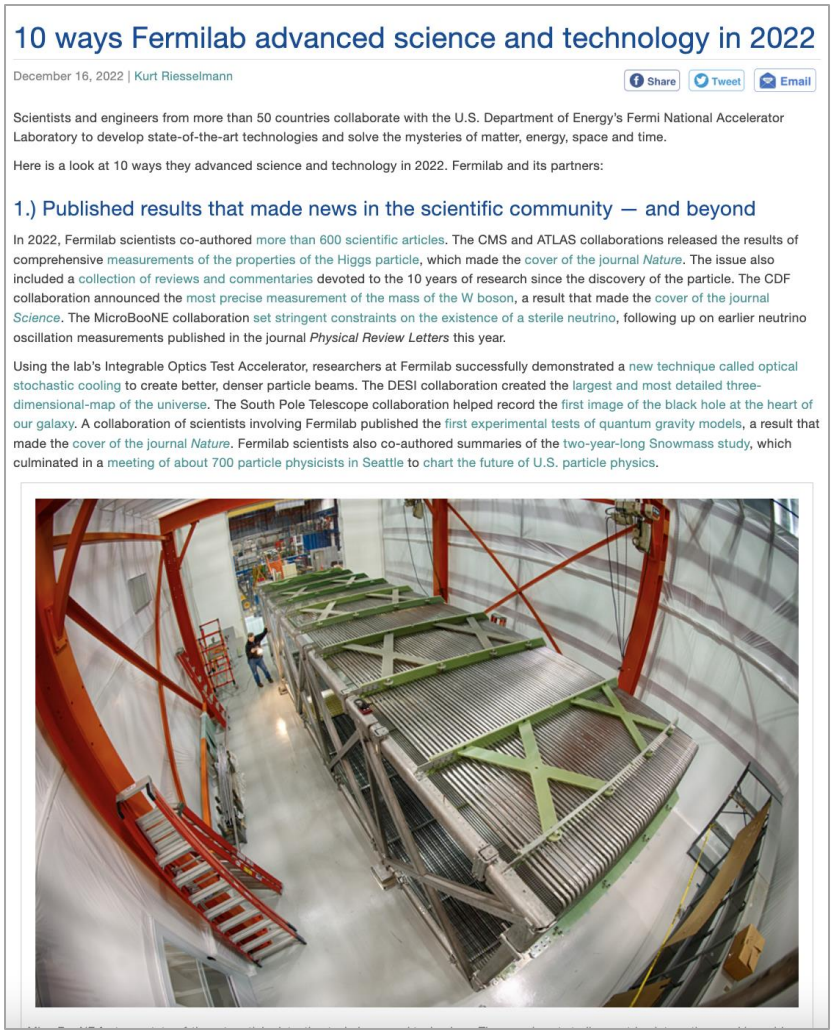
What's new at Fermilab?

Office of Communication
Tracy Marc, media relations manager
January 26, 2023

Happy New Year and a look back at 2022

https://www.youtube.com/watch?v=Q27Yik2pckM



10 ways Fermilab advanced science and technology in 2022

December 16, 2022 | Kurt Riesselmann

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Scientists and engineers from more than 50 countries collaborate with the U.S. Department of Energy's Fermi National Accelerator Laboratory to develop state-of-the-art technologies and solve the mysteries of matter, energy, space and time.

Here is a look at 10 ways they advanced science and technology in 2022. Fermilab and its partners:

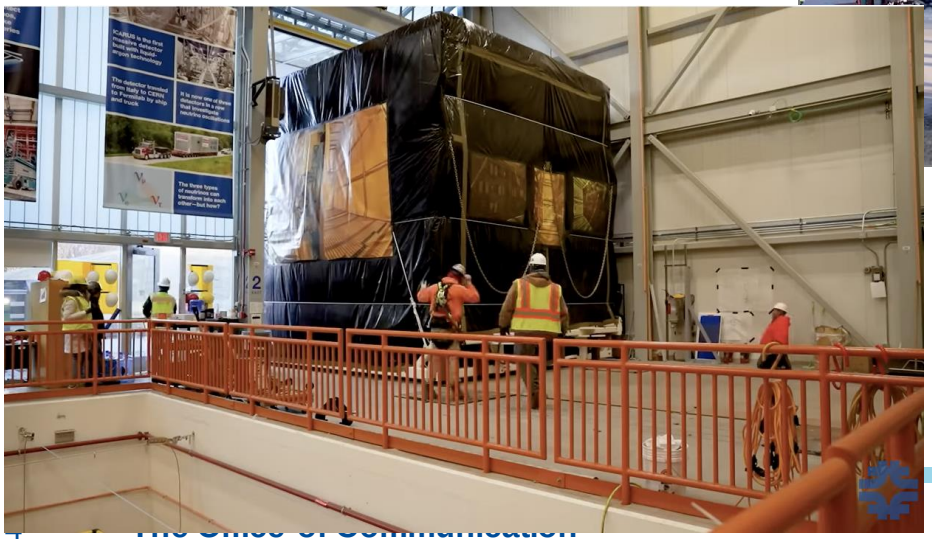
1.) Published results that made news in the scientific community — and beyond

In 2022, Fermilab scientists co-authored more than 600 scientific articles. The CMS and ATLAS collaborations released the results of comprehensive measurements of the properties of the Higgs particle, which made the cover of the journal *Nature*. The issue also included a collection of reviews and commentaries devoted to the 10 years of research since the discovery of the particle. The CDF collaboration announced the most precise measurement of the mass of the W boson, a result that made the cover of the journal *Science*. The MicroBooNE collaboration set stringent constraints on the existence of a sterile neutrino, following up on earlier neutrino oscillation measurements published in the journal *Physical Review Letters* this year.

Using the lab's Integrable Optics Test Accelerator, researchers at Fermilab successfully demonstrated a new technique called optical stochastic cooling to create better, denser particle beams. The DESI collaboration created the largest and most detailed three-dimensional-map of the universe. The South Pole Telescope collaboration helped record the first image of the black hole at the heart of our galaxy. A collaboration of scientists involving Fermilab published the first experimental tests of quantum gravity models, a result that made the cover of the journal *Nature*. Fermilab scientists also co-authored summaries of the two-year-long Snowmass study, which culminated in a meeting of about 700 particle physicists in Seattle to chart the future of U.S. particle physics.

SBND detector move, December 1

SBND detector move, December 1



SBND detector move, December 1 media coverage

Quantum update: It's colossal: Creating the world's largest dilution refrigerator

Quantum update: Fermilab and collaborators lead work on quantum gravity tests

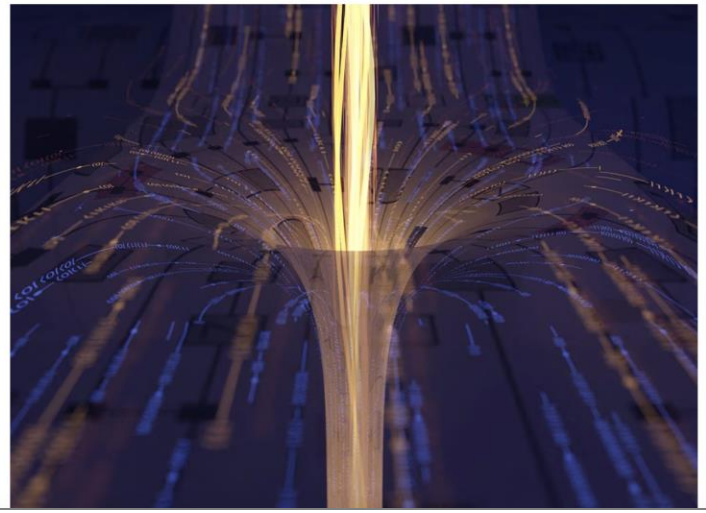
The New York Times

REUTERS®

World Business Legal Markets More

Scientists build 'baby' wormhole as sci-fi moves closer to fact

By Will Dunham



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Article | Published: 30 November 2022

vormhole dynamics on a quantum

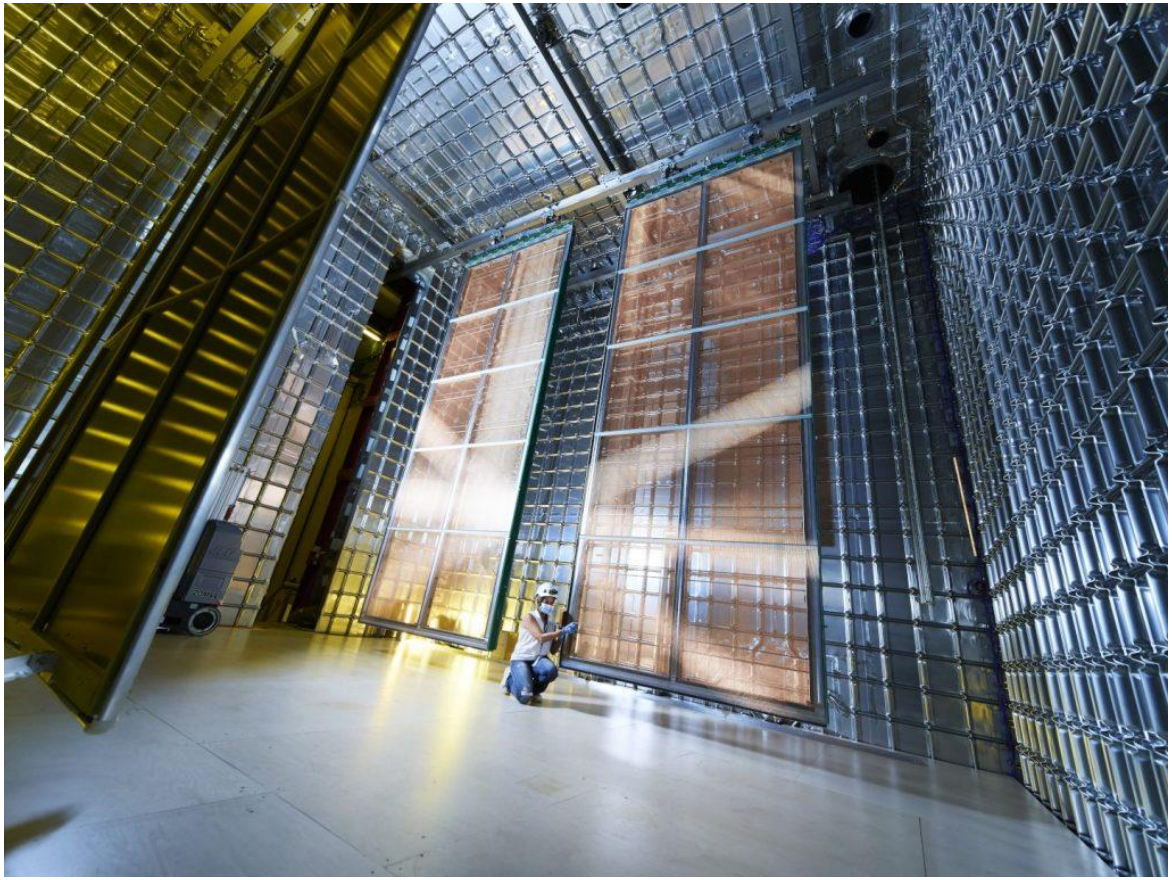
r Zlokapa, Joseph D. Lykken, David K. Kolchmeyer, Samantha I. Davis, Nikolai Maria Spiropulu

2) | Cite this article

ions | 1622 Altmetric | Metrics

iple, theorized to be a property of quantum gravity, postulates that the e of space can be encoded on a lower-dimensional boundary. The anti- mal field theory correspondence or duality[1] is the principal example of dev–Ye–Kitaev (SYK) model of $N \gg 1$ Majorana fermions[2,3] has features ce of a gravitational dual in AdS_2, and is a new realization of voke the holographic correspondence of the SYK many-body system ne conjectured ER=EPR relation between entanglement and spacetime ne traversable wormhole mechanism as implemented in the SYK

DUNE update - First DUNE science components arrive at SURF



Standing a staggering 19.7 feet tall and 7.5 feet wide, the APAs are the largest and one of the most fragile components of DUNE. Photo: CERN

DUNE update – Excavation halfway complete

When complete later this year, this cavern will be around 500 feet long, 65 feet wide and 90 feet high. It will be one of three caverns that will provide space to house particle detector modules and other equipment for the Deep Underground Neutrino Experiment. Photo: David Smith, Fermilab

PIP II update – Practice “dummy load” between Chicago and the UK

The frame boards the cargo plane at O’Hare. Photo: Brian Hartsell, Fermilab

PIP II update – Construction contract awarded for particle accelerator complex at Fermilab

A contractor was awarded the contract to build the Linac Complex for the Proton Improvement Plan II project, or PIP-II. An artistic rendering of the PIP-II campus at Fermilab. Image: Fermilab

Science news – Searching in the deep for rare, charming Higgs decays at the LHC

Nhan Tran and Nicholas Smith provided analysis on this study.
Photo: CMS collaboration

Other news – IERC name resolution

Information on the coronavirus available here

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12.01.22

Durbin, Duckworth, Foster, Underwood Introduce Legislation To Name Fermilab Research Center After Renowned Physicist Dr. Helen Edwards

WASHINGTON – U.S. Senate Majority Whip Dick Durbin (D-IL), U.S. Senator Tammy Duckworth, and U.S. Representatives Bill Foster (D-IL-11) and Lauren Underwood (D-IL-14) today introduced legislation to rename Fermilab's Integrated Engineering Research Center (IERC) after the late Dr. Helen Edwards, who worked at Fermilab as a particle physicist for 40 years. The newly-constructed IERC, which was recently authorized for official use, will be home to new office and lab space that will host an intersection of scientific disciplines.

"Dr. Helen Edwards was an exceptional scientist who dedicated 40 years of her life to expanding our understanding of particle physics. Her pioneering work on the Tevatron earned her well-deserved national recognition and provided the foundation for the advanced particle physics research conducted at Fermilab today," said Durbin. **"I cannot think of a worthier namesake for Fermilab's new IERC than Dr. Helen Edwards."**

"Illinois's own Fermilab is a crown jewel of American innovation at the forefront of cutting-edge science," Duckworth said. **"For years, hundreds of scientists and engineers at Fermilab have dedicated their expertise to scientific discovery and answering some of the world's most complicated questions, including the late and brilliant Dr. Helen Edwards. Not only is**

On Dec. 1, Senator Durbin introduced legislation to rename Fermilab's Integrated Engineering Research Center (IERC) after the late Dr. Helen Edwards, who worked at Fermilab as a particle physicist for 40 years.

Fermilab news – Fermilab's 2023 guest composer, Roger Zare

Roger Zare creates compositions for full orchestras, wind ensembles and single instruments, while serving as a visiting assistant professor of music at the Hayes School of Music at Appalachian State University.

Fermilab news – Fermilab's 2023 artist-in-residence, Ricardo Mondragon

Mondragon is a visual artist who takes inspiration from harmonies in physics and transforms them into materials.
He was born and raised in Mexico and graduated from Columbia College, Chicago.

New stories in symmetry
dimensions of particle physics

Ways to weigh a neutrino

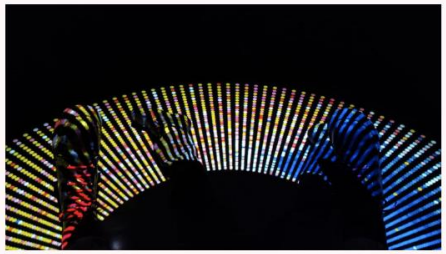
01/24/23 | By Elise Overgaard

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

01/17/23

Energy consumption, cost considerations could shape future of accelerator R&D

A recent report underscores the importance of energy consumption and cost to decisions about future large-scale particle accelerator projects.



01/10/23

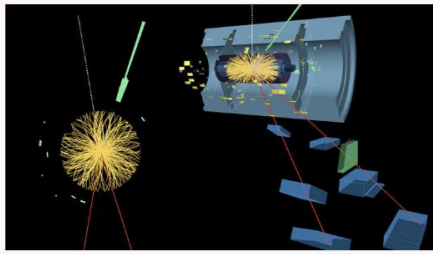
Feeling the universe in the 'Particle Shrine'

A physicist, a composer and a creative technician team up to translate the unseen particles around us into a format that human bodies can understand.

12/06/22

Physics books of 2022

This year's list includes a book about an eminent physicist striving to avoid fame, two unique books for children, and a book with equations you'll actually be able to read.



11/29/22

First-time ATLAS measurement provides new look at Higgs

For the first time, physicists have a statistically significant measuremen of the joint polarization of W and Z bosons.

11/22/22

Finding art in astrophysics technology

LSST Camera images provide the inspiration for artist Lennart Lahuis's "Astromelancholia."

11/15/22

Madagascar's path to neutrino physics

Laza Rakotondravohitra was the first Malagasy grad student to conduct research in neutrino physics. He and others are working to ensure he will be far from the last.

11/08/22

Parenting in physics

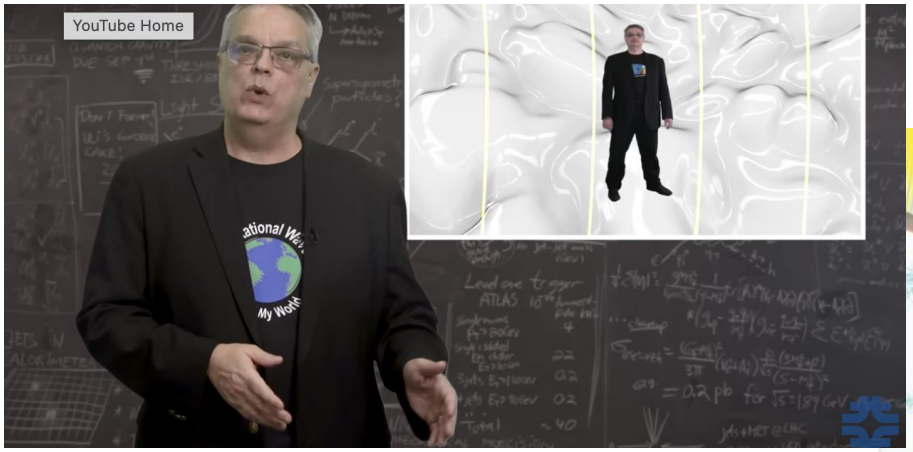
Scientists discuss the challenges of being caregivers in physics and some ways they've seen the field change for the better.

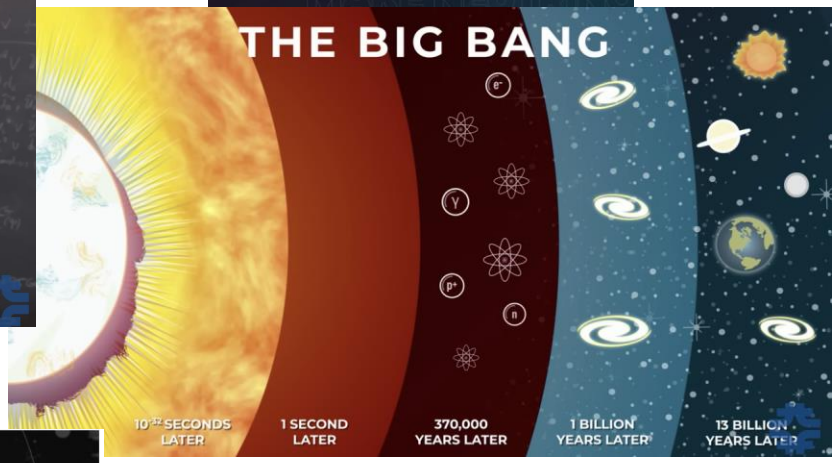
11/01/22

How to maintain a physics experiment in a desert

Threats of scorching heat, walls of tumbleweed, and countless critters mean innovation is a must for the facilities manager for LIGO Hanford Observatory.

New Fermilab videos on YouTube





Fermilab in the news

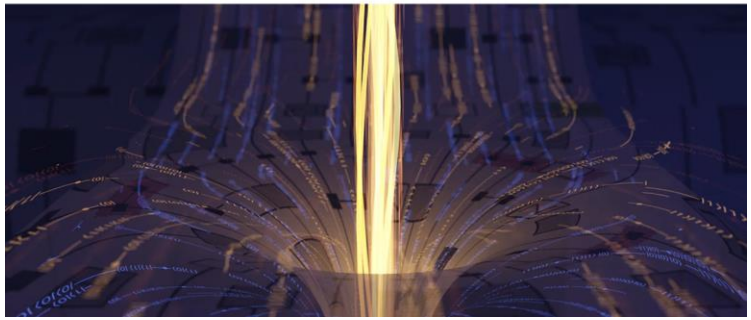
POPULAR SCIENCE

Scientists modeled a tiny wormhole on a quantum computer

It's not a real rip in spacetime, but it's still cool.

BY CHARLOTTE HU | PUBLISHED DEC 1, 2022 5:30 PM

TECHNOLOGY SCIENCE



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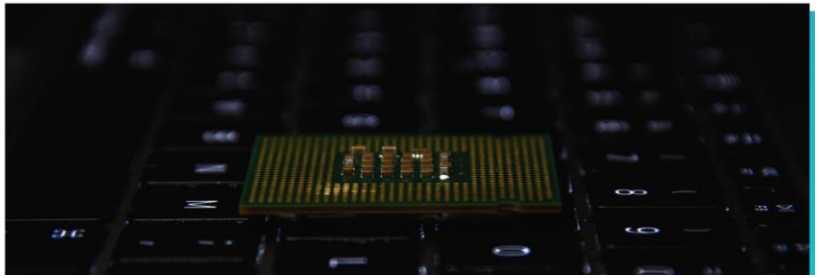
WORLD REIMAGINED

What Is Quantum Computing and How Will It Transform the Future?

CONTRIBUTOR
Lenore Elle Hawkins

PUBLISHED
DEC 15, 2022 11:54AM EST

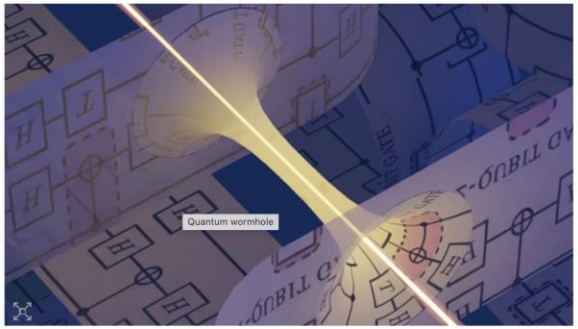


physicsworld

QUANTUM COMPUTING | RESEARCH UPDATE

Quantum teleportation opens a 'wormhole in space–time'

30 Nov 2022



Teleporting qubits: artist's impression a wormhole created in a quantum processor. (Courtesy: A Mueller/Caltech)

The equivalent to a wormhole in space–time has been created on a quantum processor. Researchers in the US used an advanced quantum teleportation protocol to open the wormhole and send quantum signals through it. By studying the dynamics of the transmitted

NEW ATLAS

PHYSICS

Traversable wormhole recreated in a quantum computer for first time

Fermilab in the news

msn

8 times physics blew our minds in 2022

4. Scientists send information through the first simulation of a holographic wormhole

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NewScientist

Biggest science news stories of 2022 as chosen by New Scientist

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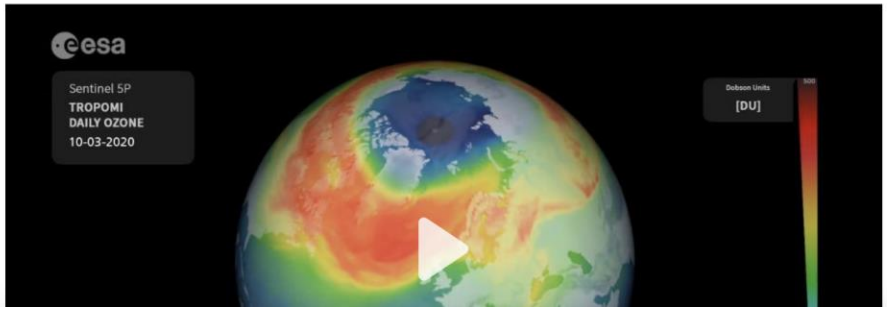
BIG THINK

CNN Opinion Political Op-Eds Social Commentary

Opinion: Finally, good news that inspires some hope for climate change

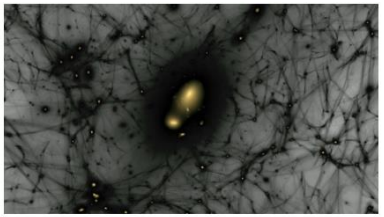
Opinion by Don Lincoln
Published 4:07 PM EST, Fri January 13, 2023



HARD SCIENCE — JANUARY 6, 2023

The case for dark matter has strengthened

Though a single measurement is not enough to definitively decide the debate, this is a major win for dark matter proponents.

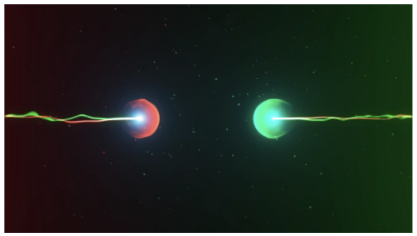


Credit: Ralf Kaehler / SLAC National Accelerator Laboratory

HARD SCIENCE — JANUARY 10, 2023

New physics? Ultra-precise measurement in particle physics confounds scientists

The difference between predictions and observations of the magnetic properties of muons suggests a mystery for the Standard Model.



Credit: flashmovie / Adobe Stock

Fermilab in the news

yahoo!news

COD Fashion Students Design PPE for Fermilab's Boston Dynamics Spot Robot

College of DuPage Fashion Design Students Meet SPOT the Fermilab Robot

Fermilab in the news

Black Hills Pioneer
First DUNE science components arrive at SURF

Black Hills Pioneer
The making of DUNE

The Rapid City Journal – Jan. 12
DUNE physics experiment taking shape underground

Questions?