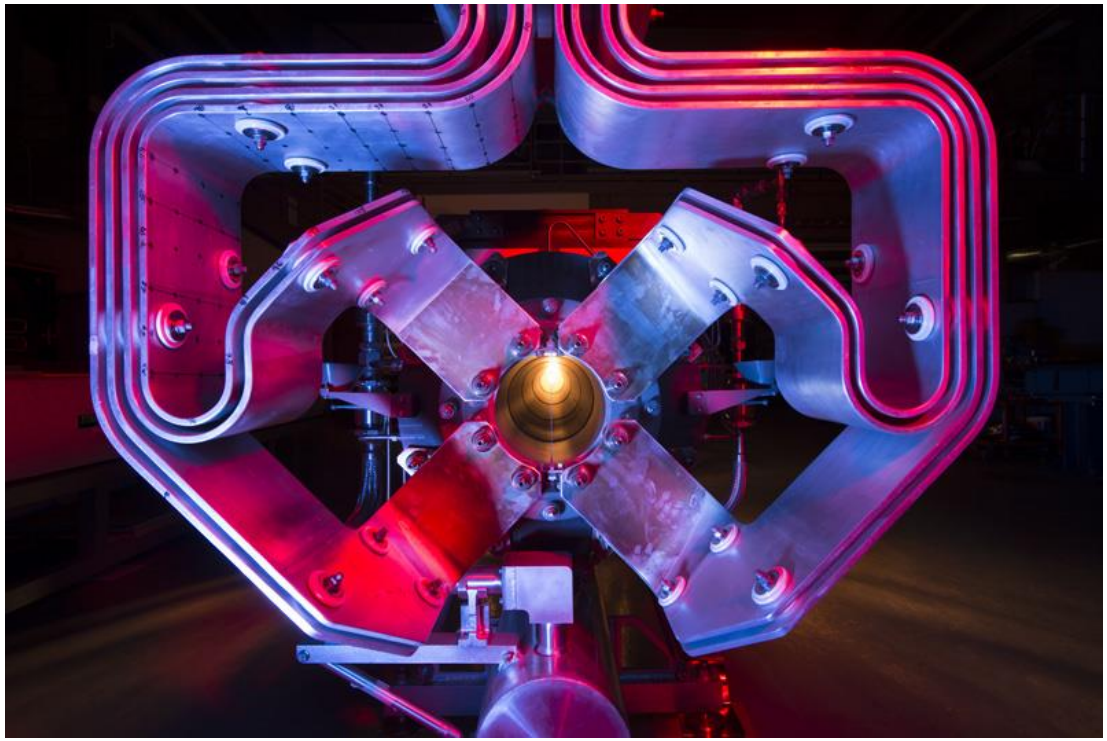
What's new at Fermilab?

Office of Communication
Tracy Marc, media relations manager
March 23, 2023

Science news

MINERvA reveals a new way to explore proton's structure with neutrinos yields first results



One of two magnetic focusing horns used in the beamline at Fermilab that produces intense neutrino beams for MINERvA and other neutrino experiments.

Science news

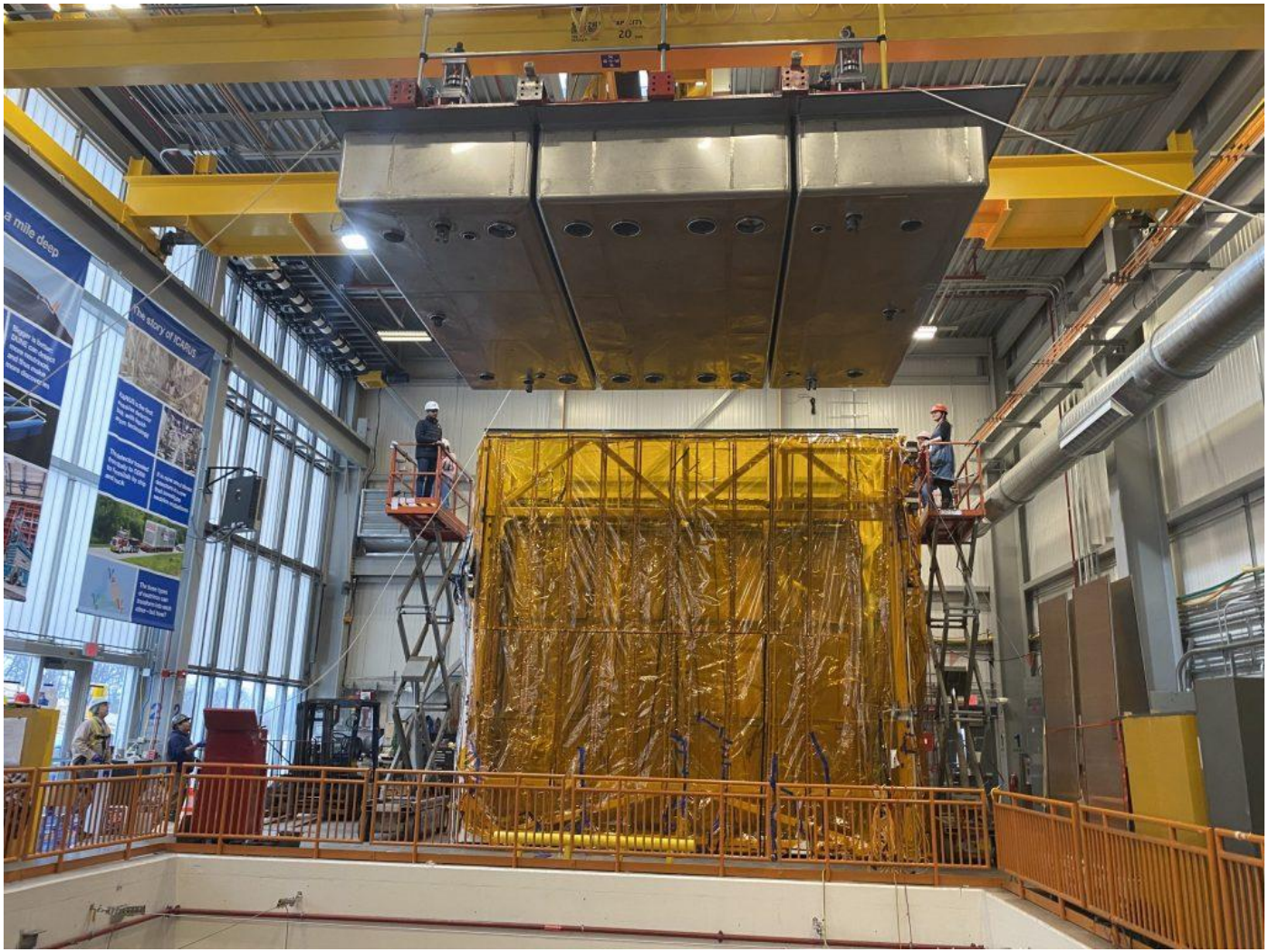
Scientists release newly accurate map of all the matter in the universe

Scientists combined data from two very different telescope surveys: The Dark Energy Survey and the South Pole Telescope.

DUNE update

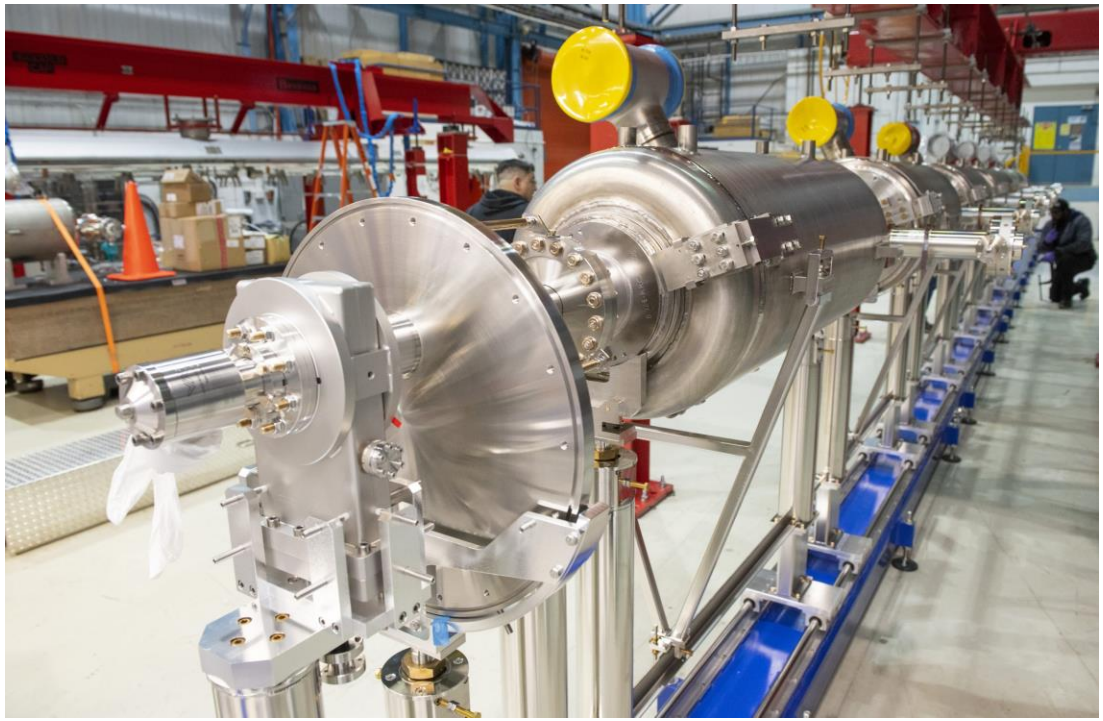
Mary Bishai joins Sergio Bertolucci as co-spokesperson of DUNE

DUNE – SBND update



PIP II update

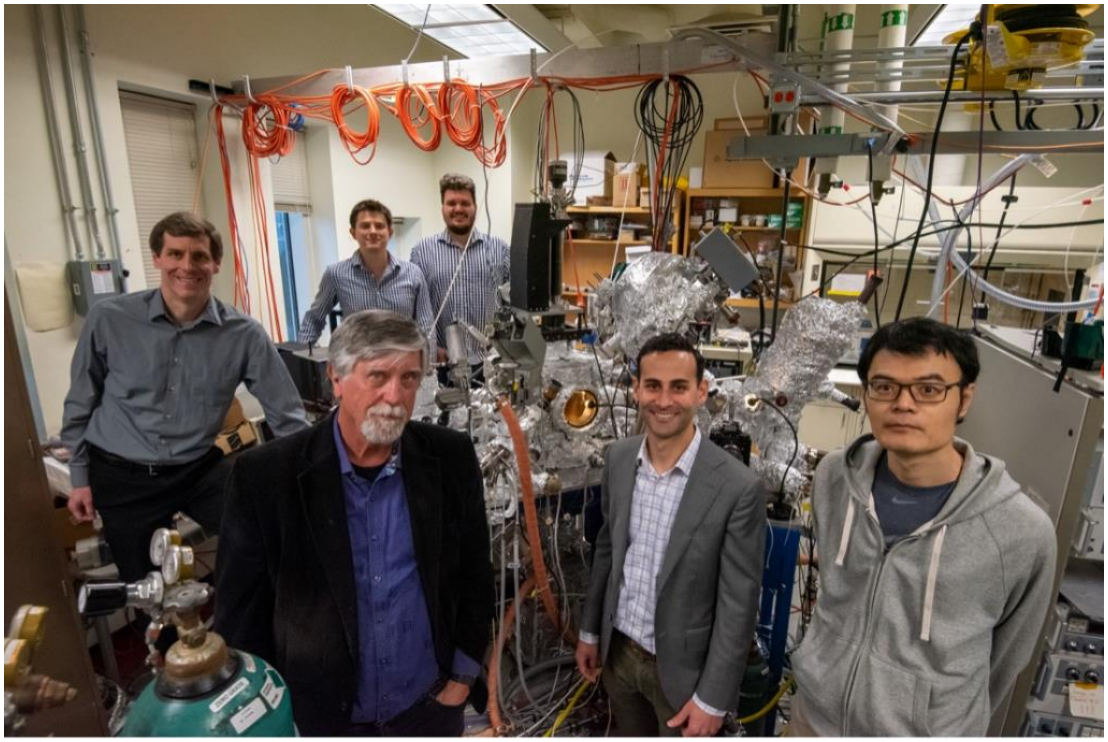
Fermilab completes the first-of-its-kind prototype of a superconducting accelerator module



The new high-beta 650-megahertz, or HB650, cryomodule is the longest and largest cryomodule in PIP-II. It is a 10-meter-long cylinder, weighing approximately 27,500 pounds.

Quantum update

Quantum researchers strike the right chord with silicides



Fermilab's silicide research team discovered how silicides impact the performance of certain qubits.

Fermilab news

New STEM program for high school girls comes to Fermilab

Science Accelerating Girls' Engagement (SAGE) provides high school girls the opportunity to connect with professional leaders to learn about potential career paths through activities, discussions, lab tours and career talks.

Fermilab news

Fermilab welcomes a new chief financial officer

Teresa Nightengale began her new role as Fermilab's new chief financial officer and senior director of the finance and procurement division in late February.

Fermilab news

Fermilab to host Pathway Summer School program

RENEW Pathway Summer Schools aim to diversify the STEM pipeline via hands-on learning opportunities through awards for five programs at six national laboratories.

New stories in symmetry

dimensions of particle physics

How to put together an international physics experiment

03/14/23 | By Madeleine O'Keefe

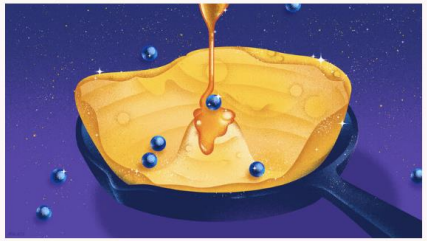
To build the DUNE neutrino experiment and its associated accelerator upgrade, experts invent customized ways to transport fragile, expensive and highly specialized components.

03/07/23

Do hidden influences give neutrinos their tiny mass?
The quest to understand the small mass of neutrinos is also a quest to discover new particles.

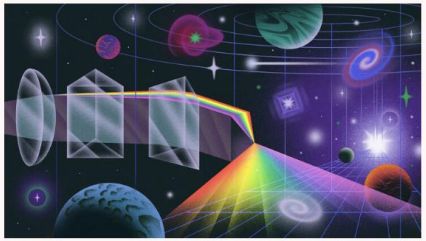
02/28/23

Kétévi Assamagan pays it forward
Kétévi Assamagan's contributions to physics go beyond his research at the Large Hadron Collider.



02/21/23

What the Higgs boson tells us about the universe
The Higgs boson is the only fundamental particle known to be scalar, meaning it has no quantum spin. This fact answers questions about our universe, but it also raises new ones.

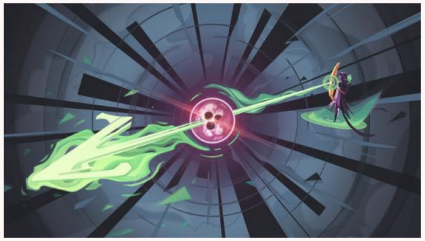


02/14/23

Creating the next 3D maps of the universe
Scientists have proposed new instruments that would use spectroscopy to decode dark matter, dark energy and cosmic inflation.

02/07/23

How to do particle physics in a climate emergency
Scientists in the particle physics community are bringing environmental and climate issues to the table in discussions about future research.



02/01/23

A new way to explore proton's structure with neutrinos yields first results
Physicists used MINERvA, a Fermilab neutrino experiment, to measure the proton's size and structure using a neutrino-scattering technique.

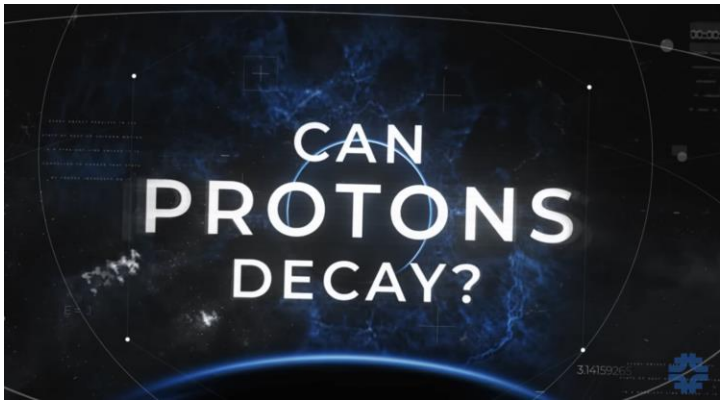
01/31/23

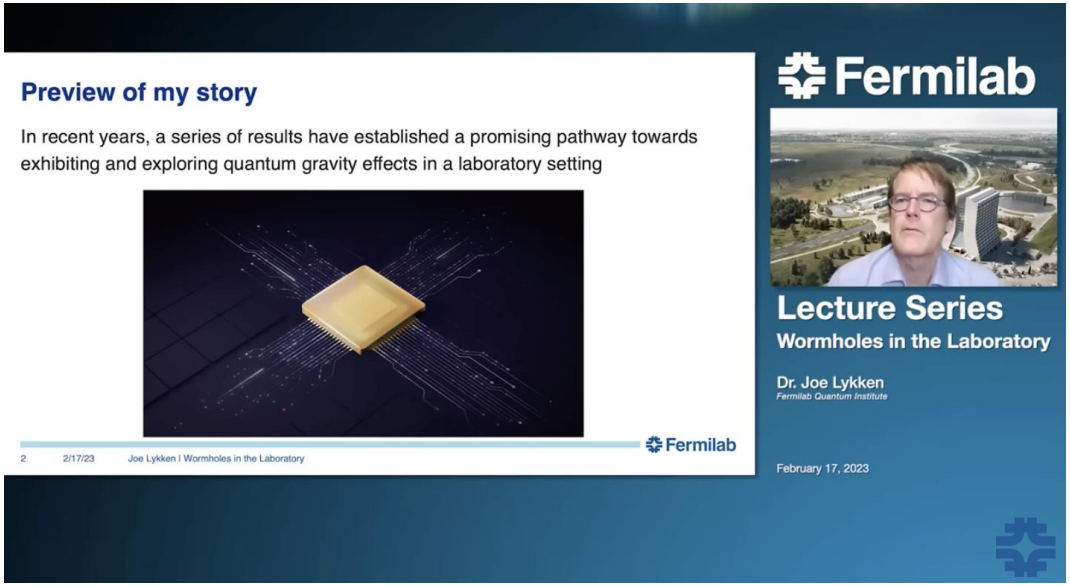
Proposed experiment seeks origin of cosmic neutrinos
Most astronomers trek to the mountaintops to study the stars, but a group of physicists are seeking the secrets of the cosmos with a detector at the bottom of the ocean.

01/24/23

Ways to weigh a neutrino
For decades scientists have tried to find a way to measure the mass of the lightest matter particle known to exist. Three new approaches now have a chance to succeed.

New Fermilab videos on YouTube





Fermilab in the news

Daily Herald
Suburban Chicago's Information Source

Addison Elementary District 4 hosts a night of science fun

Fermilab's Jerry Zimmerman, "Mr. Freeze," does experiments in front of a gym full of students and families during the annual "Science Fun Night." *(Courtesy of Addison Elementary District 4)*

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APSNews

April 2023 (Volume 32, Number 4)

This Summer, Particle Physicists Will Prioritize Projects for the Field's Future

The P5 panel is gathering information that will shape its recommendations.

By Daniel Garisto | March 16, 2023

Credit: Samuel Joseph Hertzog / CERN

A tunnel at CERN's Large Hadron Collider in 2021.

The future of particle physics in the U.S. hinges on what Hitoshi Murayama, a theoretical particle physicist at the University of California, Berkeley, and 30 other members of the Particle Physics Projects Prioritization Panel (P5) decide later this summer.

Last year, particle physicists conducted the Snowmass 2021 process (it was delayed until 2022 by the

April 2023 (Volume 32, Number 4)

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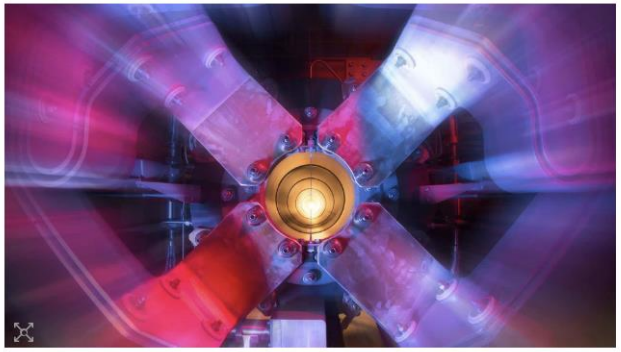
Fermilab in the news

PARTICLE AND NUCLEAR | RESEARCH UPDATE

Neutrinos probe the proton's structure in surprising measurement

08 Mar 2023



Proton probe: the MINERvA experiment at Fermilab has been used to study the structure of the proton using neutrinos. (Courtesy: Reidar Hahn/Fermilab)

Following a bold suggestion from a postdoc researcher, an international team has discovered a robust technique for probing the internal structure of the proton by using neutrino scattering. Teijin Cai at the University of Rochester and colleagues working on Fermilab's MINERvA experiment have showed how information about the proton can be extracted from neutrinos that have been scattered by the detector's plastic target.

As early as the 1950s, physicists were using high-energy electron beams to determine the size of the proton. By measuring how these electrons scatter from targets, researchers have since managed to probe the interior structure of the proton and measure the charge distributions of their constituent quarks in detail.

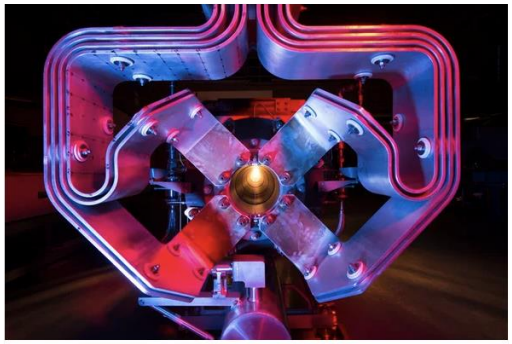
In principle, similar measurements should also be possible using a beam of neutrinos, such as the beam generated at Fermilab. Despite being chargeless and almost massless, a tiny fraction of neutrinos in a beam will interact with protons, and scatter at characteristic angles. If this scattering can be measured, it would not only complement electron scattering experiments in probing proton structures; it may also

PARTICLE PHYSICS

How Big Is a Proton? Neutrinos Weigh In

irst-of-its-kind probe brings physicists one step closer to solving the proton radius puzzle

By Anashe Bandari on March 16, 2023



One of two magnetic focusing horns used in the beamline at Fermilab that produces intense neutrino beams for MINERvA and other neutrino experiments. Credit: Reidar Hahn/Fermilab

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How Big Is the Proton? Particle-Size Puzzle Leaps Closer to Resolution
Davide Castelvecchi and Nature magazine

SPACE & PHYSICS
Ultraprecise Measurement Pinpoints the Proton's Size
Dan Falk

THE SCIENCES
The Proton Radius Puzzle
Jan C. Bernauer and Randolf Pohl

Fermilab in the news

Workshop celebra parceria entre Unicamp e Fermilab (EUA)

Autoria Felipe Mateus | **Fotos** Felipe Bezerra | **Edição de imagem** Alex Calixto | Paulo Cavalheri

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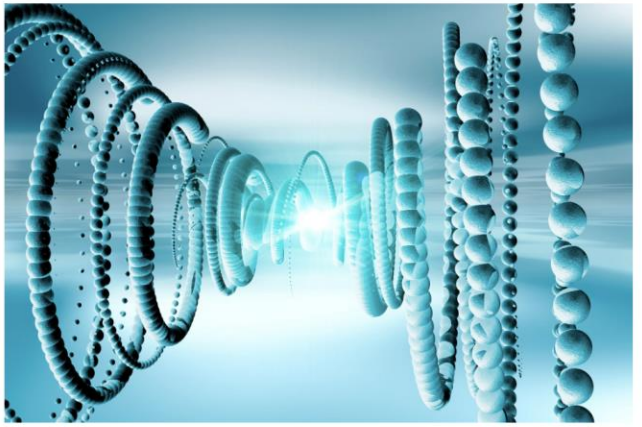
Home › Science › Neutrinos could explain why the Universe didn't just disappear after the Big Bang

Neutrinos could explain why the Universe didn't just disappear after the Big Bang

Studying the fundamental particles known as neutrinos could reveal why there is any matter in the Universe at all.



Fermilab in the news

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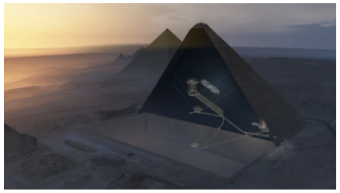
HARD SCIENCE — MARCH 4, 2023

Cosmic rays passing through Great Pyramid help reveal hidden corridor

A non-invasive method for looking inside structures is solving mysteries about the ancient pyramid.



Credit: ScanPyramids

KEY TAKEAWAYS

● The Great Pyramid is the last standing structure of the Seven Wonders of the Ancient World. ● Mysteries still remain about what's inside the pyramid. ● Building upon previous research, a recent study unveiled new details about the internal structure of the pyramid by using a non-invasive technique called muon tomography.

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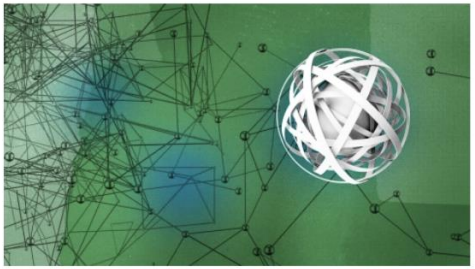
HARD SCIENCE — FEBRUARY 15, 2023

An attempt to solve a quantum problem just deepens the mystery

Recent measurements of subatomic particles don't match predictions stemming from the Standard Model.



Annelisa Leinbach, VAlex / Adobe Stock

KEY TAKEAWAYS

Fermilab in the news

Kane County Magazine, February 2023

FOR THE LOVE OF

SCIENCE

Fermilab inspires future generations of scientists

By Kevin Druley ■ Photos by Ryan Postel

Asked what she feels most people think of when they hear "Fermilab," the familiar name for the U.S. Department of Energy's Fermi National Accelerator Laboratory, Becky Thompson hardly hesitates.

"I would hope, and I expect that they're thinking about our cutting-edge science, all the amazing things that we're doing," said Thompson, who heads Fermilab's office of education and public outreach. "How we're exploring the fundamental properties of the universe. How we're exploring fundamental particles."

Of course, of course. But isn't there a herd of American plains bison on the campus of the Batavia facility? And isn't it chronicled by a 24/7 webcam?

Why, yes. "Very famous," Thompson smiles.

Fermilab encourages visitors regardless of their knowledge on the country's premier national lab for particle physics research. That includes those who may feel perplexed by science in general, let alone physics, the study of how matter and energy interact.

"Everyone's a scientist; they just might not know it," Thompson said. "And I, in my career, want to unlock that knowledge in everybody else."

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Fermi National Accelerator Laboratory

VISIT FERMILAB

- Outdoor visiting hours: Dawn to dusk daily
- Lederman Science Center: 9 a.m.-5 p.m. Monday-Friday; 9 a.m. - 3 p.m. Saturdays; closed Sundays and holidays

For more information on visiting the facility, go to www.fnal.gov/pub/visiting/hours/index.html.

'I WANT TO DO THAT, TOO'

In Thompson's view, anyone who ever tested something to get a result or viewed the world critically befits the scientist label.

Her personal catalyst for wanting to hold that distinction? Witnessing the famed double-slit experiment in her high-school physics class. "Seeing something so tangible that kind of broke my brain was amazing," Thompson said.

Fermilab senior scientist Don Lincoln attributes his career arc to being "inherently curious" during childhood, adolescence and onward. He started with dinosaurs, moved on to astronauts and went from there.

Routinely reading the works of science writers Carl Sagan, Isaac Asimov, and George Gamow while growing up influenced Lincoln as well.

"These were people with traditional, precise scientific training who were able to write in such a way that could excite me back when I was a kid," he said. These days, Lincoln repays his science studies while simultaneously paying it forward, authoring numerous books and articles while helping produce hundreds of science education videos.

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Questions?