JOSH HYDEMAN

DECODER

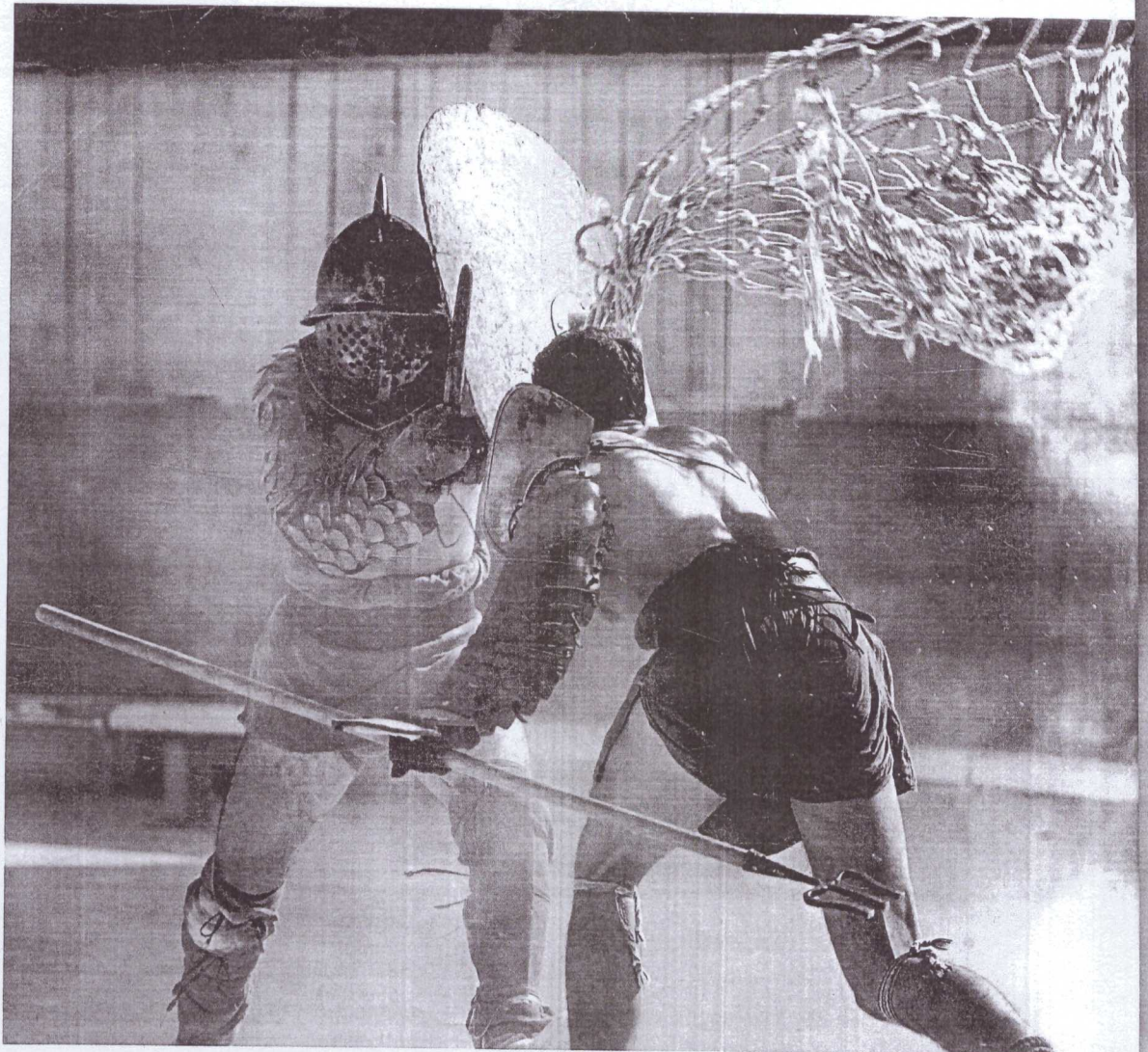
Baking in Pompeii

Mount Vesuvius buried bakeries, but the bread survived. Now its recipe has been re-created.

BY ANNIE ROTH; PHOTOGRAPH BY REBECCA HALE

ALSO

- Animals With Pockets
- Planet Possible



FEATURES

▲ **Fight Club of Ancient Rome**
Despite their depiction in movies, real gladiator battles were more about putting on a good show than killing.
BY ANDREW CURRY
PHOTOGRAPHS BY RÉMI BÉNALI
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The Lure of Trieste
It has been an overlooked gem in northern Italy. But the city may enjoy new recognition thanks to interest in its port.
BY ROBERT DRAPER
PHOTOGRAPHS BY CHIARA GOIA
..... P. 108

SPECIAL REPORT: **The Race Card Project**
RECKONING WITH THE PAST

Those conversations about race that seem too difficult? People are bravely starting them, six words at a time.
BY MICHELE L. NORRIS
PHOTOGRAPHS BY WAYNE LAWRENCE
..... P. 62

Tulsa Race Massacre
Enraged by prosperity in a Black community, white rioters attacked it in 1921, in one of the worst acts of terrorism in U.S. history.
BY DENEEN L. BROWN
PHOTOGRAPHS BY BETHANY MOLLENKOF
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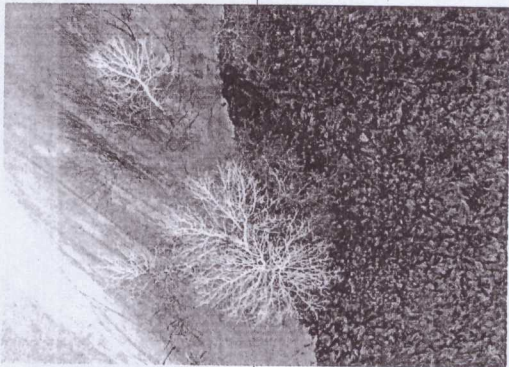
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On the Cover

Transportation of the future will feature electric vehicles, charging infrastructure, electric air taxis, and hydrogen-powered airliners that emit mostly water vapor and heat.

ILLUSTRATION: BOSE COLLINS

PROOF



10

Poisoned Beauty

The swirling colors may look like modern art—but they're mine tailings, pollution that's filling a valley near the photographer's hometown in Romania.

PHOTOGRAPHS BY GHEORGHE POPA

EXPLORE

17

THE BIG IDEA

The Persistence of Pay Inequity

What's behind the gap between men's and women's wages?

BY HELENA MARÍA VIRAMONTES

DECODER

Aerial Acrobatics

A primer on starlings' shape-shifting flights, aka murmurations.

BY DIANA MARQUES
PHOTOGRAPH BY NICK DUNLOP



ALSO

Grizzly Facial Recognition
Turning Glass to Sand



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THROUGH THE LENS

Extreme Measures

A rigorous Arctic research expedition reveals great beauty and human limitations.

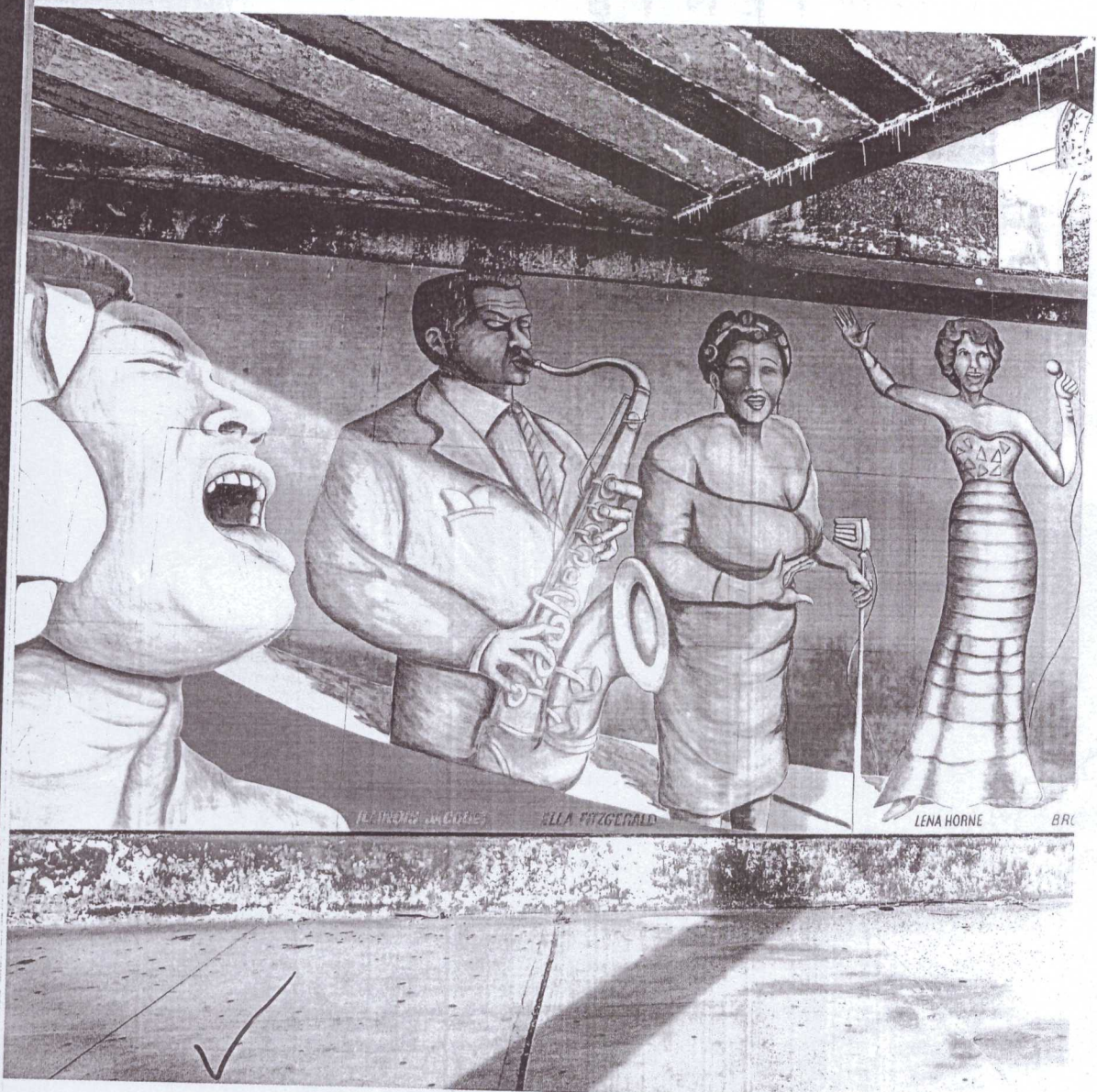
BY ESTHER HORVATH

ALSO

Earth-Friendly Dishwashing
Angelina Jolie on Bees

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FEATURES

THE FUTURE IS ELECTRIC

The Auto Industry Bets Big on Green Cars

From future vehicles, no tailpipe emissions.
BY CRAIG WELCH
PHOTOGRAPHS BY DAVID GUTTENFELDER P. 32

Aviation: How Green, How Soon?

Even "cleaner" flights warm the planet.
BY SAM HOWE VERHOVEK
PHOTOGRAPHS BY DAVIDE MONTELEONE P. 56

Night Life

Dark-sea dives yield some wild photo ops.
BY AMY MCKEEVER
PHOTOGRAPHS BY DAVID DOUBILET AND JENNIFER HAYES P. 76

A Place Where the Dream Lives

Black homeownership is the area's legacy.
BY MICHAEL FLETCHER
PHOTOGRAPHS BY ELIAS WILLIAMS P. 90

Saving Chimps and Finding Hope

At a Central African sanctuary, rescued chimps are models of resiliency for their caregivers.
BY PAUL STEYN
PHOTOGRAPHS BY BRENT STIRTON P. 114

ABOVE: A mural in the St. Albans area of Queens, New York, honors some of the Black luminaries who've lived there, including Ella Fitzgerald and Lena Horne.

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NATIONAL GEOGRAPHIC | FURTHER



NOVEMBER 2021

On the Cover: An expanded version of Kadir Nelson's painting depicts finds from the book *Lost Cities, Ancient Tombs: 100 Discoveries That Changed the World*.

1. Olmec colossal head; Mexico
2. King Tut mask; Egypt
3. Nubian pharaoh; Sudan and Egypt
4. Neo-Assyrian relief; Iraq
5. Art from Ajanta; India
6. Angkor Wat; Cambodia
7. Mesa Verde cliff dwellings; Colorado, U.S.
8. Destruction by Mount Vesuvius; Italy
9. Chichén Itzá; Mexico
10. Nebra sky disk; Germany
11. Great Pyramid of Khufu; Egypt
12. Stonehenge; England
13. Petroglyphs; Utah, U.S.
14. Lapita cemetery; Vanuatu
15. Moai; Easter Island
16. Nok terra-cottas; Nigeria
17. Sutton Hoo helmet; England
18. *Titanic*; Atlantic Ocean
19. Cave paintings; France
20. *Clotilda*; Alabama, U.S.
21. Kublai Khan fleet; Japan
22. Ötzi the Iceman; the Alps
23. Aboriginal rock art; Australia
24. Dead Sea Scrolls; West Bank and Israel
25. Jamestown crucifix; Virginia, U.S.
26. Great Mosque of Kilwa; Tanzania
27. Bactrian gold ram; Afghanistan
28. Rosetta stone; Egypt
29. Olduvai Gorge skull; Tanzania
30. Lion Gate, Mycenae; Greece
31. Knossos palace; Greece
32. Maya jade ornament; Honduras
33. Machu Picchu; Peru
34. Relief, Ellora Caves; India*
35. Riace bronze; Ionian Sea
36. Terra-cotta warriors; China

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Child of the Stars
A photographer's adaptation of Antoine de Saint-Exupéry's book reimagines *The Little Prince* as a nuanced look at Andean culture.
PHOTOGRAPHS BY RIVER CLAURE

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Dr. Fauci: His Life and Work
In interviews with *National Geographic*, Anthony Fauci tells what has shaped him: from childhood in Brooklyn to serving seven U.S. presidents.

CLOSER LOOK

The Lost River of Paris
Conservation efforts aim to bring back the historic Bièvre.
BY MARY WINSTON NICKLIN

ALSO

- Color Perception in Fish
- A New Human Species?
- Feather Forensics Lab

FEATURES

100 Wonders of Archaeology

Discoveries such as the cave art of Lascaux and the tomb of King Tut have yielded remarkable secrets dating as far back as 3.7 million years ago. From the new National Geographic book *Lost Cities, Ancient Tombs*, see the finds that changed history.
INTRODUCTION BY ANDREW LAWLER
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A War on Itself

In Tigray, Ethiopia, civilians have become the target of conflict.
BY LYNSEY ADDARIO AND RACHEL HARTIGAN
PHOTOGRAPHS BY LYNSEY ADDARIO
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An Icy World Melts

The Antarctic Peninsula is an ecosystem in peril.
BY HELEN SCALES
PHOTOGRAPHS BY THOMAS P. PESCHAK
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A Journey's Lessons

Partway through his 24,000-mile walk around the world, a writer realizes the power of remembering. And he wonders who among the thousands of people he has met is "best equipped to survive—if not master—the challenges of our uncertain age."
BY PAUL SALOPEK
PHOTOGRAPHS BY JOHN STANMEYER
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*ART FROM THE ELLORA CAVES IS MENTIONED IN THE *LOST CITIES, ANCIENT TOMBS* BOOK, BUT IT IS NOT ONE OF THE 100 WONDERS CITED IN THE BOOK OR IN THE GRAPHIC ON PAGES 51-4 OF THIS ISSUE.

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Cover image: Simon Marchner

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Stroke left woman unable to feel hunger

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Sucking carbon from the air may be just the ticket

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The pick of the pics from our inaugural photo contest



11 Home-grown baobab Domestication could save the iconic trees

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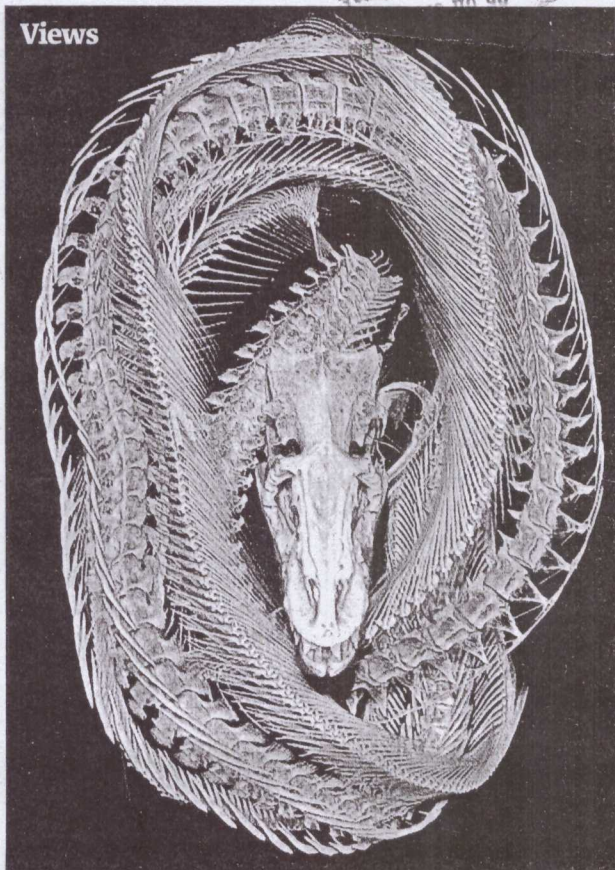
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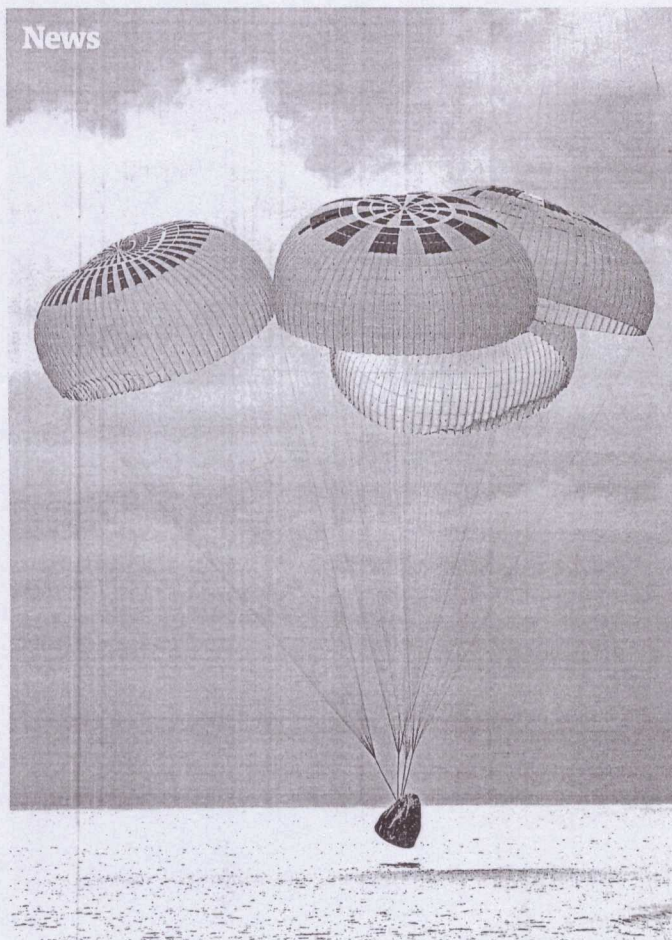
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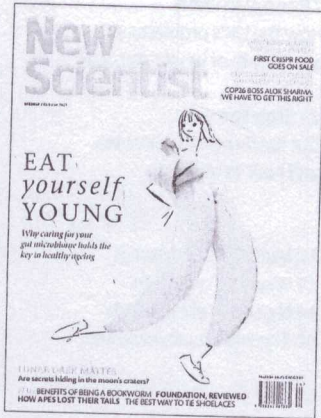
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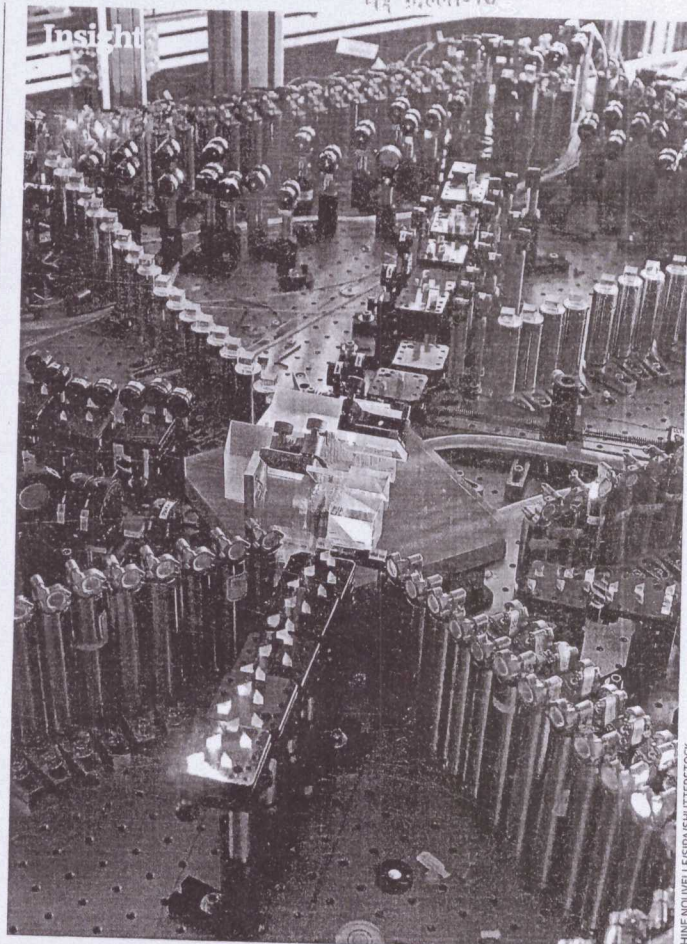
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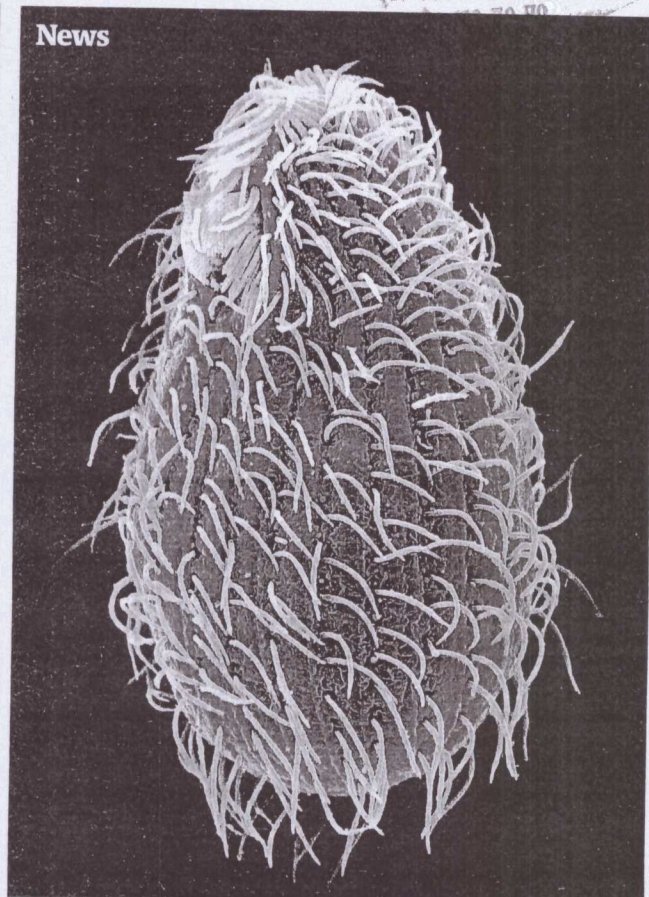
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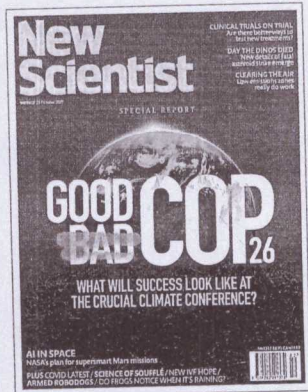
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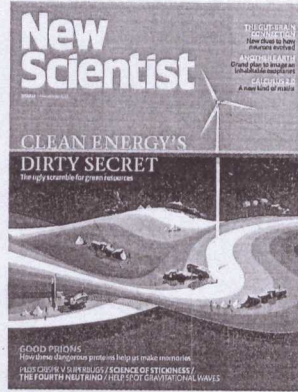
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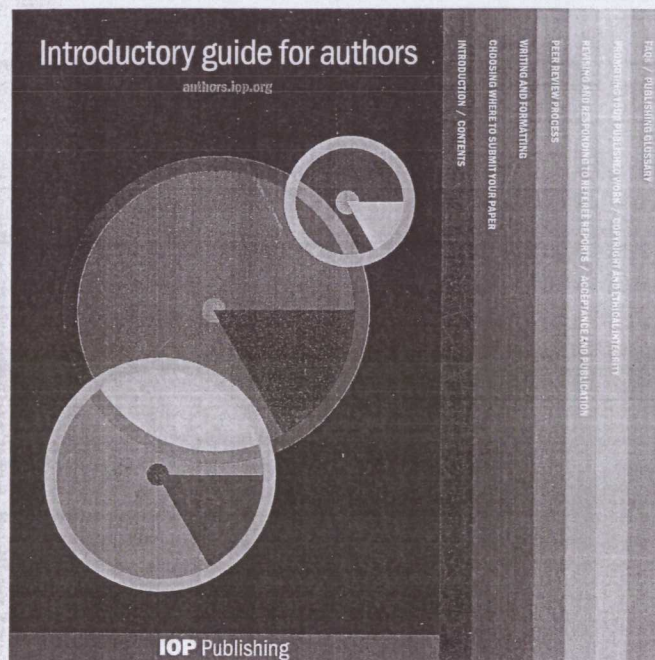
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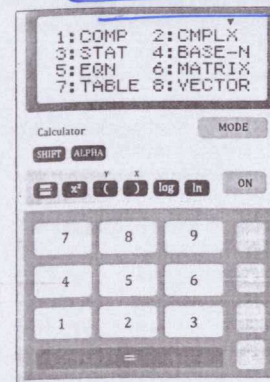
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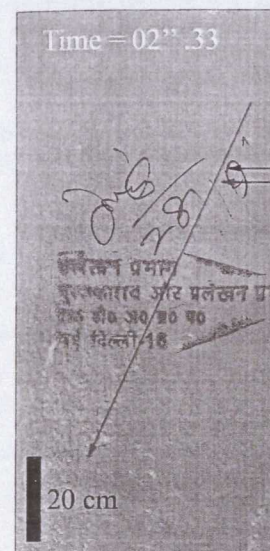
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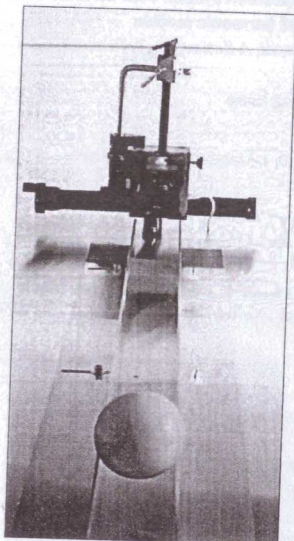
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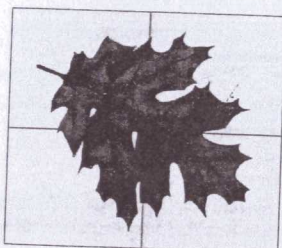
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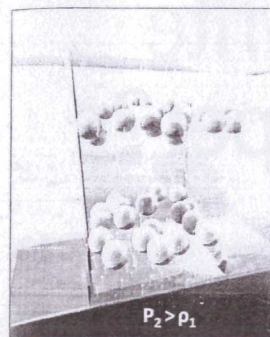


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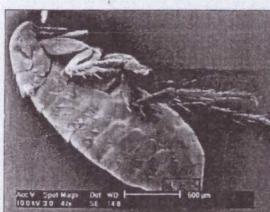
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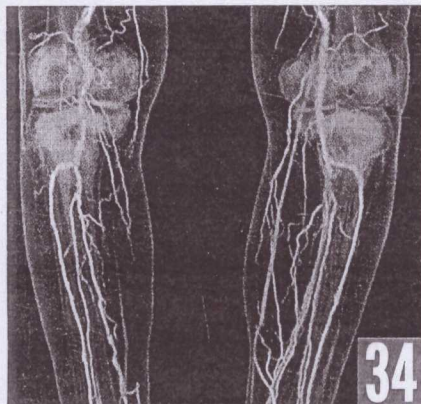


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26 Improving science education: It's not rocket science—it's harder!

Stephen M. Pompea and Pedro Russo

Scientists can help by partnering with museums, out-of-school programs, schools, organizations that develop instructional materials, or other educational projects.

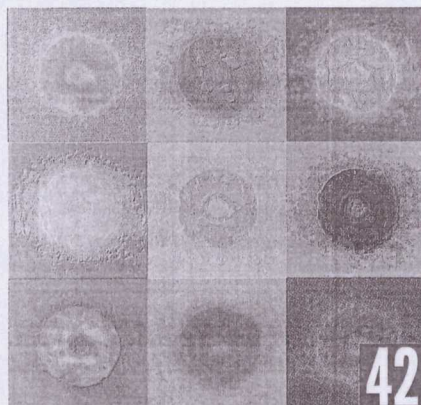


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34 Computed tomography turns 50

John M. Boone and Cynthia H. McCollough

Modern high-performance CT scanners are unparalleled among three-dimensional imaging systems in data acquisition speed and spatial resolution.



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42 Ptychography: A solution to the phase problem

Manuel Guizar-Sicairos and Pierre Thibault

First envisioned for elucidating crystalline structures, the technique is now used for high-resolution lensless imaging, wavefront sensing, and more.



ON THE COVER: The longest bone in the human body, the femur connects to the pelvis at the hip joint. This high-resolution computed tomography (CT) scan of the bone reveals its inner microstructure. The colors denote the mineral volume fraction, which provides a spatial measure of strength and can be used to identify individuals at risk of osteoporotic fracture. For an account of CT's evolution and advances, turn to the article by John Boone and Cynthia McCollough on **page 34**. (Image courtesy of Lance Frazer/Southwest Research Institute.)

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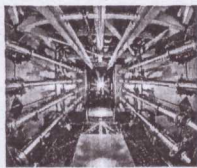


CARLYN IVERTSON/NOAA

Eunice Newton Foote

A 19th-century scientist and inventor, Foote demonstrated the heat-absorbing properties of carbon dioxide and water vapor three years before John Tyndall discovered the greenhouse effect. Only in the past decade has her prescient prediction of global warming received its due.

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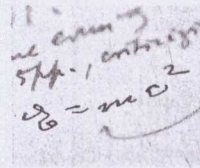


DAMIEN JEMISON/LLNL

Laser fusion

Scientists at the National Ignition Facility in California recently announced that they produced a fusion reaction that yielded more energy than was absorbed by the fuel to initiate the reaction. PHYSICS TODAY's David Kramer analyzes the laser fusion milestone and puts it into historical perspective.

physicstoday.org/Sep2021b



RR AUCTION

Einstein's handwriting

Earlier this year one of Albert Einstein's handwritten letters featuring the famous $E = mc^2$ sold for more than \$1.2 million at auction. PHYSICS TODAY's Ryan Dahn looks at Einstein's preferred type of German-language cursive writing, which he likely adopted for practical and political reasons.

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Better ways to store energy are needed to attain Biden's carbon-free grid • Replacing high-risk radioactive materials remains a challenge

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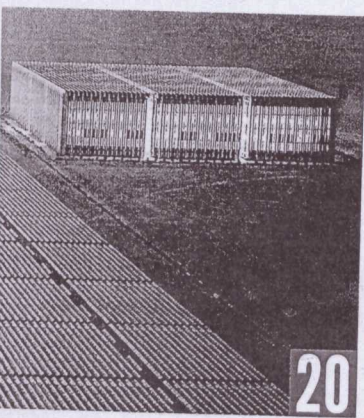
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Solid and liquid responses of a non-Newtonian fluid



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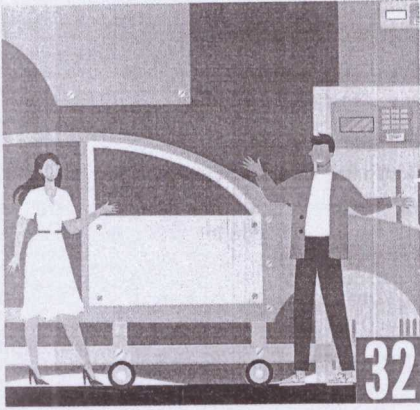
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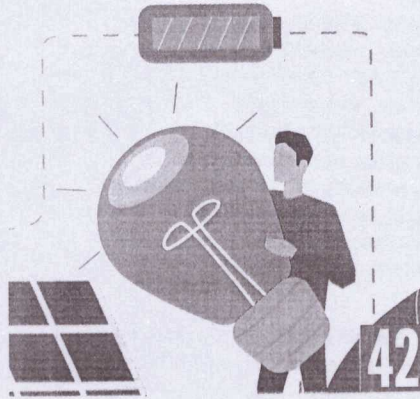
≡ Careers issue



32 Lessons from 35 years in industry

Mike Tamor

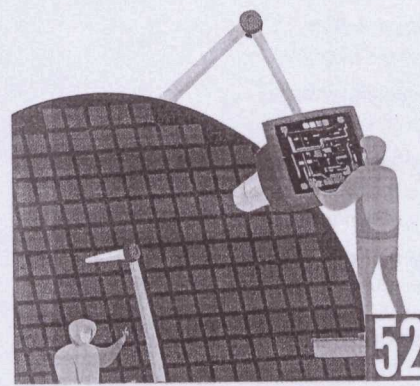
Physicists working at private-sector companies must learn quickly and adapt as needs evolve.



42 The road from academia to entrepreneurship

Christine Middleton

Developing laboratory innovations into commercial products takes more than a great idea. It requires financial investment and a team with diverse expertise.



52 ASM International's innovative divisions

Jorijn van Duijn

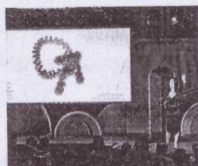
The company's history under founder Arthur del Prado illustrates the semiconductor industry's trend toward specialization—and the risks of tying a firm to one charismatic individual.



ON THE COVER: Our third annual careers issue focuses on the sector that employs the most graduates in physics and its related sciences: private industry. On **page 32**, Mike Tamor draws lessons from his career in research and research management at Ford Motor Company. On **page 42**, PHYSICS TODAY's Christine Middleton reports on physics-based startups. And on **page 52**, Jorijn van Duijn recounts the history of the semiconductor company ASM International. (Image by Ana Kova, <http://anakova.com>.)

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KARISSA SANBONMATSU/LANL

Switching fields

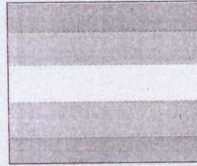
A new quantitative study finds a correlation between physicists who change areas of research and their new work's impact as measured by citations. Rachel Berkowitz reports on the results and several scientists' experiences making such shifts in research directions.
physicstoday.org/Oct2021a



SAPIENZA/ESVA

Fermi's geophysics

Archival materials reveal that shortly after his arrival at Columbia University, Enrico Fermi offered a geophysics course in the spring semesters of 1939–41. The physicist's lecture notes highlight his famously clear and thorough style on the page and in class discussions.
physicstoday.org/Oct2021b



MONICA HELMS

Author name changes

A growing number of journal publishers are adopting policies to change authors' names on past academic papers. PHYSICS TODAY's Toni Feder investigates the efforts of trans scientists who inspired the new policies and the positive impact they will have on trans scholars.
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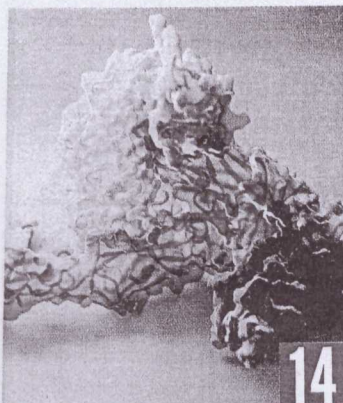
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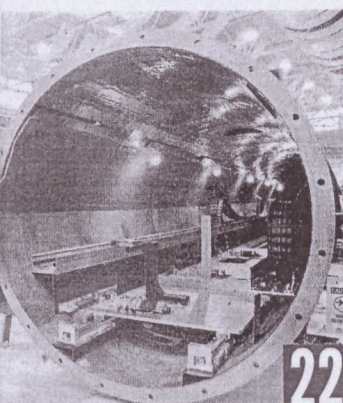
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A quieter microscope



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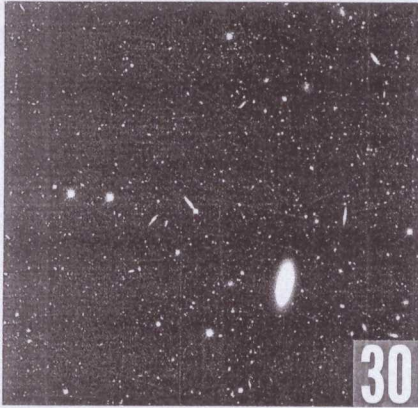
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30 Illuminating the darkest galaxies

Joshua D. Simon and Marla Geha

The behavior of extremely dim galaxies provides stringent constraints on the nature of dark matter. Establishing those constraints depends on precise stellar-motion measurements.



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38 How does the wind generate waves?

Nick Pizzo, Luc Deike, and Alex Ayet

Although the question is a classical problem, the details of how wind transfers energy to waves at the ocean surface remain elusive.



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44 The demons haunting thermodynamics

Katie Robertson

The contradictory implications of statistical mechanics have worried physicists and philosophers for centuries. Does our present-day knowledge allow us to exorcize those philosophical demons?



ON THE COVER: Waves are born at the interface of air and water, where the flow is generally turbulent over a broad range of spatial and temporal scales. Scientists have been struggling with that complexity for more than a century. For a review of historical approaches and recent experimental and numerical efforts to resolve how momentum is transferred from winds to waves, turn to the article by Nick Pizzo, Luc Deike, and Alex Ayet on page 38. (Image by iStock.com/Anna_Om.)

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College after COVID-19

New surveys of undergraduate physics students reveal the impacts of the pandemic on education and offer insights into how departments can improve. Many students report learning less from remote instruction than they would have in person and limited access to study groups with peers.

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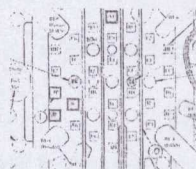


SARAH WILD

Shielded by quartz

Amid the unrelenting heat and aridity in the Namib Desert in southwest Africa, hardy bacteria manage to survive on the undersides of quartz stones. New interdisciplinary research reveals how the quartz shelters, by filtering out UV light, enable the bacteria to survive as they wait for water.

physicstoday.org/Nov2021b



NIST

NIST reactor

On page 26 of the October issue, David Kramer recounted physicists' dismay with the indefinite shutdown of NIST's research reactor in Maryland. A new report details the operator errors, which the agency partly attributes to staff turnover, that led to a release of radiation in February.

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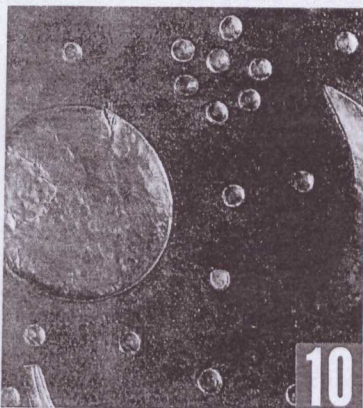
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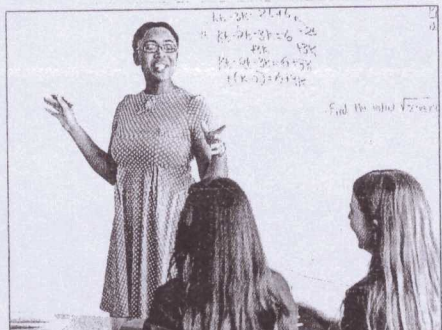
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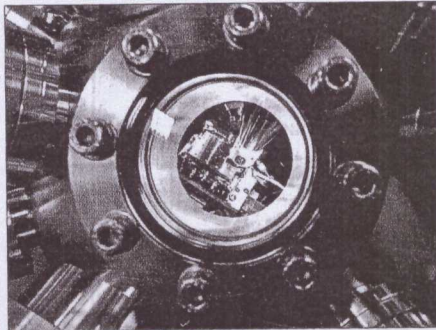
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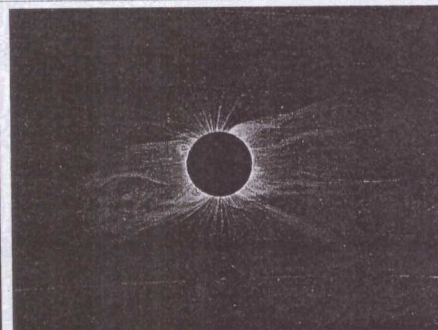
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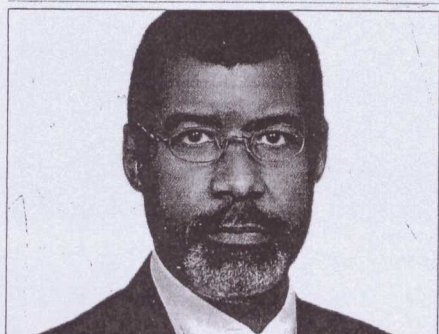
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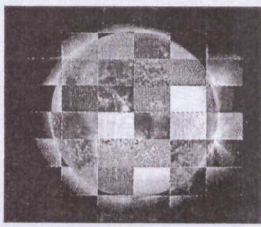
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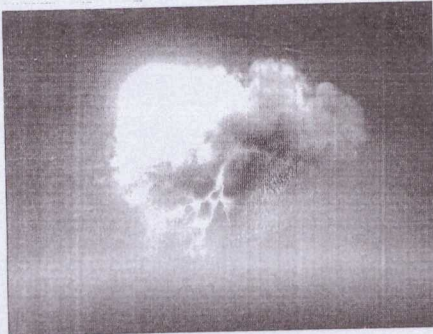
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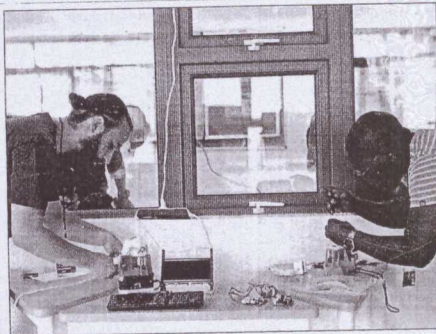
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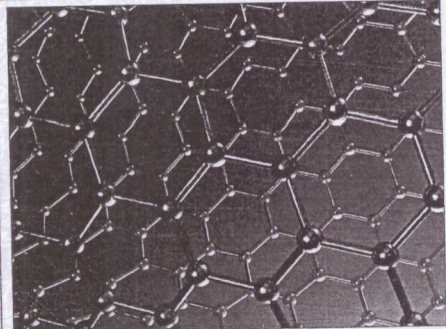
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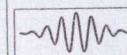


Clouds in the background belong to the class of cumulus clouds. The tallest one is cumulus congestus. These are convective clouds formed by the thermals originating near the Earth's surface and reach heights where the air is cold enough for condensation to occur.

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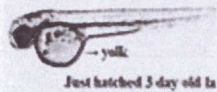
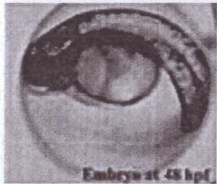
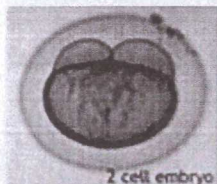
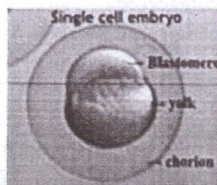
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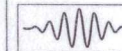
Zebrafish (*Danio rerio*) is a freshwater fish extensively used as a model vertebrate in life science research especially the development of various organ systems including the central nervous system.

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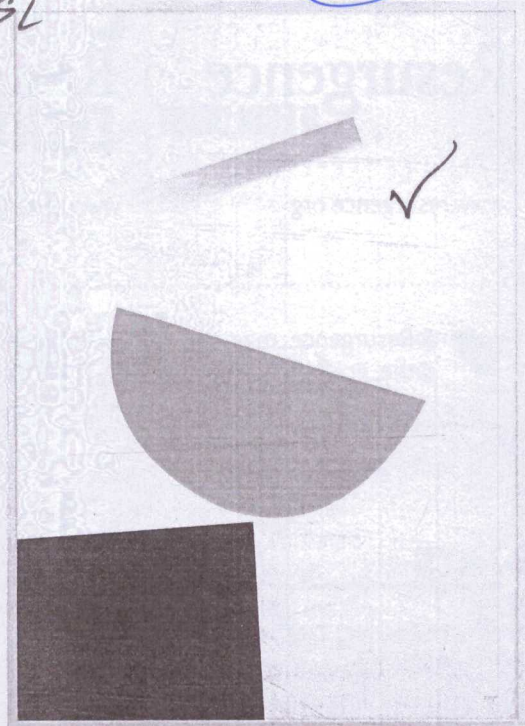
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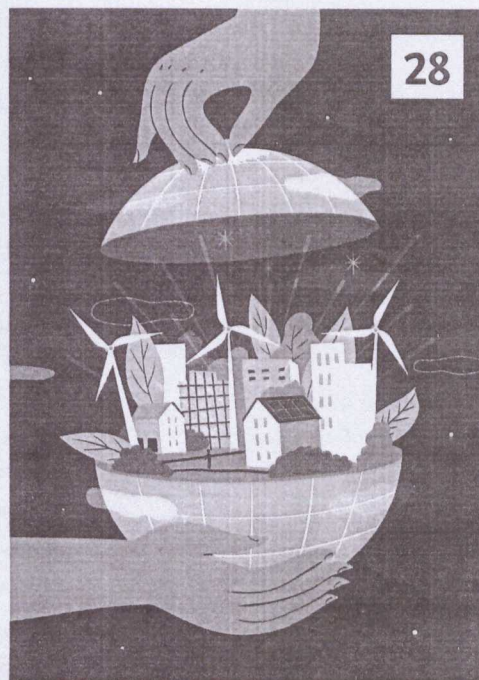
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क्यों करें प्रयोग?

विज्ञान शिक्षण में एक अहम सवाल हमेशा उठता है कि विज्ञान की कक्षा में गतिविधियों की क्या ज़रूरत है और क्यों कई शिक्षक इसके लिए राजी नहीं हो पाते हैं। एक तर्क यह दिया जाता है कि चूँकि वैज्ञानिक सिद्धान्तों का तकाज़ा होता है कि हम मात्र उन अवलोकनों पर ध्यान केन्द्रित करें जो अन्वेषणाधीन परिघटना के लिए प्रासंगिक हैं और शायद शिक्षक इन तथ्यों को सन्तोषजनक ढंग से प्रस्तुत न कर पाए, तो क्या इसी वजह से प्रयोगों को न करें? उपरोक्त लेख में विज्ञान पाठ्यपुस्तकों में गतिविधियों के तौर पर दिए गए प्रयोगों की प्रकृति और शिक्षकों की उनको लेकर समझ, साथ ही प्रयोग कराने में शिक्षकों की झिझक पर विस्तारपूर्वक चर्चा की गई है। आइए, विज्ञान की कक्षा में गतिविधियों के पक्ष में कुछ और कारणों को पढ़ते-समझते हैं।



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मशरूम से लेकर मोल्ड से लेकर यीस्ट तक, हजारों की संख्या में ऐसे जीव, कवक की छत्रछाया में आते हैं। वनस्पति शास्त्री और अन्य जीव-वैज्ञानिक फफूँद को कवक या फंजाइ भी कहते हैं। पहले केवल पौधे समझी जाने वाली यह फफूँद अपने स्वयं के टैक्सोनॉमिक साम्राज्य के रूप में उभरी हैं। इनकी प्रजातियाँ विविध हैं, जिनमें कई अद्वितीय गुण हैं: कुछ हानिरहित, कुछ उपयोगी और कुछ हानिकारक। फफूँदों में पोषण और रहन-सहन, उनकी बनावट और प्रजनन व जनसंख्या वृद्धि के तरीके आदि की विशेषताओं और भिन्नताओं के अनोखे संसार को हम जानने और समझने की कोशिश करेंगे इस लेख के माध्यम से।

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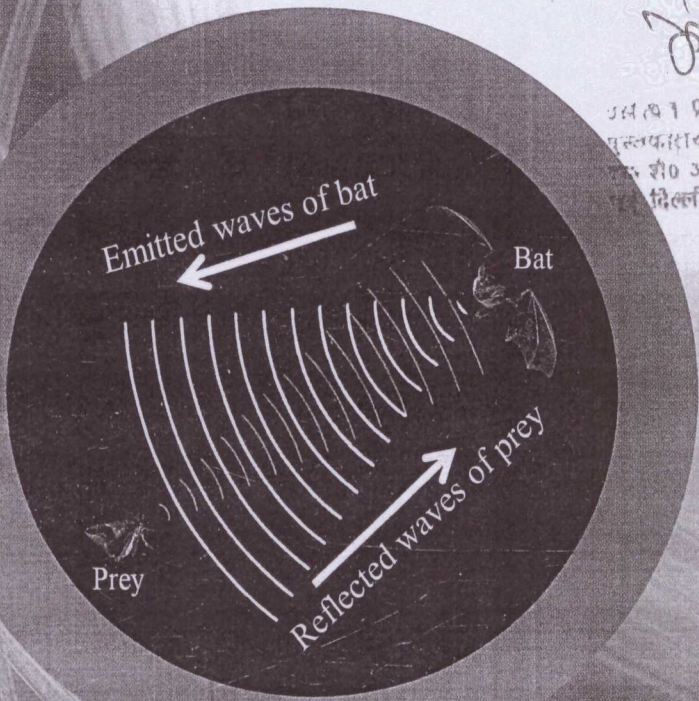
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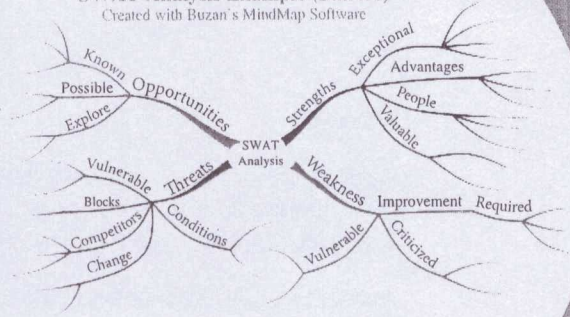
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SWAT Analysis Example (Starter)
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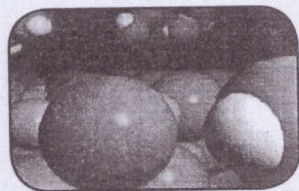
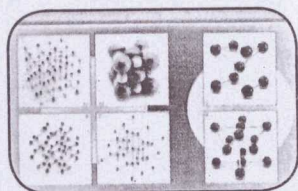


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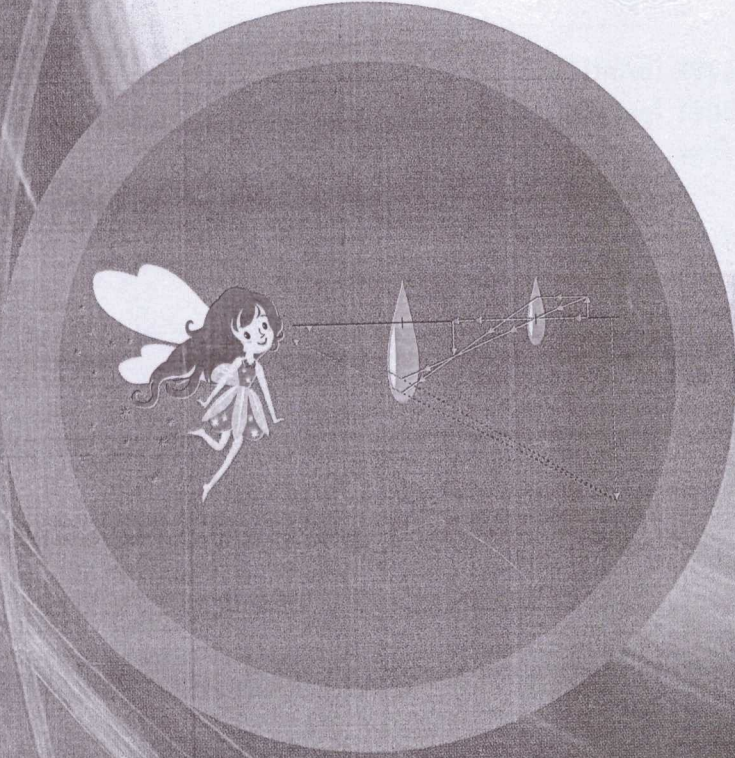
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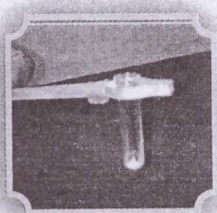
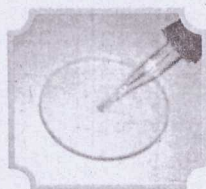
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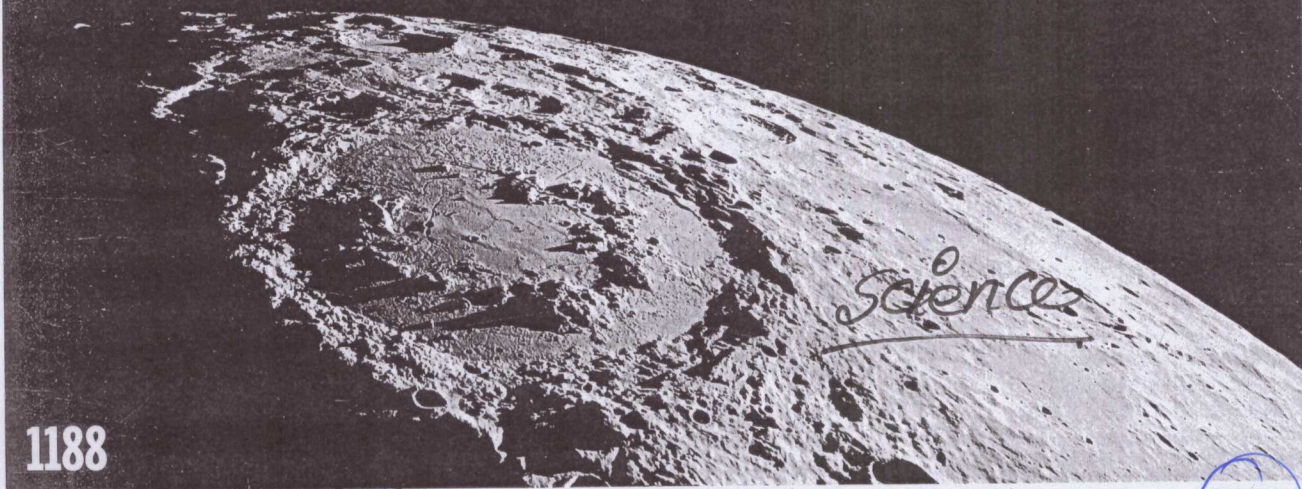
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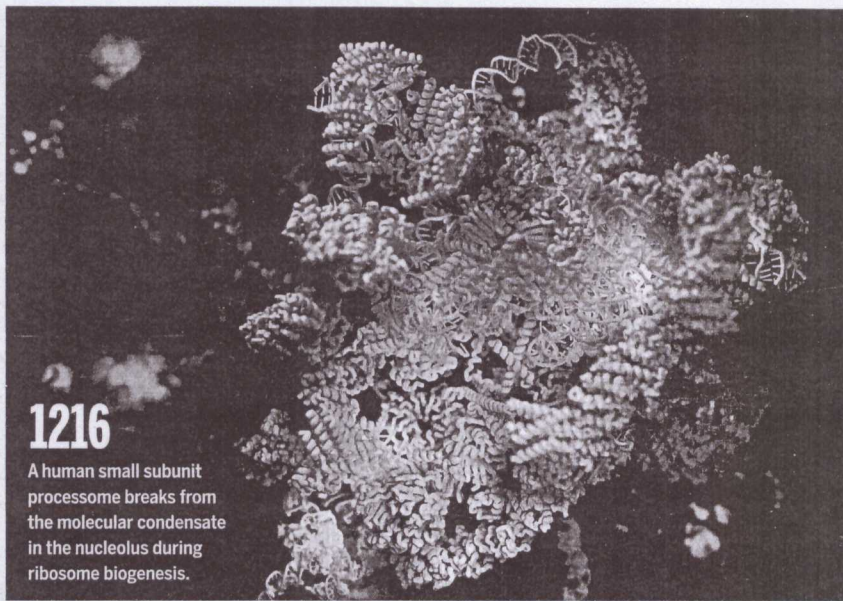
ON THE COVER

A powerful tropical thunderstorm exhibits an overshooting top that may inject water vapor into the lower stratosphere. Supercell thunderstorms, in particular, can excite hydraulic jumps at the tropopause, substantially increasing the local



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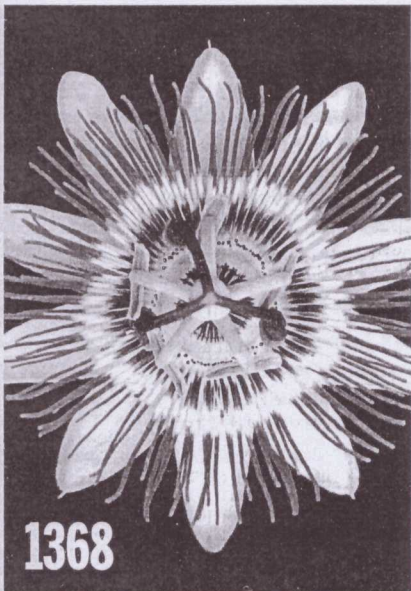
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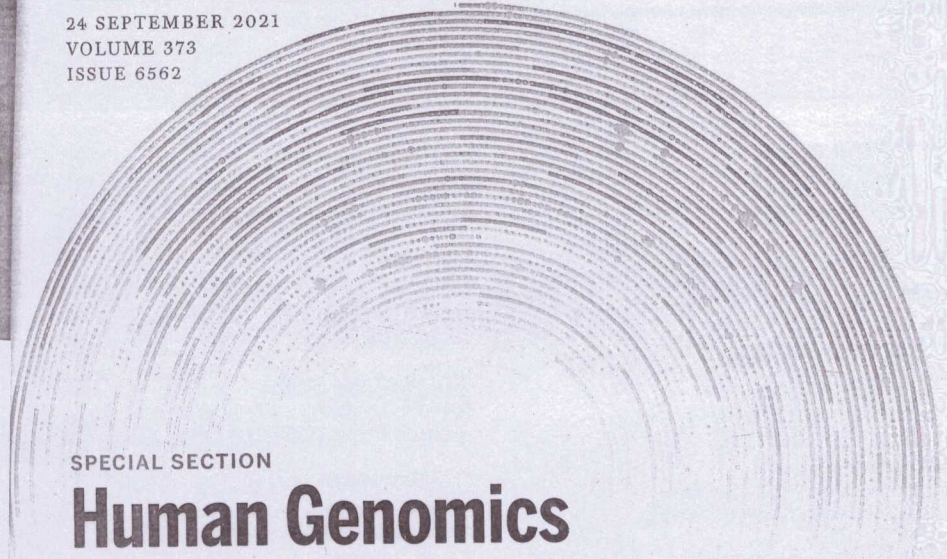
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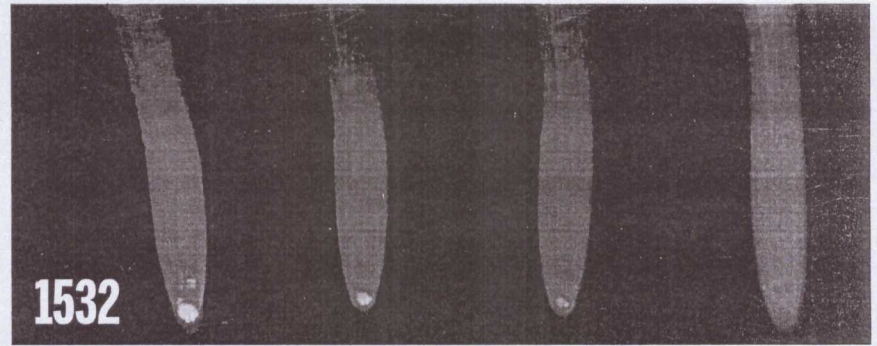
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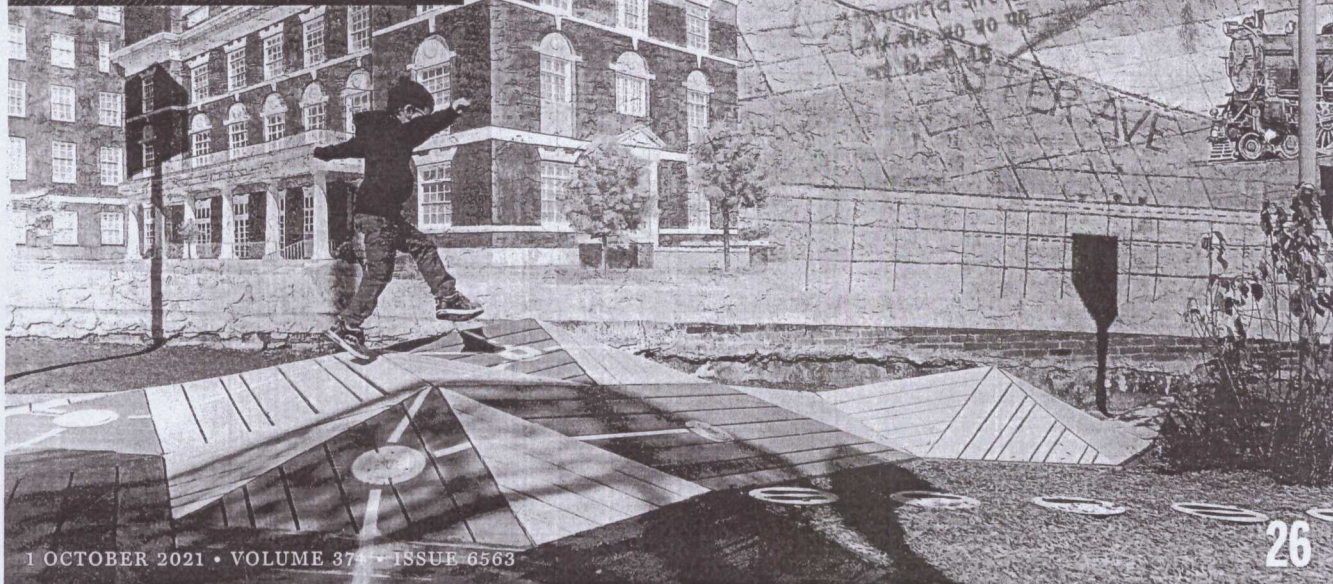


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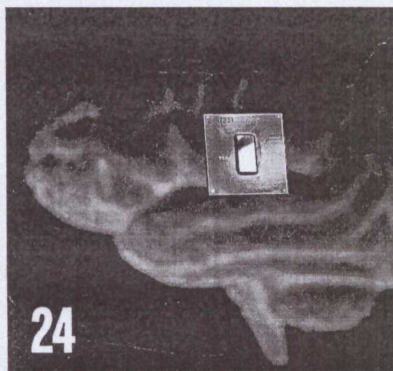
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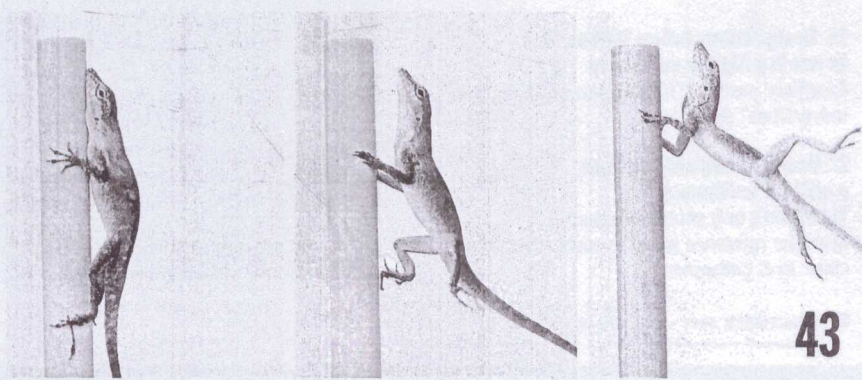
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African buffalo in Kruger National Park, South Africa, are reservoir hosts for foot-and-mouth disease (FMD) viruses, which infect wild and domestic ungulates. Highly contagious infections such as FMD spread rapidly through susceptible populations but fade out as hosts gain immunity—except in reservoir hosts, where they persist endemically. Mechanisms



of endemic persistence represent evolutionary outcomes of long-standing host-pathogen associations and may expose points of vulnerability in the transmission cycle. See pages 35 and 104. Photo: JMX Images/Shutterstock

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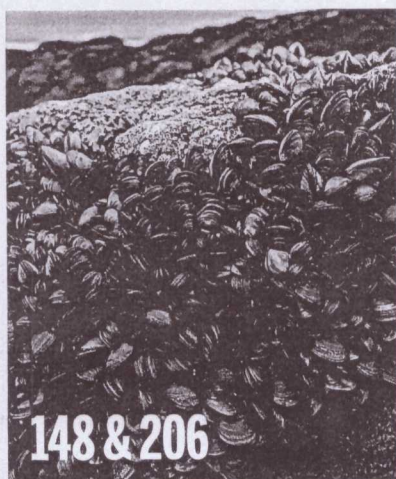
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Artist's rendering of battery electrolytes using amine-based chelants to promote intercalation and deintercalation of magnesium (Mg) ions (yellow) in high-voltage manganese oxide cathodes. The chelants also facilitate highly reversible metal plating and stripping at the Mg anode. Solvation sheath reorganization and electrode-electrolyte interface modification



led to an energy density in the Mg ion batteries of 412 watt-hours per kilogram at electrode level. See pages 156 and 172. *Illustration: V. Altounian/Science; Data: Xiao Ji, Singyuk Hou, Oleg Borodin*

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Mass incarceration in the United States has deep structural roots, with ties to race, slavery, labor, and money. In the words of the *Illustrator*, "This illustration shines a light on the structural role of the prison system and how deeply embedded it is in the fabric of this country." For more on this topic, see page 270. *Illustration: Adrian Brandon*



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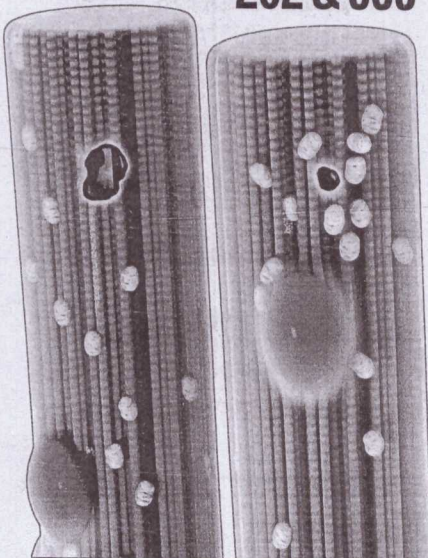
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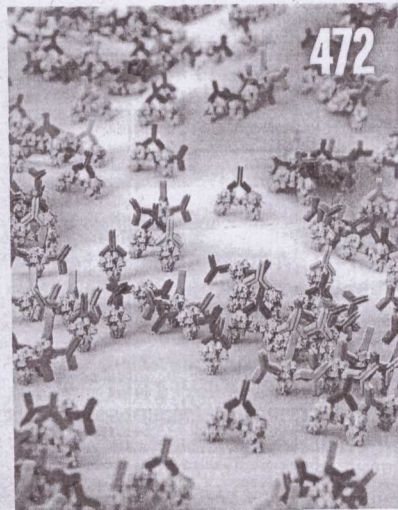
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Unlike polymers and metals, wood cannot be easily shaped. To close this processing gap, researchers have developed a method of cell wall engineering in which partial chemical delignification and a subsequent physical



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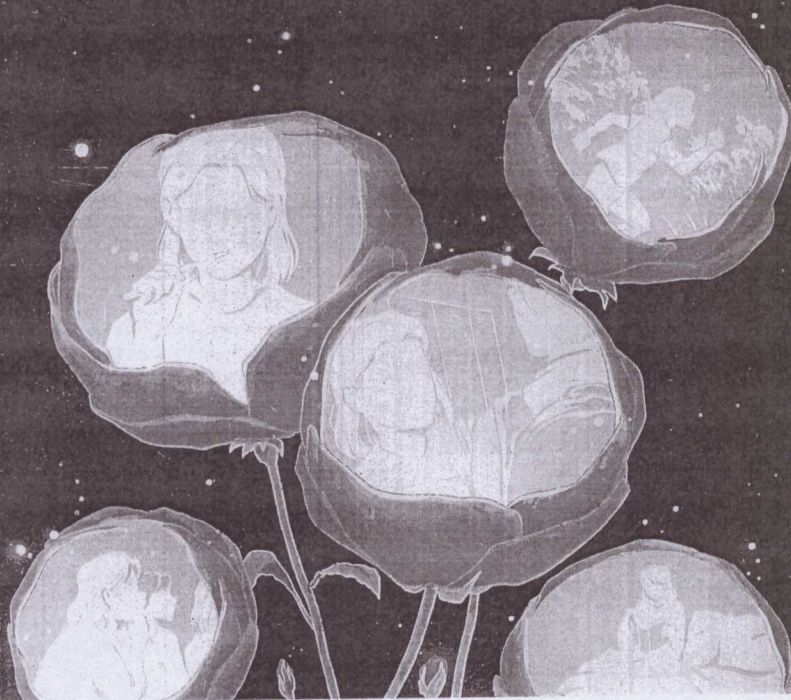


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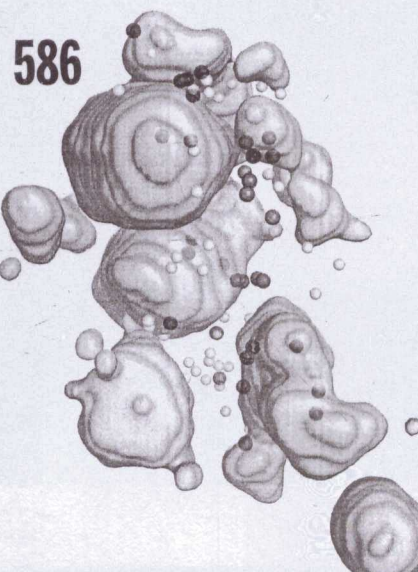
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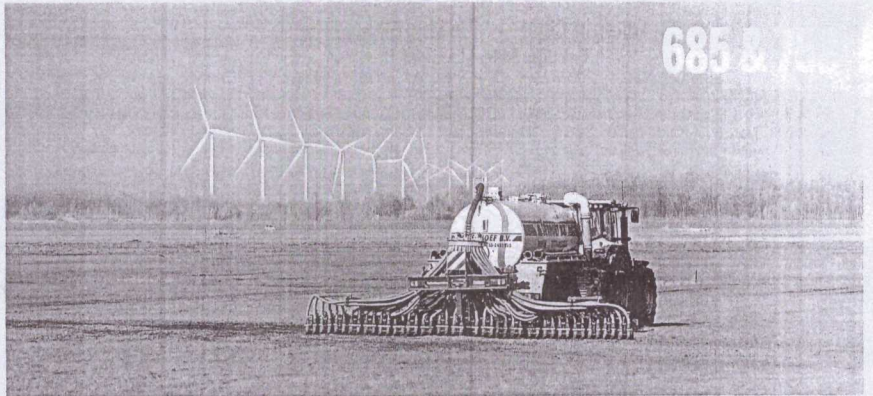
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Enhanced-color optical image of Jezero crater, Mars, taken by the Perseverance rover's Mastcam-Z instrument on 18 April 2021. The foreground flat-topped hill, informally named Kodiak butte, is 2.2 kilometers distant and 250 meters wide. It exposes ancient layered rocks that indicate gradual deposition of sediments in a river delta, followed by floods. See page 711. Credit: NASA/JPL-Caltech/ASU/MSSS

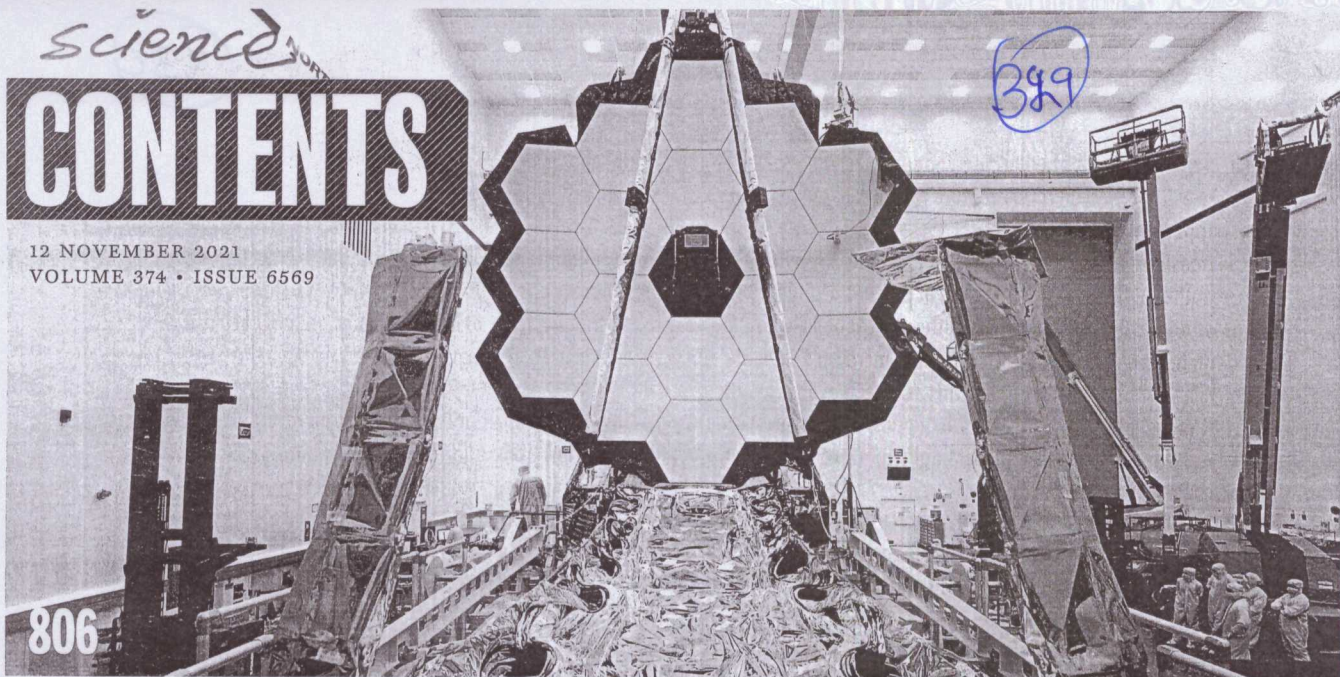


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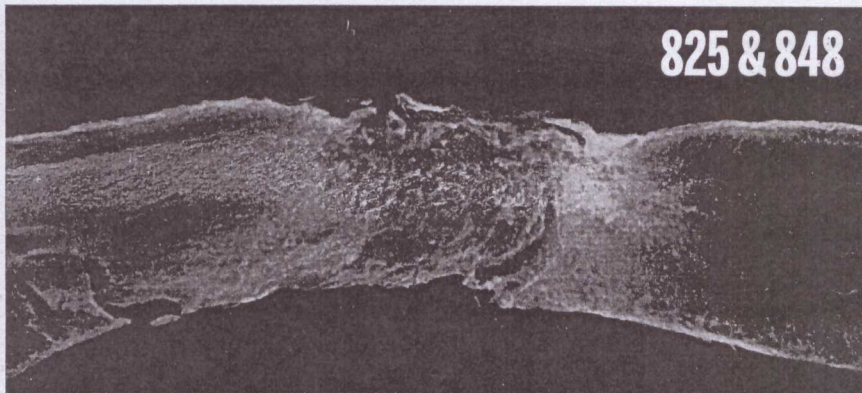
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A tiger rockfish (Sebastes nigrocinctus) nestled in a cluster of rocks. Tiger rockfish can live as long as 116 years. A genomic analysis of 88 species reveals the genetic underpinnings of rockfish life spans, which range from 11 years



for the shortest-lived species (Sebastes minor) to >200 years for the ultra-long-lived rougheye rockfish (Sebastes aleutianus). See pages 824 and 842.

Photo: Flip Nicklin/Minden Pictures



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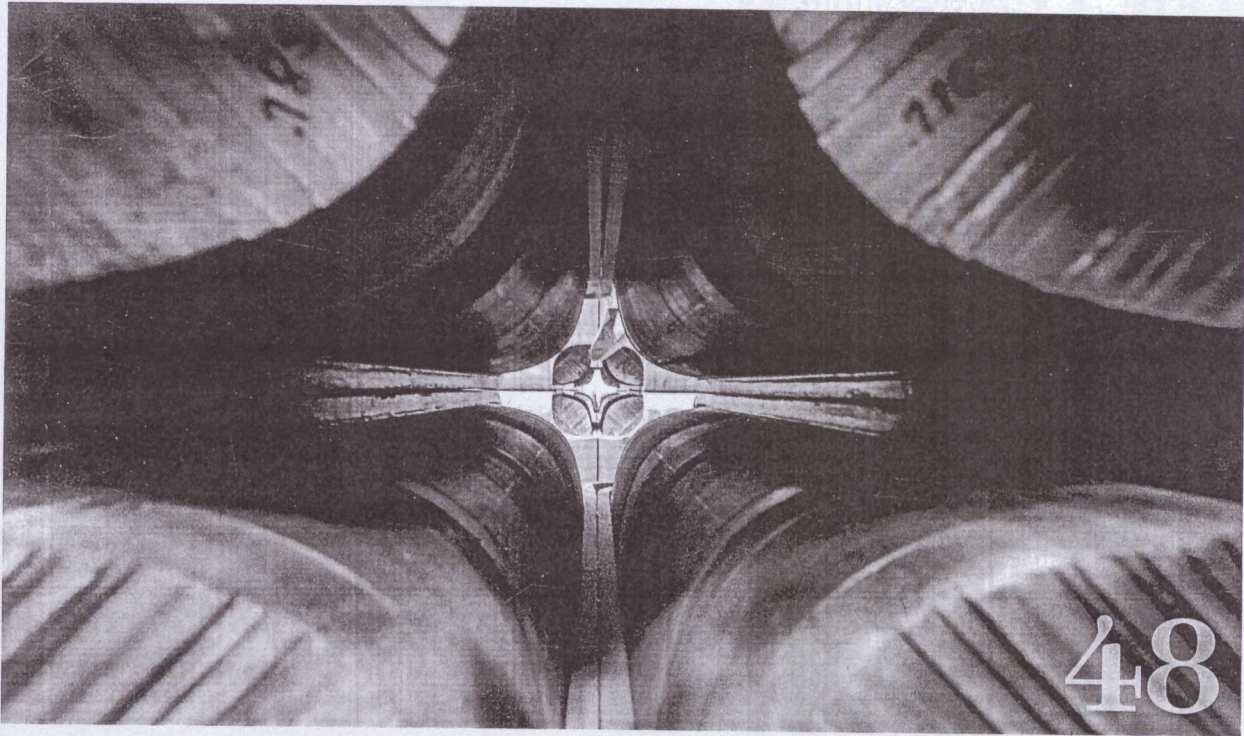
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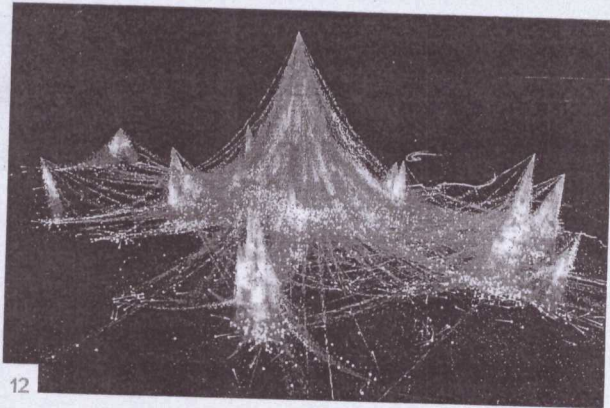
An experiment called Muon g-2 at Fermi National Accelerator Laboratory in Illinois measured excessive wobbling by particles called muons. The findings suggest new particles or forces beyond those in the Standard Model of particle physics may be involved.
 Illustration by Maria Corte.

Cindy Arnold/Fermi National Accelerator Laboratory

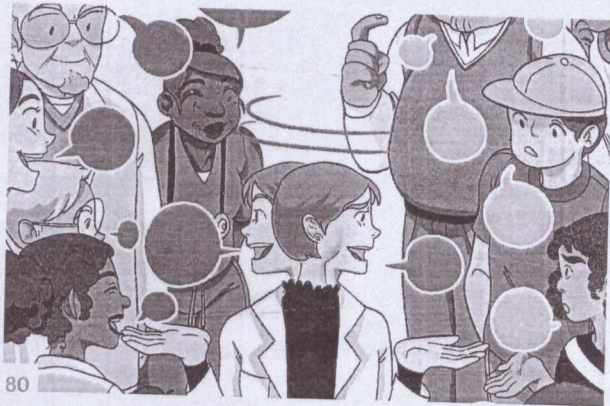
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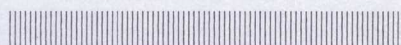
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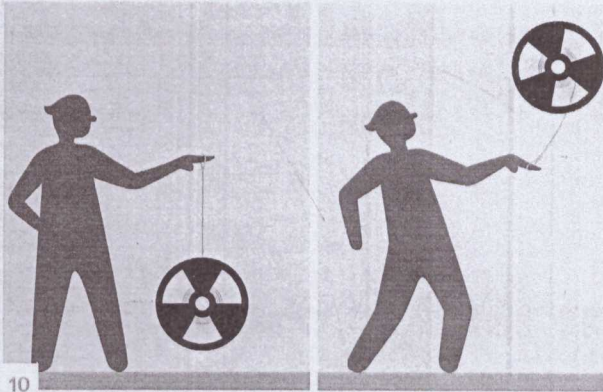
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As Earth warms, additional water evaporates into the air. Warmer air, in turn, can hold more of that vapor. A juicier atmosphere provides extra energy and moisture for destructive rainstorms and helps tropical storms like Hurricane Ida intensify faster, leaving precious little time to warn people in the crosshairs.
Illustration by Mark Ross.

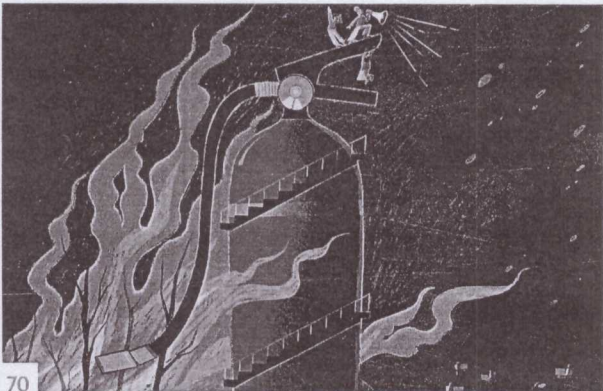
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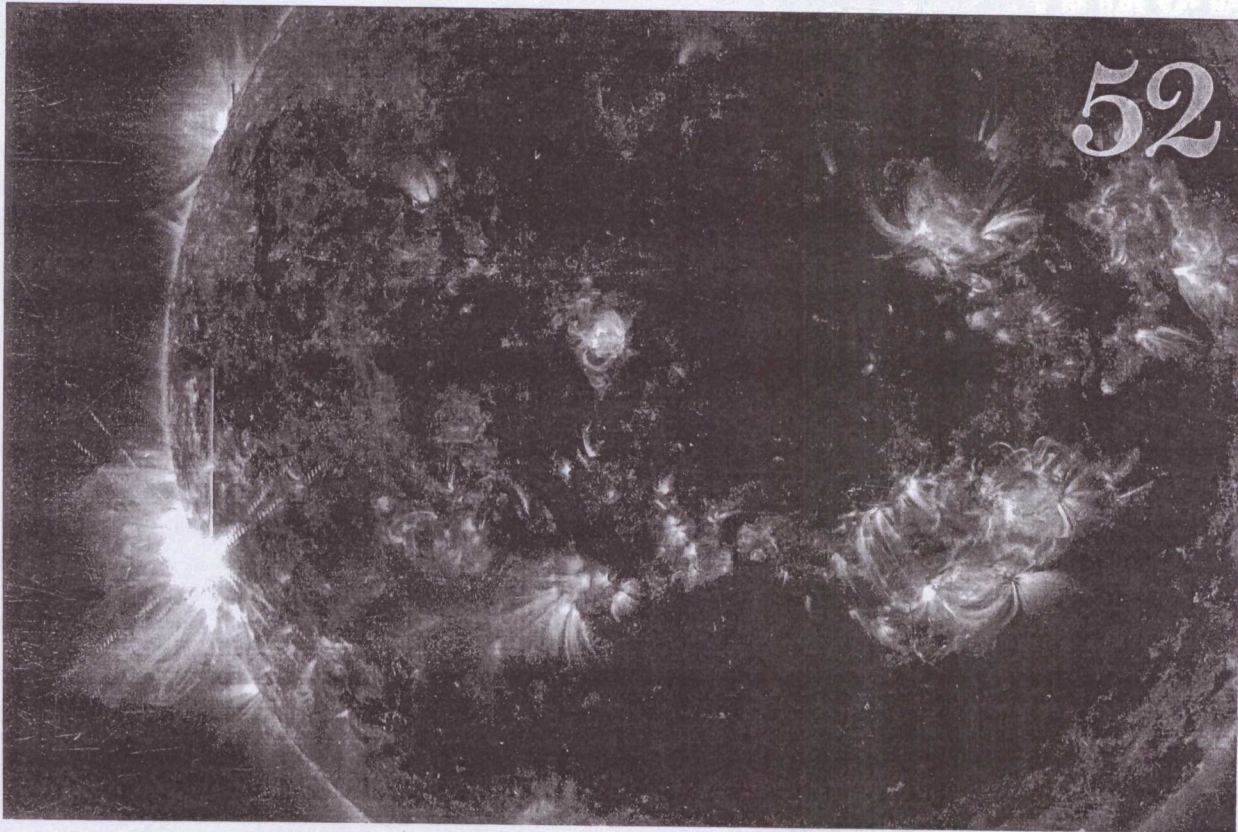
Two decades of drought data show dry spells getting worse. *By Clara Moskowitz, Cédric Scherer and Georgios Karamanis*

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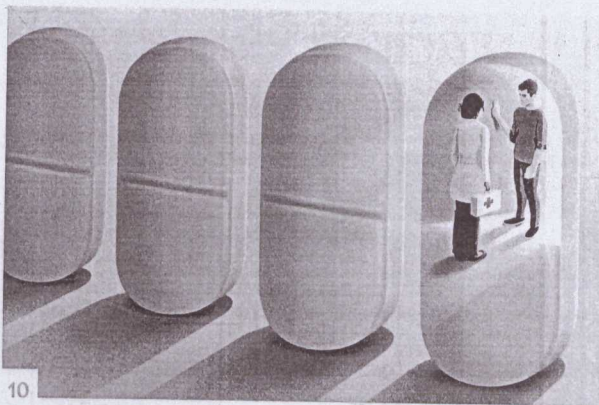
In billions of years the Milky Way and its nearest spiral neighbor, Andromeda, will crash together, eventually combining to form a single galaxy. Astronomers are studying galaxy mergers across the universe to foretell our own future and understand how these events have shaped cosmic history.

Illustration by Ron Miller

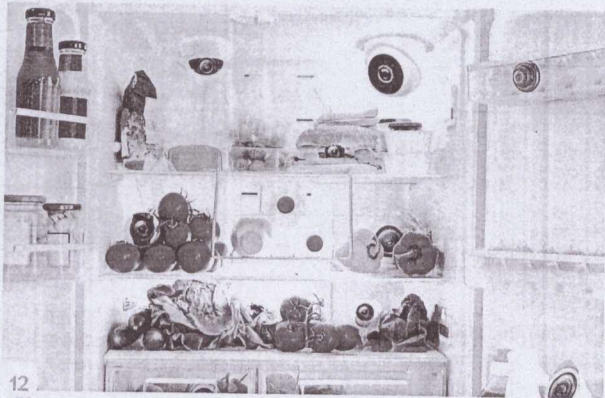


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Rig Veda

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योजना का लक्ष्य देश के आर्थिक विकास से संबंधित मुद्दों का सरकारी नीतियों के व्यापक संदर्भ में गहराई से विश्लेषण कर इन पर विमर्श के लिए एक जीवंत मंच उपलब्ध कराना है।

योजना में प्रकाशित लेखों में व्यक्त विचार लेखकों के अपने और व्यक्तिगत हैं। जरूरी नहीं कि ये लेखक भारत सरकार के जिन मंत्रालयों, विभागों अथवा संगठनों से संबद्ध हैं, उनका भी यही दृष्टिकोण हो।

योजना में प्रकाशित विज्ञापनों की विषयवस्तु के लिए योजना उत्तरदायी नहीं है।

योजना में प्रकाशित आलेखों में प्रयुक्त मानचित्र व प्रतीक आधिकारिक नहीं हैं, बल्कि सांकेतिक हैं। ये मानचित्र या प्रतीक किसी भी देश का आधिकारिक प्रतिनिधित्व नहीं करते हैं।

योजना लेखकों द्वारा आलेखों के साथ अपने विश्वसनीय स्रोतों से एकत्र कर उपलब्ध कराए गए आंकड़ों/तालिकाओं/इन्फोग्राफिक्स के संबंध में उत्तरदायी नहीं है। योजना किसी भी लेख में केस स्टडी के रूप में प्रस्तुत किसी भी ब्रांड या निजी संस्थाओं का समर्थन या प्रचार नहीं करती है।

योजना घर मंगाने, शुल्क में छूट के साथ दरों व प्लान की विस्तृत जानकारी के लिए पृष्ठ-57 पर देखें।

योजना की सदस्यता का शुल्क जमा करने के बाद पत्रिका प्राप्त होने में कम से कम 8 सप्ताह का समय लगता है। इस अवधि के समाप्त होने के बाद ही योजना प्राप्त न होने की शिकायत करें।

योजना न मिलने की शिकायत या पुराने अंक मंगाने के लिए नीचे दिए गए ई-मेल पर लिखें -

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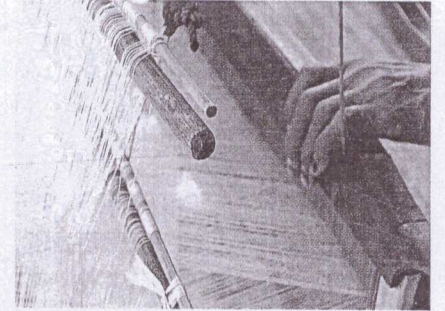
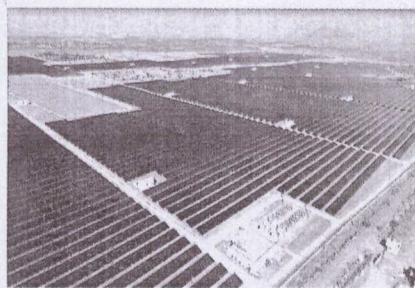
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