# What's new in Fermilab news?

Rebecca Thompson

7/23/2020

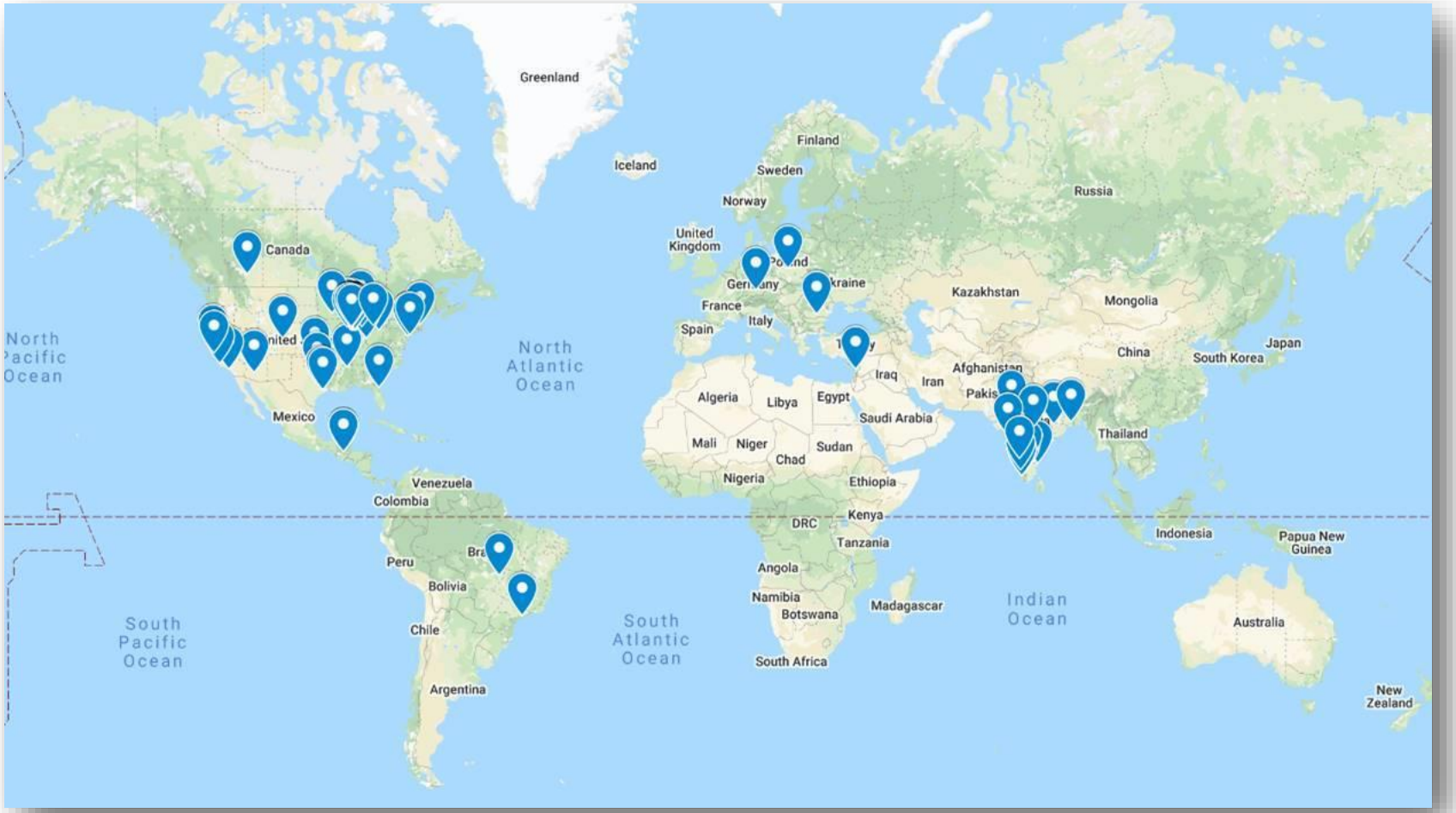
# Bison Count

- 42 Bison
- 2 Bull-1 Yearling
- 26 Females-14 cow and 12 heifers
- 13 calves with potentially 2 more on the way

# Fermilab at Home

- 16 new YouTube Videos, 2.75 million total views, 24,000 new subscribers
- 3.6 Million Twitter Impressions, 12,000 clicks, and 3,000 retweets
- Fermilab Trivia Contest! Next one is on Aug. 15th at 1pm. Register here: https://ed.fnal.gov/events/trivia/index.shtml
- Arts and Lecture @ Home Gallery Talk with Eric Coles: 200 attendees
- Arts and Lecture @ Home: Tickets available for July 31st Event
- Summer Science Series: Next event July 26th at 1pm

# International Reach for Gallery Talk



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# LBNF/DUNE

PHYSICS TODAY

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During the COVID-19 pandemic, *Physics Today* is providing complimentary access to its entire 72-year

Home > Physics Today > Volume 73, Issue 6 > 10.1063/PT.3.4494

01 JUNE 2020 • page 14

## Accelerator experiments are closing in on neutrino *CP* violation

It's starting to look like neutrinos and antineutrinos aren't exact mirror images of each other.

Johanna L. Miller

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Physics Today 73, 6, 14 (2020); https://doi.org/10.1063/PT.3.4494

Somewhere in the laws of physics, particles must be allowed to behave differently from their antiparticles. If they weren't, the universe would contain equal amounts of matter and antimatter, all the particles and antiparticles would promptly annihilate one another, and none of us would exist.

## Crews create a blast to take the Deep Underground Neutrino Experiment to the next stage

June 24, 2020 | Lauren Biron and Leah Hesla

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It started with a blast.

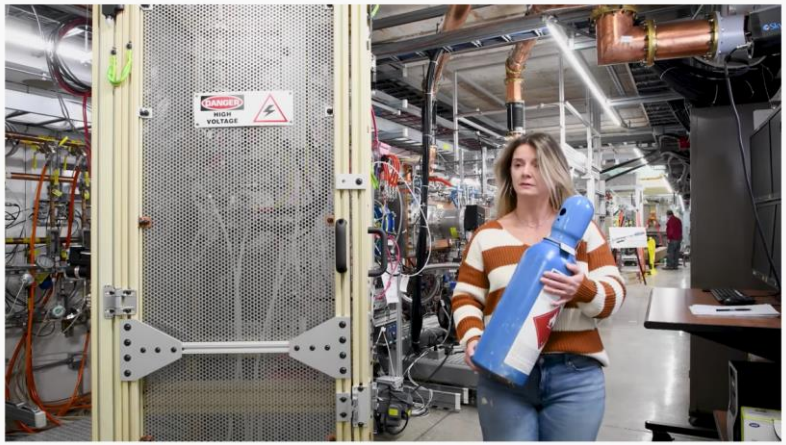
On June 23, construction company Kiewit Alberici Joint Venture set off explosives 3,650 feet beneath the surface in Lead, South Dakota, to begin creating space for the international Deep Underground Neutrino Experiment, hosted by the Department of Energy's Fermilab.

The blast is the start of underground excavation activity for the experiment, known as DUNE, and the infrastructure that powers and houses it, called the Long-Baseline Neutrino Facility, or LBNF.

Situated a mile deep in South Dakota rock at the Sanford Underground Research Facility, DUNE's giant particle detector will track the behavior of fleeting particles called neutrinos. The plan for the next three years, is that workers will blast and drill to remove 800,000 tons of rock to make a home for the gigantic detector and its support systems.

"The start of underground blasting for these early excavation activities marks not only the initiation of the next major phase of this work, but significant progress on the construction already under way to prepare the site for the experiment," said Fermilab Deputy Director for LBNF/DUNE-US Chris Mossey.

# PIP-II





## Accelerating science globally: PIP-II engineers continue designs for particle-propelling machine from home

June 8, 2020 | Jerald Pinson

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With people around the world working from home during these unprecedented times, many Fermilab employees are working remotely, and this includes work on the design of Fermilab's PIP-II accelerator. While certain aspects of the accelerator project can be carried out only in a laboratory, such as making and testing components, the international team of engineers and scientists can advance other aspects, like component design and working on the machine's detailed blueprints, from their home offices.

In many ways, years of videoconferencing with their international partners has prepared the team to continue making progress from home.

This is especially true for those who are designing the PIP-II cryomodules, large metal structures that keep superconducting accelerator components chilled to just a few degrees above absolute zero as they propel protons to close to the speed of light. Researchers and engineers from five countries have been collaborating on the design and construction of these cryomodules, work that has remained relatively uninterrupted during the lab's teleworking period.




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# Strike for Black Lives

## *For a Day, Scientists Pause Science to Confront Racism*

Scholars said they would not hold classes or lectures on Wednesday, and leading journals and scientific associations said they would not announce most breakthroughs.

Brian Nord, center, is a physicist at Fermi National Accelerator Laboratory. "We need to rethink what scientific collaborations should look like," he said. "Black people need a seat at the table." Bailey Bedford/Fermilab

NEWS · 09 JUNE 2020

## Thousands of scientists worldwide to go on strike for Black lives

Academics and scientific organizations will stop research activities on 10 June to reflect and take action on systemic inequalities in science.

Nidhi Subbaraman


People have marched worldwide to protest against the death of George Floyd at the hands of police in Minneapolis, Minnesota. Credit: David Cliff/SOPA Images/LightRocket via Getty

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# Neutrino 2020

## Neutrino 2020 kicks off June 22

June 17, 2020

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### Media contact

- Lauren Biron, Fermi National Accelerator Laboratory, media@fnal.gov


A record 2,700-plus registrants from around the world will gather online from June 22 to July 2 for Neutrino 2020, the biggest conference in neutrino physics. This year the event is hosted by the Department of Energy's Fermilab and the University of Minnesota. The meeting brings together experts in the field to share the latest findings and future plans in neutrino research.

Neutrinos are exciting and enigmatic particles that may hold clues to some of the big mysteries in physics. They've been a hot topic in both science and the news recently. Signals of unexpectedly energetic neutrinos arrived in Antarctic weather balloons. Data have shown hints that neutrinos and their antimatter twins may not act as expected, a potential tie to why the universe is so full of matter. Enormous international collaborations are building gigantic experiments to better understand the little particle.

"Neutrinos are such an interesting avenue of research to explore because they hold so many secrets," said Steve Brice, a scientist at Fermilab and one of the conference organizers. "We know there is physics beyond the Standard Model, our current understanding of the universe. Pursuing neutrinos is one of our best hopes of learning more of these fundamental truths about our world."

The headline talk by University of Wisconsin-Madison physicist Francis Halzen will look to the future role neutrinos can play in multi-messenger astronomy, the coordinated collection of different kinds of signals (such as those from gravitational waves) from beyond our solar system. Combined, these messengers provide a new window into our cosmos. David Nygren of the University of Texas Arlington will give the second headline talk, showcasing the progress in R&D for neutrino detectors.

Each day will feature updates and plans relating to one or two topics within neutrino physics. These include directly measuring the still-unknown mass of the neutrino, neutrino interactions, solar neutrinos, neutrino theory, neutrino cosmology and astronomy, reactor neutrinos, neutrinoless double beta decay, sterile neutrinos, and neutrino mixing. One day will be dedicated to long-distance neutrino experiments, including the international Deep Underground Neutrino Experiment hosted by Fermilab and the Hyper-Kamiokande experiment hosted by Japan.

# World Record Breaking Magnet

## Fermilab achieves 14.5-tesla field for accelerator magnet, setting new world record

July 13, 2020 | Leah Hesla

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The Fermilab magnet team has done it again. After setting a world record for an accelerator magnet in 2019, they have broken it a year later.

In a June 2020 test, a demonstrator magnet designed and built by the magnet team at the Department of Energy's Fermilab achieved a 14.5-tesla field strength for an accelerator steering dipole magnet, surpassing their previous record of 14.1 T.

This test is an important step toward addressing the demanding magnet requirements of a future hadron collider under discussion in the particle physics community. If built, such a collider would be four times larger and almost eight times more powerful than the 17-mile-circumference Large Hadron Collider at the European laboratory CERN, which operates at a steering field of 7.8 T. Current future-collider designs estimate the field strength for a steering magnet — the magnet responsible for bending particle beams around a curve — to be up to 16 T.

"Our next goal is to break the '15-tesla wall' and advance the maximum field in accelerator steering magnets to 17 T and even above, significantly improve magnet quench performance and optimize cost," said Fermilab scientist Alexander Zlobin, who leads the magnet project. "Reaching these goals will provide strong foundation for future high-energy colliders."

Read more about the Fermilab-built future-collider steering magnet.

# Dark Matter and Dark Energy

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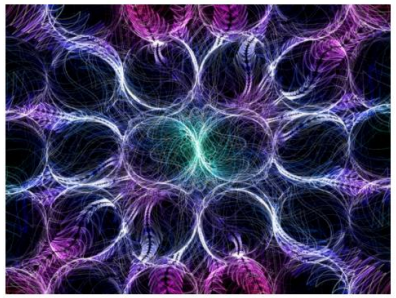
PHYSICS

## Direct Proof of Dark Matter May Lurk at Low-Energy Frontier

Mysterious effects in a new generation of dark matter detectors could herald a revo… discovery

By Daniel Garisto on June 9, 2020 اعرض هذا باللغة العربية



Credit: Getty Images

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## An unexpected result from a dark matter experiment may signal new particles

The XENON1T experiment spotted an excess of events at low energies

Scientists with the XENON1T experiment (shown) observed extra blips in their dark matter detector at low energies. That could be a sign of new particles such as solar axions or from tiny amounts of radioactive tritium, the researchers say.
XENON COLLABORATION

By Emily Conover
JUNE 17, 2020 AT 11:38 AM

An experiment searching for cosmic dark matter may have finally detected something. But it's not dark matter.

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# Other Highlights

## Three Fermilab scientists receive DOE Early Career Research Awards

June 23, 2020 | edited by Leah Hesla

The Department of Energy's Office of Science has selected three Fermilab scientists to receive the 2020 DOE Early Career Research Award, now in its 11th year. The prestigious award is designed to bolster the nation's scientific workforce by providing support to exceptional researchers during the crucial early years, when many scientists do their most formative work.

This year, 76 scientists from across the nation – including 26 from DOE's national laboratories and 50 from U.S. universities – have been selected to receive funding as part of DOE's Early Career Research Program.

"The Department of Energy is proud to support funding that will sustain America's scientific workforce and create opportunities for our researchers to remain competitive on the world stage," said DOE Undersecretary for Science Paul Dabbar. "By bolstering our commitment to the scientific community, we invest into our nation's next generation of innovators."

Profiles on these three individuals and their research will be published over the next few weeks.

The Fermilab recipients are:

**Robert Ainsworth**, for ensuring bunch stability in multimegawatt accelerated particle beams
**Laura Fields**, for measuring precision neutrino fluxes for LBNF/DUNE
**Jonathan Jarvis**, for the development of next-generation particle beam cooling and control with optical stochastic cooling


Robert Ainsworth


Laura Fields


Jonathan Jarvis

*Fermilab particle accelerator science research and neutrino research are supported by the DOE Office of Science.*

*Fermilab is supported by the Office of Science of the U.S. Department of Energy. The Office of Science is the single largest supporter of basic research in the physical sciences in the United States and is working to address some of the most pressing challenges of our time. For more information, visit science.energy.gov.*

Tagged: accelerator science, award, neutrino

## CMS collaboration publishes 1,000th paper

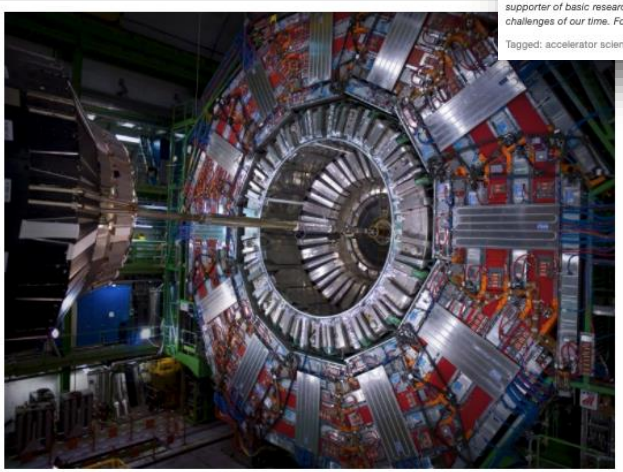
June 24, 2020 | James Wetzel

The discovery of the Higgs particle by the international CMS and ATLAS collaborations is the most famou
at the Large Hadron Collider at CERN. The scientists made the announcement on July 4, 2012, and it wa
Nobel Prize: The theorists who predicted the Higgs mechanism received the award in 2013.

Most impressively, it only was publication number 183 for the CMS collaboration. On June 19, CMS scien
publishing their 1,000th peer-reviewed research paper.

It's an unprecedented achievement. For the last 10 years, CMS scientists have been producing, testing a
arising from the spectacular particle collisions at the Large Hadron Collider, describing fundamental aspe
universe in one paper after another. Peering into the behavior of nature's most fundamental constituents
humming, high-tech machine known as the CMS particle detector, the CMS collaboration has contribute
foundations of knowledge in particle physics.

Churning out raw data from a cavern located 100 meters below the French countryside, the CMS detecto
data for its collaboration to publish on average more than 100 research papers per year.


On June 19, CMS scientists celebrated publishing their 1,000th peer-reviewed research paper. For the last 10 years, scientists have been producing, testing and publishing insights arising from particle collisions inside the CMS detector at the Large Hadron Collider. Photo: CERN

## Five thousand eyes on the skies: Scientists choreograph robots to observe distant galaxies

July 6, 2020 | Jerald Pinson

Since 2005, scientists have been scanning the night sky to create a three-dimensional map of our universe with the purpose of shedding light on one of the biggest mysteries in physics: the nature and identity of dark energy and dark matter. That effort is about to get a massive upgrade with the successful installation and testing of the Dark Energy Spectroscopic Instrument, or DESI.

Scientists recently installed DESI at the Kitt Peak National Observatory in Arizona. The device features 5,000 optical fibers, each one designed to collect light from a single galaxy. DESI is enabling scientists to gather 20 times more data than previous surveys.

A previous instrument on a different telescope, the Baryon Oscillation Spectroscopic Survey instrument, required collaborators to drill 1,000 holes into large metal plates that held fibers in a configuration that exactly matched the position of known galaxies in a small portion of the night sky. Each time scientists wanted to image new galaxies, a new plate had to be drilled and the fibers inserted by hand.

With DESI, researchers have relegated the grueling work of pinpointing galaxy locations to a hive of 5,000 robotic pencil-shaped tubes. The positioners have a precision of several micrometers — about one-10th the width of a human hair — and are capable of moving on their own to focus on distant galaxies.

# Thank you!

Thank you!

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