

ARCTIC MELTDOWN: Why Record Heat Is Altering Weather Worldwide

PAGE 48

SCIENTIFIC AMERICAN

TINY KILLERS

How plantlike predators rule the seas

PLUS

MECHANICAL BRAINS

Do nerves communicate with physical pulses? PAGE 60

FLASHES IN THE NIGHT

Mystery signals from the far cosmos PAGE 42

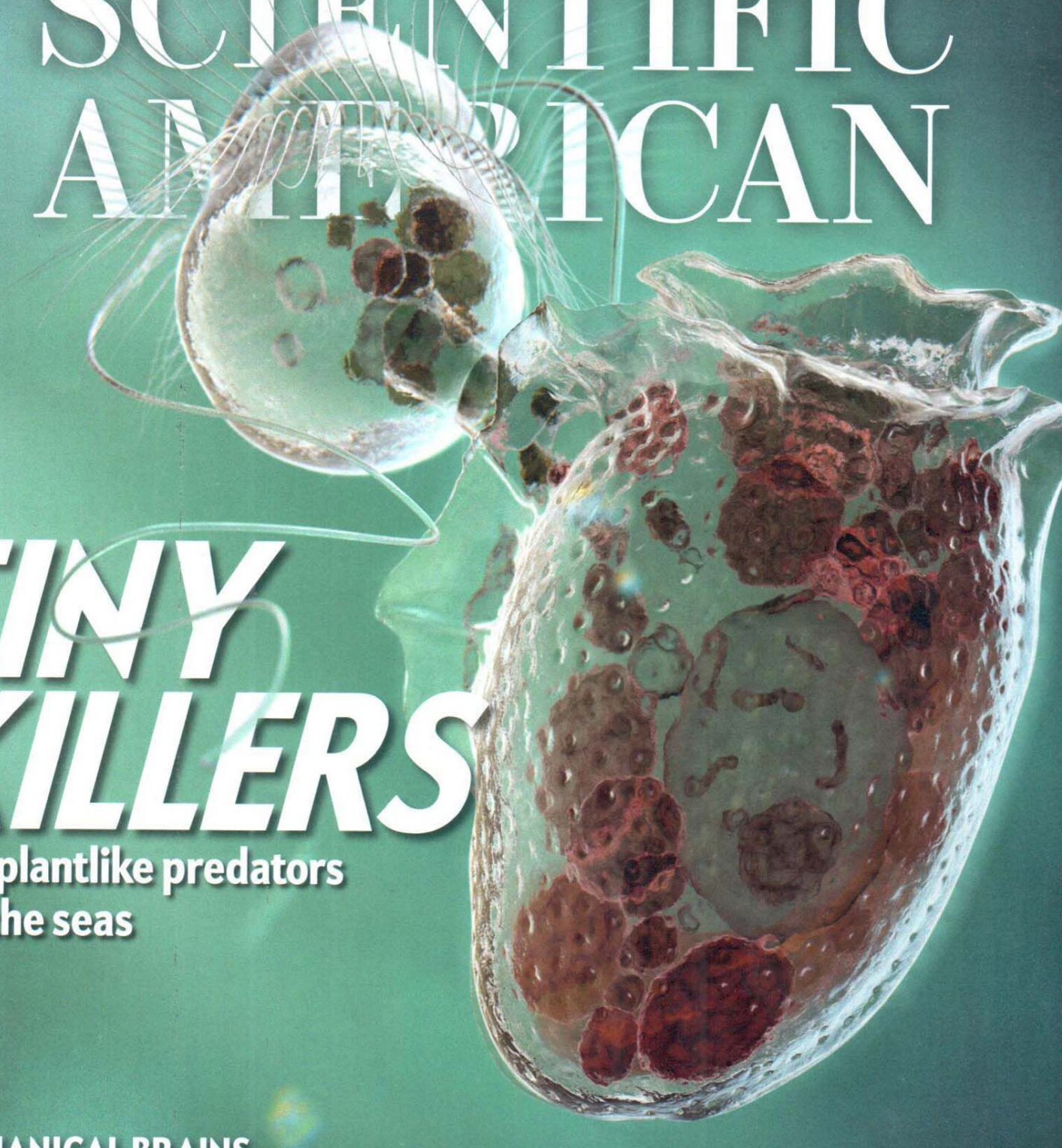
THE SHAPE OF SEASHELLS

How mollusks get their spirals PAGE 68

ScientificAmerican.com

\$6.99 U.S.

APRIL 2018





MARINE BIOLOGY

26 The Perfect Beast

Mixotrophs, tiny sea creatures that hunt like animals but grow like plants, can change everything from fish populations to rates of global warming.

By Aditee Mitra

MEDICINE

34 The Cancer Tree

Evolutionary studies indicate that the genetic changes enabling a cancer to develop arise shockingly early within the primary tumor. This discovery points to a promising new approach to therapy.

By Jeffrey P. Townsend

ASTRONOMY

42 Flashes in the Night

Astronomers are racing to figure out what causes powerful bursts of radio light in the distant cosmos.

By Duncan Lorimer and Maura McLaughlin

ENVIRONMENT

48 Meltdown

The Arctic climate is shattering record after record, altering weather worldwide.

By Jennifer A. Francis

MENTAL HEALTH

54 Preventing Suicide

Social scientists are closing in on new ways to stop people from taking their own lives.

By Lydia Denworth

NEUROSCIENCE

60 The Brain, Reimagined

Physicists who have revived experiments from 50 years ago say nerve cells communicate with mechanical pulses, not electric ones.

By Douglas Fox

MATHEMATICS

68 How Seashells Take Shape

Mathematical modeling reveals the mechanical forces that guide the development of mollusk spirals, spines and ribs.

By Derek E. Moulton, Alain Goriely and Régis Chirat



ON THE COVERS

Previously thought to be a rarity, microscopic plankton called mixotrophs are turning out to be rulers of the ocean food web. These hybrid beasts hunt like animals and photosynthesize like plants. Here a mixotroph called *Dinophysis* (right) sucks the innards from another, *Mesodinium*.

Illustration by Mark Ross Studios (left)

The Arctic is melting and warming faster than anyone thought possible. As a result, billions of people may face longer heat waves, deeper freezes and heavier rains.

Illustration by Maciej Frolow (right)

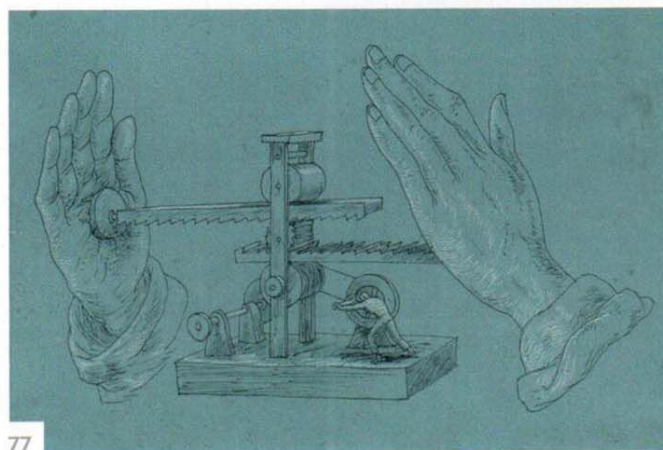
SCIENTIFIC AMERICAN



23



25



77

4 From the Editor

6 Letters

10 Science Agenda

Halting the suicide epidemic. *By the Editors*

11 Forum

Expensive space telescopes may be hurting the golden age of astronomy. *By Martin Elvis*

12 Advances

AI takes photo fakery up a notch. Bonobos prefer meanies. New England is sitting atop hot rocks. Programming in DNA. Human noise stresses out birds.

24 The Science of Health

Pancreatic cancer deaths are taking a bigger toll. *By Claudia Wallis*

25 TechnoFiles

Automotive touch screens may be giving you fits and starts. *By David Pogue*

76 Recommended

The ultimate dinosaur biography. When *Apollo 8* first orbited the moon. A cosmological caper that did not lead to a Nobel. *By Andrea Gawrylewski*

77 Skeptic

The politics of atheism. *By Michael Shermer*

78 Anti Gravity

Early 2018 was full of monkey business. *By Steve Mirsky*

79 50, 100 & 150 Years Ago

80 Graphic Science

Reptiles worldwide need protection. *By Mark Fischetti, Mapping Specialists and Rachel Ivanyi*

ON THE WEB

"Planet Nine" Revisited

Scientific American examines the still frenzied search for the elusive Planet Nine, more than two years after astrophysicists revealed the strongest evidence yet of its existence. Go to www.ScientificAmerican.com/apr2018/planet-9

Scientific American (ISSN 0036-8733), Volume 318, Number 4, April 2018, published monthly by Scientific American, a division of Nature America, Inc., 1 New York Plaza, Suite 4500, New York, N.Y. 10004-1562. 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; TVQ1218059275 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 available: write Reprint Department, Scientific American, 1 New York Plaza, Suite 4500, New York, N.Y. 10004-1562; fax: 646-563-7138; reprints@SciAm.com. Subscription inquiries: U.S. and Canada (800) 333-1199; other (515) 248-7684. Send e-mail to scacustserv@cdsfulfillment.com. Printed in U.S.A. Copyright © 2018 by Scientific American, a division of 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). 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.

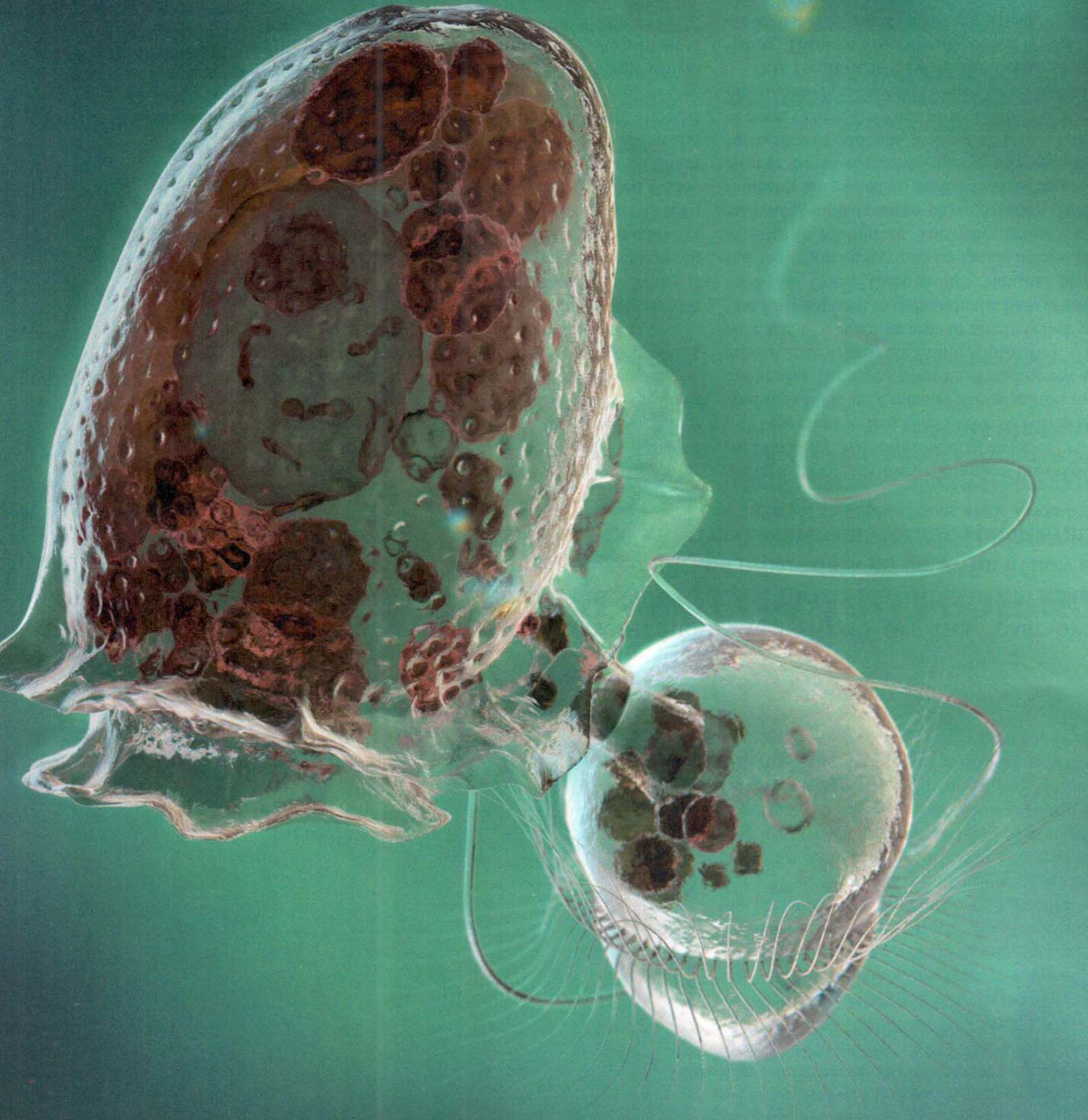
THE PERFECT BEAST

Mixotrophs, tiny sea creatures that hunt like animals but grow like plants, can change everything from fish populations to rates of global warming

By Aditee Mitra

Illustration by Mark Ross Studios

SUCKER PUNCH: One mixotroph, *Dinophysis* (right), sucks photosynthesizing organs from another, *Mesodinium*.







MEDICINE

The Cancer Tree

Evolutionary studies indicate that the genetic changes enabling a cancer to develop arise shockingly early within the primary tumor. This discovery points to a promising new approach to therapy

By Jeffrey P. Townsend

Illustration by Marcos Chin



PARKES OBSERVATORY, a radio telescope in Australia, made the first detection of a mysterious brief radio flare from the distant universe.

ASTRONOMY

Flashes in the Night

Astronomers are racing to figure out what causes powerful bursts of radio light in the distant cosmos

By Duncan Lorimer and Maura McLaughlin

ONE DAY IN EARLY 2007 UNDERGRADUATE STUDENT DAVID NARKEVIC came to us with some news. He was a physics major at West Virginia University, where the two of us had just begun our first year as assistant professors. We had tasked him with inspecting archival observations of the Magellanic Clouds—small satellite galaxies of the Milky Way about 200,000 light-years away from Earth. Narkevic had an understated manner, and that day was no exception. “I’ve found something that looks quite interesting,” he said nonchalantly, holding up a graph of a signal that was more than 100 times stronger than the background hiss of the telescope electronics. At first, it seemed that he had identified just what we were looking for: a very small, bright type of star known as a pulsar.

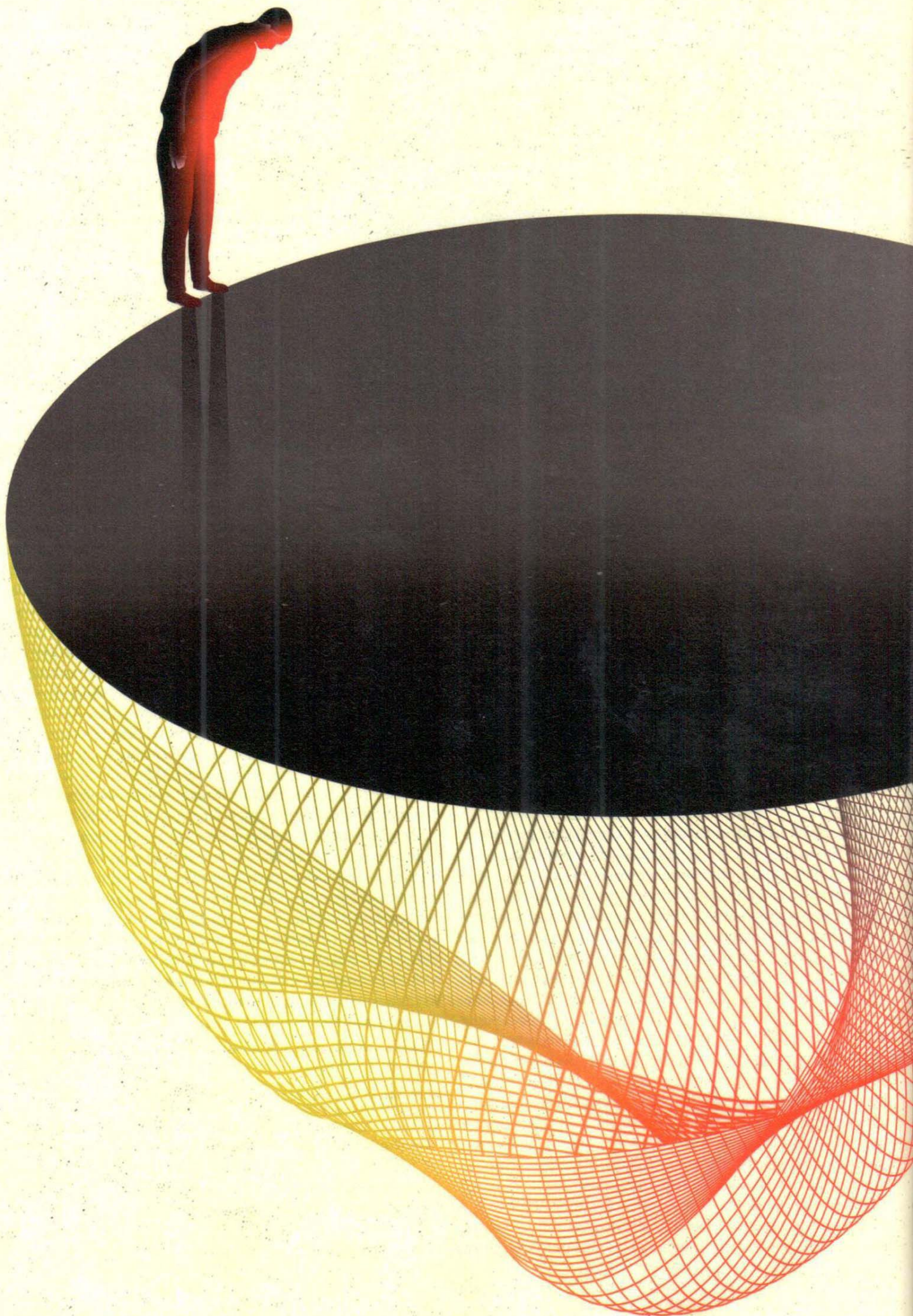
IN BRIEF

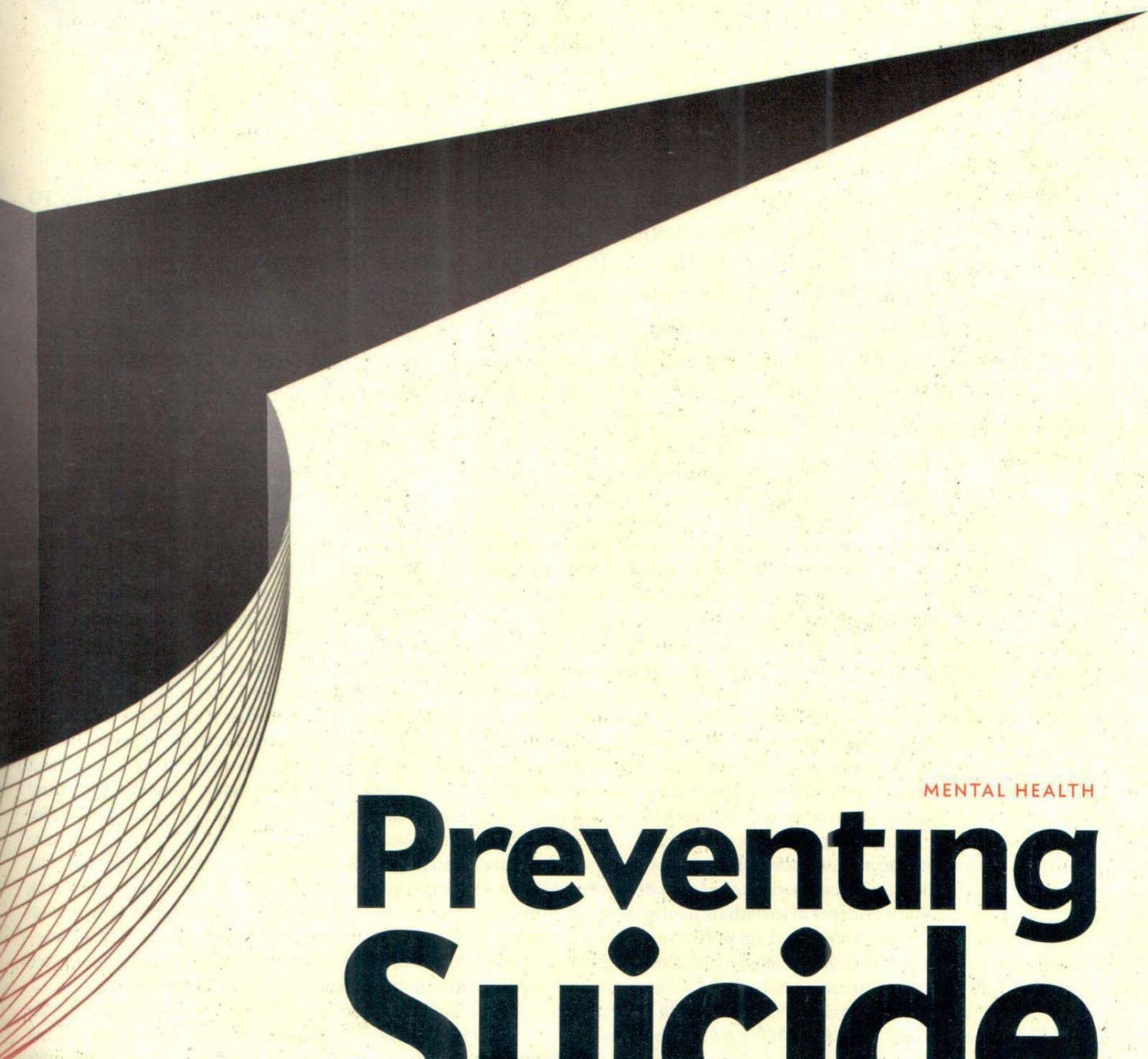
A strange burst of radio light from the distant cosmos mystified scientists when they spotted it in 2007.

Astronomers doubted that the flash was celestial until they found similar blasts, dubbed “fast radio bursts.”

A quest is on to discover more of these strange bursts and identify what causes them.

Theories include compact stars, supernovae and even exotic possibilities such as cosmic strings.





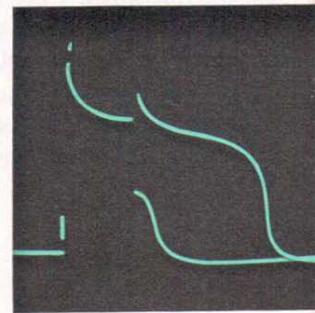
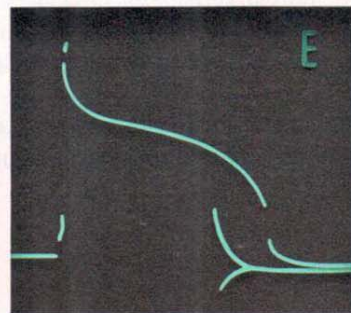
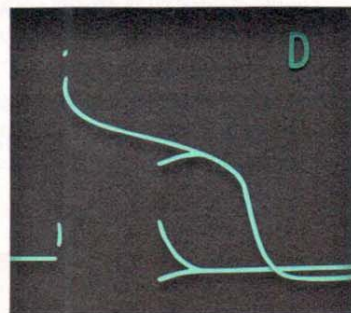
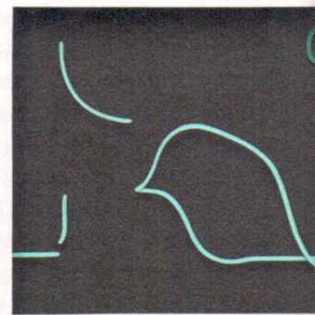
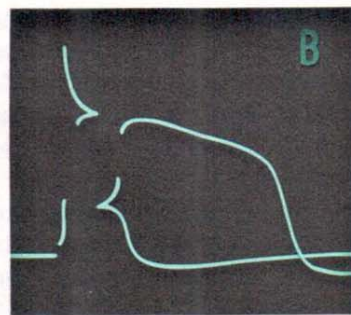
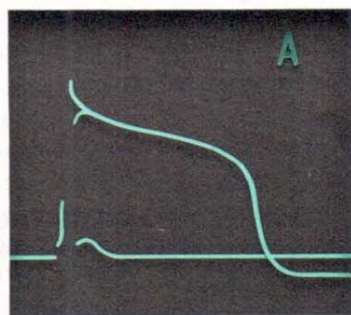
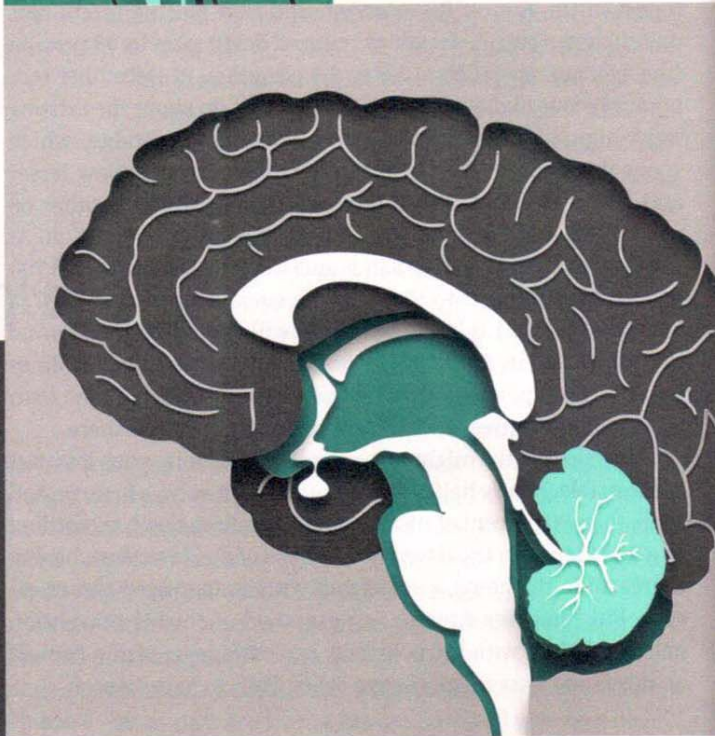
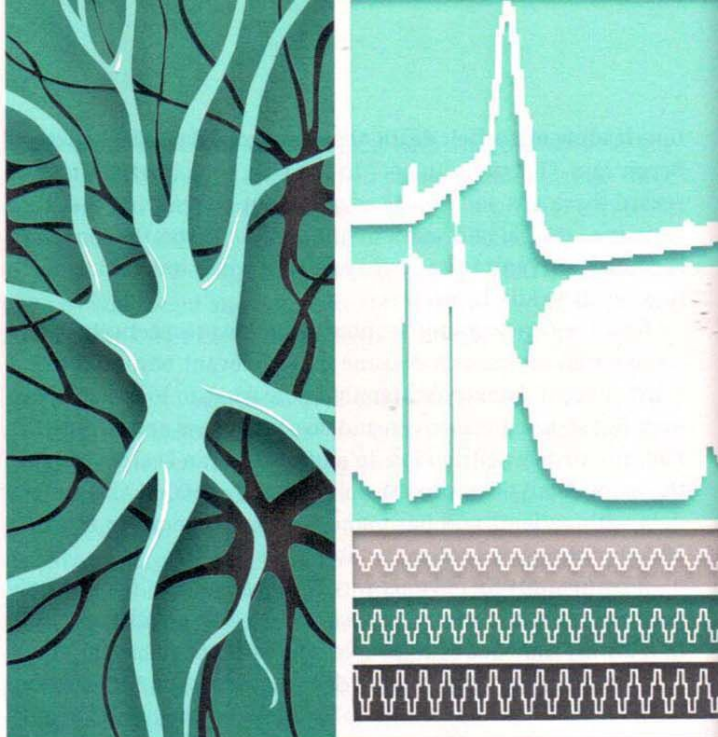
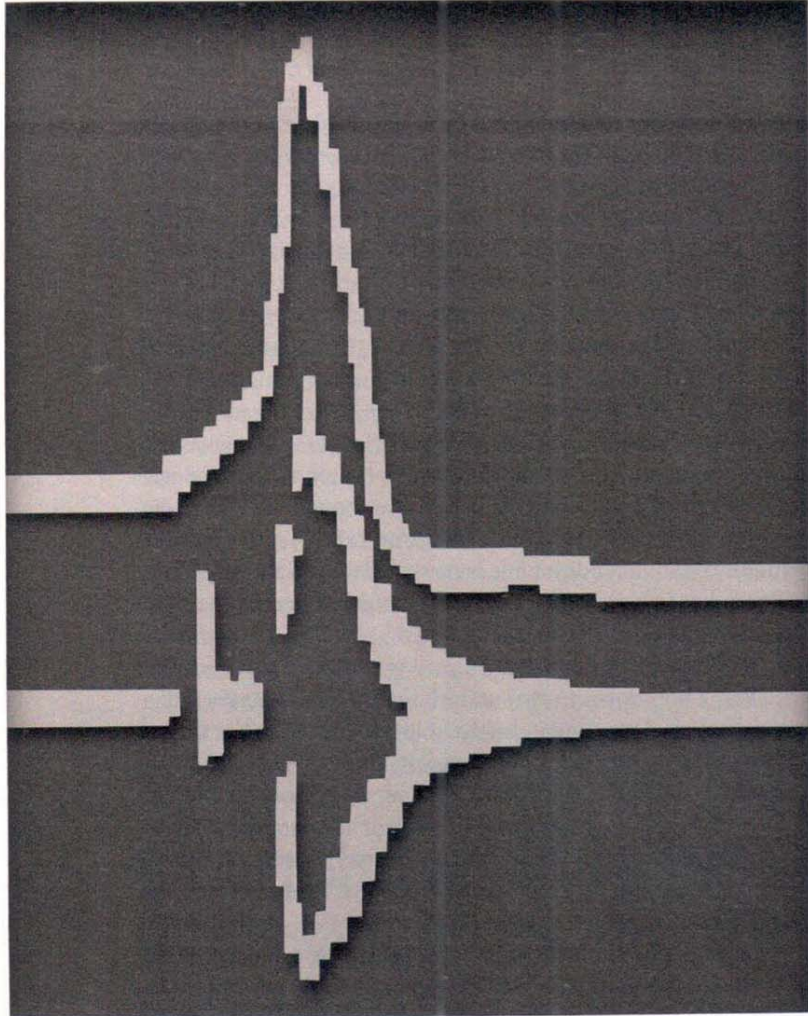
MENTAL HEALTH

Preventing Suicide

Social scientists have begun to close in on new ways to stop people from taking their own lives

By Lydia Denworth

Illustration by Brian Stauffer



NEUROSCIENCE

THE BRAIN,

Be imagin be

Physicists who have
revived experiments
from 50 years ago
say nerve cells
communicate with
mechanical pulses,
not electric ones

By Douglas Fox



MATHEMATICS

How Seashells Take Shape

Mathematical modeling reveals
the mechanical forces that guide
the development of mollusk
spirals, spines and ribs

*By Derek E. Moulton, Alain Goriely
and Régis Chirat*

Illustrations by Bryan Christie Design

