CAB meeting, May 26, 2022

Fermilab News

Fermilab astrophysicist Josh Frieman elected to National Academy of Sciences

What's new for LHC Run 3?
CERN's accelerators and the LHC's detectors have undergone major upgrades that will allow scientists to collect more data in the upcoming run than they did in the previous two runs combined.

How to make a muon beam
For the Muon g-2 experiment, researchers create billions of muons to study their surprising properties.

Georgian Technical University and Fermilab sign collaboration agreement on neutrino research
The two institutions have signed an agreement to collaborate on research in support of one of the largest particle physics experiments in the world: DUNE, hosted by Fermilab.

Press releases

Fermilab site reopens to the public, welcomes visitors
Beginning March 28, Fermilab will again be open to the public for outdoor activities, such as biking, hiking, running and viewing the bison herd.

Lia Merminga appointed director of Fermi National Accelerator Laboratory April 5, 2022
Lia Merminga, an internationally renowned physicist and scientific leader, has been appointed to lead the U.S.' premier particle physics and accelerator lab, effective April 18. Merminga will be the seventh director of Fermilab and the first woman to serve in the role.

CDF collaboration at Fermilab announces most precise ever measurement of W boson mass to be in tension with the Standard Model
Scientists of the Collider Detector at Fermilab collaboration have achieved the most precise measurement to date of the mass of the W boson, one of nature's force-carrying particles. The measured value shows tension with the value expected based on the Standard Model of particle physics. April 7

New accelerator at Fermilab approved for construction start
The Department of Energy has formally approved the start of full construction for the PIP-II project, an upgrade to the Fermilab accelerator complex that includes a new linear accelerator. PIP-II is an essential enhancement that will power the world's most intense high-energy neutrino beam. It is the first particle accelerator built in the United States with significant contributions from international partners. April 20

Fermilab strengthens commitment to U.S. veterans and JROTC with new $4 million workforce development program May 4, 2022

Fermilab engineers develop new control electronics for quantum computers that improve performance, cut costs April 29, 2022
Quantum computing experiments now have a new control and readout electronics option that will significantly improve performance while replacing cumbersome and expensive systems. Developed by a team of engineers at Fermilab in collaboration with the University of Chicago, the Quantum Instrumentation Control Kit, or QICK for short, is easily scalable.

Fermilab is home to a new baby bison
The bison population is growing as the birth ushers in spring. April 14

Joint press releases

SLAC's superconducting X-ray laser reaches operating temperature colder than outer space, May 10, 2022

Astronomers reveal first image of the black hole at the heart of our galaxy, May 12, 2022

Breakthrough MicroBooNE measurement elucidates neutrino interactions
For the first time, physicists extracted the detailed "energy-dependent neutrino-argon interaction cross section," a key value for studying how neutrinos change their flavor. April 12

News/People

Suzie Shrubb draws musical inspiration from the cosmos at large
As this year's composer-in-residence, they will create musical pieces in concert with Fermilab's scientists.

A minute with Wally Levernier, lab ecologist
Levernier shares his passion for the environment, birding and prairie restoration at Fermilab.

Fermilab astrophysicist Josh Frieman elected to National Academy of Sciences
Fermilab scientist Josh Frieman, former director of the Dark Energy Survey, has been elected by his peers to membership in the National Academy of Sciences, considered one of the highest honors a scientist can receive. Members are elected in recognition of their distinguished and continuing achievements in original research.

6 students awarded DOE graduate student research fellowships
The students received the prestigious U.S. Department of Energy Office of Science Graduate Student Research Award to conduct their doctoral research at Fermilab.

A minute with Jim Fromm, head of business infrastructure applications
Fromm discusses working at Fermilab as well as joining the lab's EDI Task Force.

Videos

Don Lincoln – W boson mass: The hardest measurement
Fermilab's CDF experiment has recently announced a measurement of the mass of the W boson with unprecedented precision. Even more interesting, the measurement disagrees with theoretical predictions. If confirmed, this could be a very big deal. In this video, Fermilab's Dr. Don Lincoln gives a far-ranging explanation of the measurement and its significance.

Don Lincoln – **How can a photon have momentum?**
Physics students often ask how it is that a massless photon can have momentum. In this video, Fermilab's Dr. Don Lincoln shows that the question arises from a misuse of equations and also shows that, when you think about it, it's not surprising at all.

Even Bananas – How do particle accelerators make neutrinos?
Neutrinos are neutral, meaning the magnets in a particle accelerator can't manipulate them. So how can scientists make a dense beam of neutrinos for their experiments? Neutrino physicist Kirsty Duffy and Fermilab accelerator operator Laura Bolt explain the power of protons and how teams can generate intense beams of neutrinos using particle accelerators.

Symmetry magazine

Recent issues:
What's up with the W boson mass?
The CDF experiment at Fermilab measured the mass of the W boson and came up with an answer that no one expected.

The other physics problem
Black physicists say efforts to recruit and retain more Black students must concentrate on challenges they face at both Historically Black Colleges and Universities and Primarily White Institutions.

Think like a computer
A pilot program, designed in part by educators at Sanford Underground Research Facility, is introducing computational thinking into elementary school curricula.

Can a theory ever die?
Neglected theories will wilt and wither but can bloom again with enough attention.

Double trouble Higgs
Scientists worried Higgs pairs would be too rare for LHC experiments to find. But by using machine learning, they now are getting tantalizingly close.

What's new for LHC Run 3?

CERN's accelerators and the LHC's detectors have undergone major upgrades that will allow scientists to collect more data in the upcoming run than they did in the previous two runs combined.

Hitoshi Murayama brings people together
Building international research communities is a cornerstone of Murayama's physics career.

How to make a muon beam
For the Muon g-2 experiment, researchers create billions of muons to study their surprising properties.

Where do theories come from?
The catalysts for inspiration are hard work and innumerable connections with a wider scientific community.

In the News

Challenging the standard model
From Nature Italy May 20, 2022: CDF co-spokesperson Giorgio Chiarelli tells the story of how Italy contributed to the measurement of the W boson mass, opening a door on new physics. For more than 10 years after the Tevatron detector at Fermilab produced the last crashes between protons and antiprotons, the collaboration announced the most precise measure of the W boson mass ever achieved.

Watch out for the W
From the Nature Briefing, May 13, 2022: Based on data recorded with the CDF II detector at Fermilab between 2002 and 2011 at the Tevatron, the collaboration reconstructed more than 4 million W boson candidates through their decays into an electron or muon accompanied by the respective neutrino. The CDF Collaboration stated their result "suggests the possibility of improvements to the standard model calculation or of extensions to it".

Dark Energy Camera spies 'galactic ballet' of galaxies in stunning space photo
From USA News Hub, May 10,2022: The Dark Energy Camera on the Víctor M. Blanco 4-meter Telescope, one of the most powerful cameras in the world just photographed two distant galaxies entwined in what's been described as a "galactic ballet." Read more about these amazing new images captured by the DECamera developed and tested at Fermilab.

The standard model of particle physics may be broken – an expert explains
From The Conversation, May 6, 2021: A recent series of precise measurements in the LHCb, Muon g-2 and CDF experiments have threatened to shake up physics. Now, the LHC is gearing up to run at higher energy and intensity than ever before to make very precise measurements that will test the predictions of theories by looking for deviations from the Standard Model.

Fermilab's particle physics division – The search for antimatter and the machinations of the universe with Chris Polly
From the Finding Genius Podcast, May 4, 2022: The Muon g-2 project led by Fermilab holds the potential to reveal some of the universe's inner workings. Chris Polly joins the Finding Genius Podcast to explain his work on the Muon g-2 project, how the experiment studies muons and what the results mean relative to the Standard Model of particle physics.

Scientists want to use cosmic rays to map the Great Pyramid of Giza's secrets
From NBC News, May 4, 2022: A new research initiative that includes Fermilab scientist Alan Bross plans to scan Egypt's Great Pyramid of Giza using energetic particles from space. The new device is a high-powered telescope to map the Great Pyramid's internal makeup from all angles and could help scientists "see" inside the ancient structure to glean new details about its mysterious inner chambers.

Fermilab develops a new generation of quantum control electronics for improved size, performance, and cost
From Quantum Computing Report, April 30, 2022: A Fermilab quantum engineering team has collaborated with the University of Chicago to create a new open-source design for control electronics for superconducting quantum processors called the Quantum Instrumentation Control Kit.

Muons spill secrets about Earth's hidden structure
From Science News, April 22, 2022: A more detailed survey of the Great Pyramid is being planned by a team of researchers who will place much larger detectors than previously used outside the pyramid measuring muons from multiple angles. The results will provide a 3-D view of what's inside in the Great Pyramid, says Fermilab particle physicist Alan Bross.

Fermilab gets the go-ahead to start building new linear accelerator anticipated worldwide
From the Daily Herald, April 22, 2022: Fermilab's PIP-II accelerator project has received full approval from the Department of Energy for construction, including a new superconducting radio-frequency linear particle accelerator that will help scientists in their quest to better understand our universe.

A newly measured particle could break known physics
From WIRED, April 18, 2022: A collaboration of over four hundred scientists, hundreds of measurements and a 0.1 percent too heavy W boson have led to a tiny discrepancy in the Standard Model theory that could be a huge shift in fundamental physics.

Fermilab welcomes new baby bison as first sign of spring
From FOX 32 Chicago, April 19, 2022: Fox News Chicago's Tim McGill visited Fermilab yesterday for a first-hand look at the lab's newest bison calves and the well-known herd. Herdsman Cleo Garcia shared with McGill his experiences and the behaviors he has observed in caring for the bison for the past 11 years

Fermilab welcomes its first bison born this spring
From the Daily Herald, April 14, 2022: Fermilab in Batavia announced that its first baby bison of 2022 was born on Wednesday, April 14.

Scientists propose 'BREAD' experiment to find particles of mysterious dark matter
From U Chicago News, April 12, 2022: Scientists from the University of Chicago and Fermilab have released an innovative new design for an experiment called the the Broadband Reflector Experiment for Axion Detection (BREAD) to find the mysterious substance is known as dark matter. BREAD, is especially promising because it can look for possible axions with a range of different masses.

Who ordered a too heavy W boson?
From Pour la Science, April 11, 2022: A new measurement of the mass of the W boson is higher than predicted by the Standard Model. Is this a sign of new physics? For experts in the field, this conclusion would be premature. But this result is nevertheless very interesting as one of the most difficult measurements in physics.

Research highlights that the mass of W-boson particle does not match Standard Model
From AZO Quantum, April 11, 2022: The W boson, one of nature's force-carrying particles, has been detected by the Collider Detector at Fermilab (CDF) team, which includes 400 scientists from across the world.

A tiny particle may upend physics…and our own understanding of the universe
From Popular Mechanics, April 9, 2022: New research shows the W boson is heavier than scientists expected with the discovery going against the Standard Model of particle physics. Recently, a 400-person team announced the results of data they carefully sifted through of more than four million collisions from the Collider Detector at Fermilab.

Lia Merminga becomes first woman to head Fermi National Accelerator Laboratory
From Physics World, April 7, 2022: Particle physicist Lia Merminga has been appointed the first female director of Fermilab and will begin her term on April 18.

Shock result in particle experiment could spark physics revolution
From the BBC, April 7, 2022: Scientists of the CDF collaboration have found a tiny difference in the mass of the W Boson compared with what the theory says it should be – just 0.1%. If confirmed by other experiments, the implications could be enormous and could challenge the Standard Model of particle physics.

Fermilab reopens to the public
From FOX News Chicago, March 29, 2022: For the first time in two years, Fermilab welcomed back visitors on March 28. FOX News asks Fermilab's Alison Markovitz what is

new for the public as the lab reopens and what visitors can expect on the grounds and with outdoor activities.