

[Science](#) Breakthrough Prizes Give Top Scientists the Rock Star Treatment

- [Email](#)
- [Share](#)
- [Tweet](#)
- [More](#)

Search

-

[TIMES INSIDER](#)

search sponsored by

Site Search Navigation

Search NYTimes.com

<http://nyti.ms/1kpw7JW>

Site Navigation

- [Home Page](#)
 - [Home Page](#)
 - [World](#)
 - [U.S.](#)
 - [Politics](#)
 - [N.Y.](#)
 - [Business](#)
 - [Business](#)
 - [Opinion](#)
 - [Opinion](#)
 - [Tech](#)
 - [Science](#)
 - [Health](#)
 - [Sports](#)
 - [Sports](#)
-
- [Arts](#)
 - [Arts](#)
 - [Fashion & Style](#)
 - [Fashion & Style](#)
 - [Food](#)
 - [Food](#)
 - [Travel](#)

- [Magazine](#)
- [T Magazine](#)
- [Real Estate](#)
- [Obituaries](#)
- [Video](#)
- [The Upshot](#)
- [Conferences](#)

- [Crossword](#)
- [Times Insider](#)

- [Multimedia](#)
- [Photography](#)

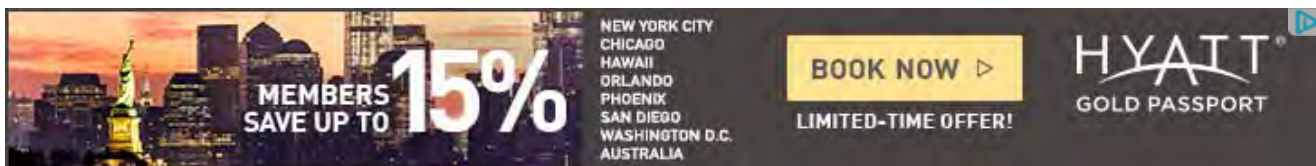
- [NYT Store](#)
- [NYT Wine Club](#)
- [nytEducation](#)
- [Times Journeys](#)

- [Subscribe](#)
- [Manage Account](#)
- [Today's Paper](#)
- [Blogs](#)
- [Times Topics](#)
- [Tools & Services](#)
- [Jobs](#)
- [Classifieds](#)
- [Corrections](#)

- [More](#)

Site Mobile Navigation

Advertisement



NEW YORK CITY
CHICAGO
HAWAII
ORLANDO
PHOENIX
SAN DIEGO
WASHINGTON D.C.
AUSTRALIA

MEMBERS
SAVE UP TO **15%**

BOOK NOW ▷

LIMITED-TIME OFFER!

HYATT[®]
GOLD PASSPORT

[Science](#)

- [Share](#)

Breakthrough Prizes Give Top Scientists the Rock Star Treatment

By THE NEW YORK TIMES NOV. 8, 2015 [Related Article](#)

Photo



Winners of the 2016 Breakthrough Prize awards in Mountain View, Calif., on Sunday evening. Credit Steve Jennings/Getty Images

- [email](#)
- [Share](#)
- [Tweet](#)
- [save](#)
- [more](#)

The richest awards in science were handed out Sunday night when the [Breakthrough Prize](#) organization presented a total of \$21.9 million to physicists, mathematicians, life scientists and one talented high school student. The awards take the form of seven \$3 million awards, one of which was split among roughly 1,300 physicists; \$500,000 split among eight early-career researchers; and \$400,000 to a high school student for creating a [video communicating a scientific concept](#).

The Breakthrough Prizes were founded by Sergey Brin of Google; Anne Wojcicki of 23andme; Jack Ma of Alibaba and his wife, Cathy Zhang; Yuri Milner, an Internet entrepreneur, and his wife, Julia Milner; and Mark Zuckerberg of Facebook and his wife, Priscilla Chan.

The awards were given out in an Oscar-style ceremony hosted by the founders and Graydon Carter, the Vanity Fair editor, at NASA's Ames Research Center in Mountain View, Calif., with entertainment by Pharrell Williams and food by Thomas Keller of the French Laundry and Per Se. Seth MacFarlane was the M.C. for the awards presentation, which also featured boldface names like Russell Crowe and Hilary Swank.

And the scientists were in their Oscar-worthy finest.

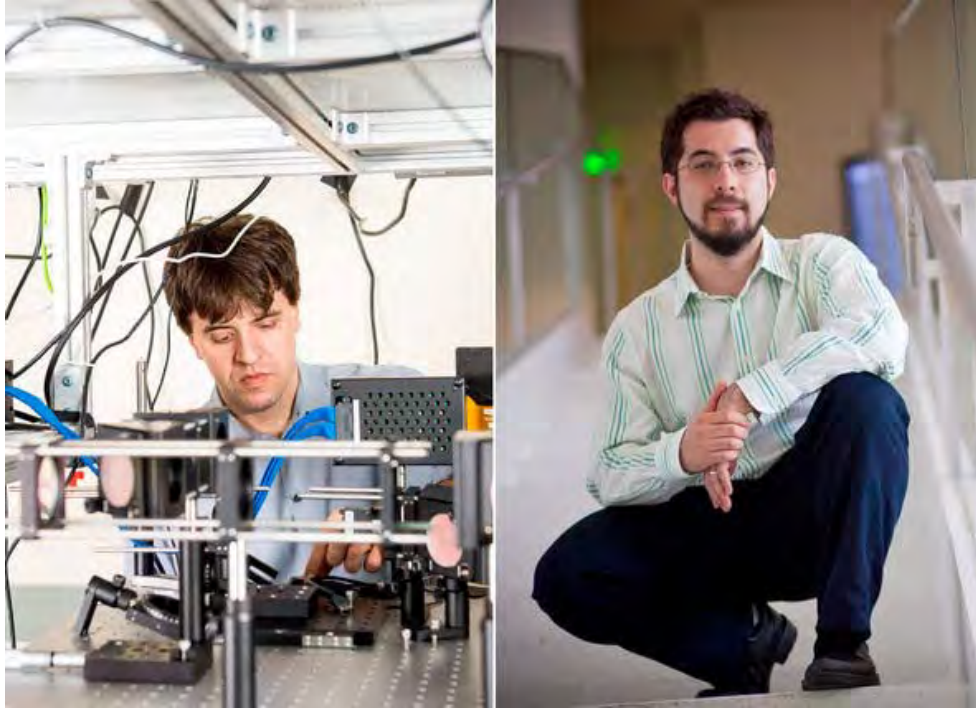
It all began when Mr. Milner announced in 2012 that he would hand out \$3 million apiece to nine theoretical physicists, in the belief that physicists are equal to rock stars and deserve to be paid and celebrated like them. Over the years, as more sponsors have joined, the prizes have spread to life sciences and mathematics. The winners each year are chosen by a committee of previous winners.

“By challenging conventional thinking and expanding knowledge over the long term, scientists can solve the biggest problems of our time,” Mr. Zuckerberg said in a statement. “The Breakthrough Prize honors achievements in science and math so we can encourage more pioneering research and celebrate scientists as the heroes

they truly are.”

Here are this year’s Breakthrough Prize laureates.

Photo



Left, Karl Deisseroth, Stanford School of Medicine; Edward S. Boyden of the McGovern Institute for Brain Research at M.I.T. Credit Left, Winni Wintermeyer for The New York Times; Dominick Reuter/M.I.T. News

@ 9 G7 -9B79G

? Uf` 8Y]ggYfch\ UbX 9Xk UfX G" 6cnXYb

Cdrc[YbYH]Vg

Karl Deisseroth, a professor at Stanford University and a Howard Hughes Medical Institute investigator, and Edward S. Boyden, a professor at the Massachusetts Institute of Technology, each received \$3 million for their roles in the development of optogenetics, a technique that allows scientists to use light to turn neurons and groups of neurons on and off.

The technique is transforming the study of the brain because it allows scientists to test ideas about how the brain works. It has already been used to turn a kind of aggression on and off in flies, and thirst on and off in mice, pinpointing the brain cells involved.

The technique is universally praised, but the question of who will be recognized for its development is an issue for any prize committee. Dr. Boyden, Dr. Deisseroth and three other scientists published a [paper in 2005](#) that is recognized as a breakthrough. They demonstrated how to reliably control mammalian neurons with light, making widespread use of the technique inevitable.

Their paper built on earlier work, as much of science does. Opsins, light-sensitive chemicals that are crucial to optogenetics, have been studied since the 1970s. And the fact that optogenetics [could be done was demonstrated in 2002](#).

In 2013, the [European Brain Prize recognized six scientists](#) for work on

Photo



@ 9 G7-9B79G

>c\b <UfXm

5n\Yja YfYgYUFWX

Alzheimer's disease was a complete mystery in the late 1980s. In autopsies, pathologists could see the ravages left in patients' brains, but how and why did the process start? There were rare families in which the disease seemed to be inherited, though, and perhaps there was a gene mutation that might provide a clue to what goes awry. The problem was finding those families.

In the late 1980s, a woman who lived in Nottingham, England, contacted John Hardy at University College London and asked if he and his team wanted to study her family. Her father was one of 10 siblings, five of whom had developed Alzheimer's disease, and she could trace the disease back for three generations. Their investigation led to the discovery of a gene mutation that, if inherited, always caused the disease. The gene's protein was the amyloid precursor protein, or APP. Every person in that family who inherited the gene overproduced amyloid and got the disease. For the first time, scientists had a clue to what starts the horrendous destruction of brain cells in Alzheimer's disease. And for the first time, by putting that gene mutation in mice, they could study Alzheimer's in a lab animal, look for drugs to block the gene's effects and finally use the tools of science to look for a cure. *GINA KOLATA*

Photo



@ 9 G7-9B79G

<Y`Yb <cWg

7\c`YghYfc` fYgYUfW

Helen Hobbs, a professor at the University of Texas Southwestern Medical Center and a Howard Hughes Medical Institute investigator, and her colleague Jonathan Cohen were intrigued when they read a short paper describing a French family with stunningly high levels of LDL cholesterol, the dangerous kind, and early deaths from heart attacks and strokes. The family members turned out to have a mutation in a gene, PCSK9, whose function was unknown. Dr. Hobbs and Dr. Cohen began to wonder: If too much PCSK9 caused heart disease, would people who made too little be protected? They scrutinized genetic data from a federal study and found that about 2.5 percent of blacks had a mutation that destroyed one copy of the gene; 3.2 percent of whites had a mutation that hobbled a copy of the gene but did not destroy it. In both cases, less PCSK9 was made and LDL levels were low. The people with the mutations seemed almost immune to heart disease, even if they had other risk factors like high blood pressure, smoking or diabetes.

What would happen if someone had both copies of PCSK9 destroyed? Dr. Hobbs found one young woman, an aerobics instructor, without PCSK9. She was healthy and fertile even though her LDL level was 14, lower than seemed possible (the average is 100). That discovery led to a race among drug companies to make cholesterol-lowering drugs that mimicked the effects of the PCSK9 mutations. The result is drugs that can make LDL levels plunge to the 30s, the 20s, even the teens. The first two such PCSK9 inhibitors were approved this year for people with high cholesterol levels who cannot get them down with statins and are at high risk of heart disease. *GINA KOLATA*



Photo



Svante Paabo with a reconstructed Neanderthal skull. Credit Frank Vincken

@ 9 G7 -9B79G

Gj UbhY DUUVc

9j c'i h]cbUfm[YbYh]V0j

There was a time when scientists who study human evolution had to content themselves with bone fragments and stone tools from our distant ancestors. But today, scientists can also browse through the genomes of humans who lived tens of thousands of years ago. No one has done more to bring that ancient DNA back from oblivion than Svante Paabo.

In the early 1980s, Dr. Paabo made his first search for old genetic material in a 2,400-year-old Egyptian mummy. He managed to retrieve a few fragments, which gave him the confidence to search much older fossils — first of animals, and then of ancient humans. In 1997, Dr. Paabo and his colleagues found snippets of DNA in Neanderthal fossils. In recent years, they have managed to reconstruct the entire [genome of a Neanderthal](#) with the same precision as the genome from a living person.

Over and over again, this ancient DNA has surprised Dr. Paabo, the director of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. He and his colleagues have found that [modern humans and Neanderthals interbred](#) at least twice before Neanderthals became extinct 40,000 years ago. They discovered an

extinct lineage of humans called the [Denisovans](#) by extracting DNA from a pinky bone. Now Dr. Paabo is studying the biological differences encoded in the genomes of our extinct relatives, hoping for clues to how we became human. *CARL ZIMMER*

Photo



The Sudbury Neutrino Observatory detector during construction. Credit Sudbury Neutrino Observatory

: I B85A 9BH5@D<MG=7G

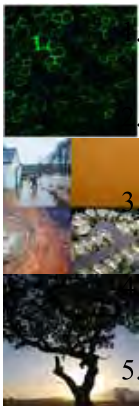
BYi hf]bc <i bhYfgž Vmh\Y <i bXfYXg

BYi hf]bc cgWV`Uh]cbg

Neutrinos are the spooks of the subatomic world, able to sail through walls and our bodies like moonlight through windows, changing identities like spies on the run. Next to photons, which carry light, they are the most abundant of the known particles in the universe, and they are the most elusive.

1. [Science](#)

The Fundamental Physics prize is being awarded to an entire community of some 1,300 physicists who have labored underground in tunnels and caverns over the last decades to investigate these ghostly denizens of the cosmos.



[Gene Editing Offers Hope for Treating Duchenne Muscular Dy](#)

[Climate Chaos, Across the Map](#)

[A Kion Expert Who Isn't Inclined to Turn Tail](#)

[Giant Squid, Elusive Creature of the Deep Gets a Vivid Close-](#)

[Programs Expand Schizophrenic Patients' Role in Their Own C](#)

6. [Vivid Scenes From a Warm December](#)

The neutrino community is having quite a moment. Last month, Dr. Kajita and Dr. McDonald received the Nobel Prize in Physics. *DENNIS OVERBYE*

share

- [LinkedIn](#)
- [Share](#)
- [Google+](#)
- [Twitter](#)
- [Print](#)
- [Link](#)

<http://nyti.ms/1PwMoq3>

- [Save](#)
- [Print](#)



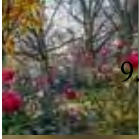
7. [Observatory](#)

[Ants Can Change Their Roles, Study Finds](#)



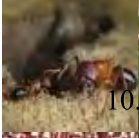
8. [Letter of Recommendation](#)

[Letter of Recommendation: Terro Liquid Ant Bait](#)

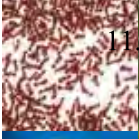


9. [Q. & A.](#)

[A Marine Ecologist Strives to Protect the Seas](#)

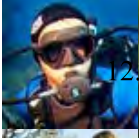


[As Home Births Grow in U.S., a New Study Examines the Risks](#)



11. [Feature](#)

[The Terrible Beauty of Brain Surgery](#)



[In 2015 Obituaries, a Portrait of Eras Grim and Innocent](#)



13. [Reactions](#)

[Letters to the Editor](#)



14. [Observatory](#)

14:9A 5H:7G

[New Type of Rock Is Discovered on Moon](#)



15. [Observatory](#) makes you think of a car engine part first and foremost, let's face it: you're probably not cut out for geometric topology.

[The Residents of Vanuatu, Then and Now](#)



16. [Observatory](#) mathematics, "manifold" refers to any object that seems flat on a small scale. For example, people for centuries thought the earth was flat because on a small scale – at least in a sea around the world. Fine. And circles are one-dimensional manifolds; forms like planes and spheres are two-dimensional manifolds.

[David Cameron Defends Flood Record as Northern England Is](#)



17. [Q&A](#) Agol, a mathematician at the University of California, Berkeley, and the Institute for Advanced Study, focuses primarily on manifolds of four or fewer dimensions, a field of study known as low-dimensional topology. He has handled what the prize foundation called his "spectacular contributions to low-

[The Plant Had a Lovely Striation. Then They Got the Pruning](#)



18. [Take a Number](#) dimensional topology and geometric group theory, including work on the solutions to the tameness, virtual Haken and virtual fibering conjectures."

[3,988,076: The Number of U.S. Births in 2014](#)



19. [Books](#)

[Review: 'Too Much of a Good Thing' Finds a Dilemma in Our](#)



20. [Matter](#)

[Seeking the Gears of Our Inner Clock](#)



21. [Observatory](#)

GET 10 FREE ADOBE STOCK IMAGES.

[How Turkey Vultures Stay Aloft to Focus on Dinner](#)

22. [Sinosphere](#)



11, 2015

[As China Hungers for Coal, 'Behemoth' Studies the Ravages at](#)

Correction:

An article on patients who

about the Breakthrough Prize misidentified the gene that John Hardy discovered a mutation of in Alzheimer's disease. He discovered a mutation in the amyloid precursor protein gene, not presenilin.

23. [Drought Deepens South Africa's Malaise](#)

- [Email](#)
- [Share](#)
- [Tweet](#)
- [More](#)

24. [Robert Spitzer, 83, Dies; Psychiatrist Set Rigorous Standards for](#)

25. [Timothy Peake, British Astronaut, Dials Wrong Number From](#)

More on

[mes.com](#)

26. [N.Y.C. Nature](#)

[The Christmas Fern, a Cold-Weather Frond](#)



27.

[Dr. Alfred G. Gilman, Whose Work on Proteins Won Nobel Prize](#)

28.

[When Gun Violence Felt Like a Disease, a City in Delaware Turned](#)

U.S.

29.

[December Heat Tricks Flowers Into Putting On Spring Display](#)
[t Know How Many Foreign Visitors Overstay Visas](#)

Jan. 1.

30.

[Video: Snow in San Diego, for the Polar Bears](#)

• [Obama](#)

31.

[Brazil's Cereals Reveal Novel Genetic Disruption in DNA](#)

Jan. 1.

32.

[A Fitting End for the Hottest Year on Record](#)

Presidential
gun...

33.

will meet with Attorney General Loretta E. Lynch on Monday to discuss what he can do to curb

[Ban on Microbeads Proves Easy to Pass Through Pipeline](#)

34.

[Leaks in Instrument Force NASA to Delay Mars Mission Until](#)

35.

[Unseasonable Greetings in a New York Searching for Jack Frost](#)

36.

[With In Vitro Fertilization, Persistence Pays Off, Study Suggests](#)

37.

[Op-Docs](#)

[Guns](#)

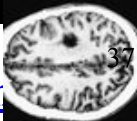
[Why Texas Is Getting Even Friendlier](#)

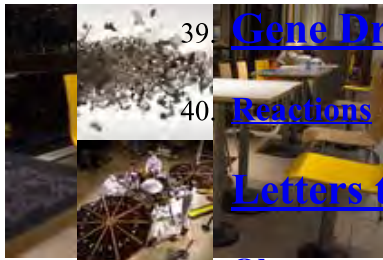
['Animated Life: The Living Fossil Fish'](#)

Dec. 3

38.

[SpaceX Successfully Lands Rocket After Launch of Satellites In](#)





39.

[Gene Drives Offer New Hope Against Diseases and Crop Pests](#)

40.

[Reactions](#)

41.

[Letters to the Editor](#)

41.

[Observatory](#)



Dec. 3

[Homeless Find Shelter Under McDonald's Golden Arches](#)
[Domesticated Dogs Lag in Reproduction](#)



42.

[F.D.A. Ends Ban, Allowing Some Blood Donations by Gay Men](#)

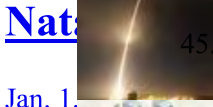
43.

[In Missouri, Fewer Gun Restrictions and More Gun Killings](#)

44.

[Q&A](#)

[Would a Potato Chip Lover Tire of Eating Only Chips?](#)



Jan. 1

[Nat'l Grammy Award-Winning Singer, Dies at 65](#)

[The New Health Care](#)

[Drink to Your Health \(in Moderation\), the Science Says](#)

Site Info

[Navigation](#)

46.

[The Parched West](#)

- © 201
- Home
- Search
- Acces
- Conta
- Work
- Adver
- Your
- Privac
- Terms
- Terms

[York Times Company](#)

[California Wants to Store Water for Farmers, but Struggles On](#)

47.

cerns? Email us at accessibility@nytimes.com. We would love to hear from you.

[Science Fake](#)

[When the Situation Is Fluid, Sit Back and Watch](#)

48.

[After Cecil Furor, U.S. Aims to Protect Lions Through Endang](#)

49.

[Senate Votes to Overhaul Chemical Safety and Ban Beads in B](#)

Site Info

[Navigation](#)

50.

[Revalued](#)

- Site M
- Help
- Site F
- Subsc

[To Achieve Paris Climate Goals, U.S. Will Need New Laws](#)

[Gray Matter](#)

Go to the ne

['Run, Hide, Fight' Is Not How Our Brains Work](#)

[Wind Power Spreads Through Turbines for Lease](#)

[Raw Data](#)

[In Developing World, Cancer Is a Very Different Disease](#)

Play Video