



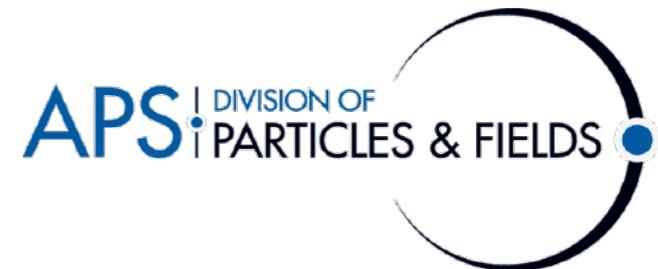
HEP COMMUNITY COMMUNICATIONS ACTIVITIES

Keti Kaadze
on behalf of
Fermilab UEC, US LHC UA, SLAC UO

HEPAP
November 2, 2021

Annual Advocacy Effort

- Tremendous effort for many years from HEP community to advocate a support for our science
 - Different users organizations



- This effort is possible thanks to University Research Association



Objectives of the Activity

Aim of the trip is visit with:

- Congressional offices
- Congressional appropriations and authorization staff
- The Administration (Office of Management and Budget, Office of Science and Technology Policy)
- Funding agencies (DOE and NSF)

Our message:

- Share our excitement about our research
- Thank everyone for their continued support
- Help convey the value added to the society by HEP
- Deliver our Ask

Who Are We?

All 73 participants:

- Organizers
 - Ketí Kaadze, Nadja Strobber (UEC)
 - Harvey Newman, Kevin Black (USLUA)
 - Mandeep Gill (SLUO)
- “Trip” logistics
 - Fernanda Psihas, Rob Fine, Justin Vassel (UEC)
- Meeting planning
 - Breese Quinn (Congressional committees)
 - Harvey Newman (Executive offices)
- Developing material
 - Michael Cooke (DOE) and some key members of HEP community (usparticlephysics.org)

Keti Kaadze	Josh Isaacson
Nadja Strobbe	Andrea Albert
Ashley Back	Sapta Bhattacharya
Jonathan Asaadi	Kevin Pedro
Reddy Gandrajula	Frank Golf
Manolis Kargiantoulakis	Mathew Muether
Sophie Middleton	Gavin Davies
Monica Nunes	Karl Warburton
Isobel Ojalvo	Harvey Newman
Alexx Perloff	Kevin Black
Aleena Rafique	Garvita Agarwal
Yuanyuan Zhang	Austin Baty
Ohana B. Rodrigues	Christina Wang
Anna Hall	Jane Nachtman
Zach Williams	Jennifer Ngadiuba
Maria Casales	Joseph Haley
Zubair Ahmad Dar	Julia Gonski
Kirsty Duffy	Lauren Hay
Joseph Zennamo	Margaret Morris
Louise Suter	Rachel Bartek
Breese Quinn	Rachel Hyneman
Fernanda Psihas	Sarah C. Eno
Cindy Joe	Sergei Gleyzer
Jim Hirschauer	Tao Han
Andrew Whitbeck	Elena Laura Busch
Indara Suarez	Daniel Diaz
Tom Eichlersmith	Javier Duarte
Mateus Carneiro	Elizabeth Brost
Rob Fine	Dhiman Chakraborty
Anne Norrick	Eva Halkiadakis
Patrick Meade	Steven Clark
Andre de Gouvea	John Stupak
Micah Groh	Terrance Figy
Amber Johnson	Kiley Elizabeth Kennedy
Meenakshi Narain	Mandeep Gill
Scarlet Norberg	Micah Buuck
Richie Diurba	

Layout of Trip

2019 trip

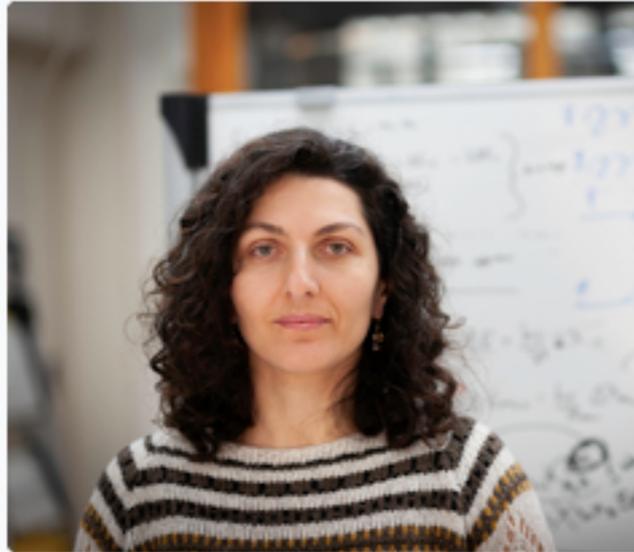


- A group of trip attendees is formed
 - UEC, USLUO, SLUA, experienced and new members
- Training sessions are held to prepare attendees about congressional process, meeting etiquette, science communication, and materials
- Trip attendees schedule meetings
 - A special framework is used to assign offices to attendees based on connections
- Attend the meetings
 - In-person: 3-4 days in DC
 - Virtual: 1-2 weeks (based on 2021 experience)

2021 “trip”



Washington-HEP Integrated Planning System



Keti Kaadze

Your Full Schedule

Yellow = you are the primary.

Type	Meeting	Time	Location	Primary	Secondary
Legislator	Mann, Tracey R-KS 1 ✓ Packet Phone meeting	2021-03-08 12:00:00	None	Keti Kaadze	Aleena Rafique
Legislator	Rosen, Jacky D-NV ✓ Packet Phone meeting	2021-03-09 10:20:00	None	Keti Kaadze	Micah Buuck
Legislator	Marshall, Roger R-KS ✓ Packet Phone meeting	2021-03-09 11:30:00	None	Keti Kaadze	Mathew Muether
Legislator	LaHood, Darin R-IL 18 ✓ Packet Phone meeting	2021-03-10 14:30:00	None	Keti Kaadze	Kirsty Duffy
Legislator	Feinstein, Dianne D-CA ✓ Packet Phone meeting	2021-03-11 13:00:00	(202) 228 – 0808 and On Zoom	Harvey Newman	Keti Kaadze
Legislator	Sherman, Brad D-CA 30 ✓ Packet Phone meeting	2021-03-11 13:00:00	and on Zoom	Harvey Newman	Keti Kaadze

- Tracks attendees schedule and connections
- Tracks scheduling progress and office information
- Maintains records of meetings and meeting reports over all years

MEETING #1972

2021-MARCH

Sen Roger Marshall R-KS

Congressional Office Meeting - Senate

[Edit meeting details](#)

✓ Packet Delivered! (undo)

ASSIGNED

CONTACT

SCHEDULE

FILE REPORT

Attendees

Primary
Keti Kaadze (UEC)

Secondary
Mathew Muether (UEC)

Coordinates

Time
2021-03-09 11:30:00

Phone Number (if any)
None assigned

Meeting with

Name & email
Bill Birsic <bill_birsic@marshall.senate.gov>

Position
Legislative Aide

SCHEDULING PROGRESS



Rejected: 29 Scheduled: 298 Contacted: 435 Assigned: 455 Unassigned: 82

PACKET DELIVERY PROGRESS



Packets Delivered: 328 / 537

Material

Material

We deliver a clear and concise message:

- We represent over 6000 scientists working on exciting science
- As a community, we are well focused with a clear plan to achieve our discovery potential: P5 report
- Science that we perform trains future innovators of the world both in academia and beyond

Understanding nature's most mysterious particle
Neutrinos are the most abundant matter particles in the universe. They are produced in great quantities in the sun and other stars. Each second, a trillion neutrinos pass through our bodies, yet very little is known about them. What role do they play in our universe?

Building an International Flagship Neutrino Experiment
An international team of over 1,000 scientists and engineers from more than 30 countries is building the most advanced neutrino experiment in the world, which could change our understanding of the universe. Groundbreaking for this revolutionary endeavor—hosted by the U.S. Department of Energy's Fermilab with contributions from across the U.S. and around the globe—look place in July of 2017. The first of two large prototype detectors started recording data in Sept. 2018.

Cosmic Acceleration
Left: One of the massive-scale lenses for the DUNE Dark Energy Science Experiment. Right: Aerial view of the Fermilab site.

Sparking interest in STEM
Through diverse activities, we share the thrill of exploring the unknown and making new discoveries. Reaching tens of thousands of people every year, our public engagement programs promote scientific literacy and show how science makes a difference in all of our lives.

Particle Physics Experiment Timeline
2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

Particle Physics in the United States
A map of the United States showing various particle physics experiments and facilities across the country.

Dark Matter Science - Beyond the Ordinary
The mystery of the dark matter. What is dark matter? We don't know! It's completely unlike the matter that makes up the earth and the stars and the galaxies. Dark matter doesn't emit any light at all; this is why we call it 'dark'.

Particle Physics Makes a Difference in Your Life
Global science, local impact. Particle physics is a global discovery science central to the modern innovation ecosystem. It drives national, regional, and local progress in science and industry. And it improves your quality of life.

Vera C. Rubin Observatory
The Legacy Survey of Space and Time (LSST)
Rubin Observatory's Legacy Survey of Space and Time (LSST) will scan the entire visible southern sky every few days for a decade – the widest, fastest and deepest view of the night sky ever observed. Its vast public archive of data will dramatically advance our knowledge of the dark energy and dark matter that make up 95% of the universe, as well as galaxy formation and potentially hazardous asteroids.

Fermi National Accelerator Laboratory
Fermilab is America's premier laboratory for particle physics research, funded by the U.S. Department of Energy. Thousands of scientists around the world conduct research at the frontiers of discovery.

The United States at the Large Hadron Collider
The subatomic world is a complex mosaic of fundamental particles, fields and forces. But there are still many pieces we don't understand. How can we find these particles? Albert Einstein discovered that energy and mass are two sides of the same coin. Pack enough energy into a tiny region of space, and new particles will pop into existence. What does this research accomplish?

Particle Physics Builds STEM Leaders
Particle physicists share the excitement of discovery, inspire young minds, and promote public understanding of science. We work with educators to prepare students for the challenges of the 21st century.

Contributing to the innovation economy
We develop our students' analytical and technical skills, enabling them to excel in their careers. Particle physics students pursue many career paths. Their contributions spur innovation in a wide range of industries.

Particle Physics is Discovery Science
Exploring the Universe. The challenge of particle physics is to discover what our world is made of and how it works at the smallest scales. Particle physics explores the unexplored universe from the biggest scales to the smallest.

The Ask and Priorities

The U.S. particle physics community asks for your support in advancing P5 priorities by passing FY 2022 appropriations that include:

At least \$1180M for High Energy Physics within the Department of Energy's Office of Science including at least \$320M for core research

At least \$10B for the National Science Foundation

This level of funding will provide support needed to advance world-leading scientific research, develop STEM leaders, and make progress on construction and operations of new facilities and experiments. Specifically, the funding request will support scientific researchers and students at universities and national laboratories to advance experimental and theoretical research and accelerator and detector R&D to take advantage of new and future science facilities and experiments. Core research funding is critically important not just for new discoveries but also developing the next-generation workforce. This funding will also advance P5 priority projects, operations of existing and recently completed large facilities, and completion of small and medium-sized projects. These new capabilities are needed to explore the nature of neutrinos, the Higgs boson, dark matter, dark energy, and the yet-to-be discovered forces that govern the origin and evolution of our universe.

The funding level we are requesting is to advance **P5 priority projects**, operations of existing and recently completed large facilities, completion of medium-sized projects. **Core research** funding is critically important not only for new discoveries but also developing the **next-generation workforce**. Specifically, funding will support scientific researchers and students and **universities and national laboratories**.

The P5 strategy has been very successful. Even with extraordinary challenges due to COVID-19, there was great progress.

Recent results

The LHC experiments reported many important and precise results. The remarkably productive ATLAS and CMS experiments have each produced about 1,000 refereed publications, including the recent evidence of Higgs boson decays to muon pairs and other processes

Theoretical physicists have gained insight into how evaporating black holes can radiate their quantum information, suggesting new aspects of quantum gravity. They also have proposed new candidates for the dark matter and new ways to search for them.

The High-A Altitude Water Cherenkov (HAWC) Observatory energy cosmic gamma ray ever seen. Such used to test fundamental symmetries and to city models.

usparticlephysics.org

eration technology and in high-field super- steering magnets.

ubin/LSST Camera cosmic survey projects itioned from construction to commissioning the LZ dark matter experiment.

cosmic microwave background facility, ard with the selection of LBNL as the host rements uniquely probe physics of the early ll beyond those of earth-bound accelerators rtrino properties.

imental particle physicists are advancing on Science (QIS), providing solutions to on, data analysis, sensors, and simulations.

heory community will continue to play key sults from current experiments, motivating d pursuing answers to the deepest questions.

irrent P5 horizon, and guided by new results, ext Snowmass community process, in which ll areas of the field are discussed in depth. US is also working with partners worldwide cepts for facilities that could be hosted here n to the well-studied International Linear l, there are proposed facilities such as the r (FCC) at CERN, which is part of the recently trategy for particle physics.

pursuing R&D on advanced technologies rations of accelerators and detectors with ations in science, medicine, and industry.

Strategic Plan for U.S. Particle Physics in the Global Context

usparticlephysics.org



Building for Discovery

The P5 Report provides the strategy and priorities for U.S. investments in particle physics for the coming decade.

The top three priorities in 2021

Strengthen support for particle physics research at universities and national laboratories, which includes data analysis, R&D, design of new experiments, and a vibrant theory program. As emphasized in the P5 Report, these activities are essential for the success of the field. They are crucial for extracting scientific knowledge from all the great new data, developing new methods and ideas, maintaining U.S. leadership, and training the next generation of scientists and innovators.

Advance the High-Luminosity Large Hadron Collider (HL-LHC) accelerator and ATLAS and CMS detector upgrade projects on schedule, continuing the highly successful LHC program and bilateral partnership with CERN.

Advance the Long-Baseline Neutrino Facility (LBNF), Deep Underground Neutrino Experiment (DUNE), and Proton Improvement Plan-II (PIP-II), working with international partners on the design, prototypes, initial site construction, and long-lead procurements.

These carefully chosen investments will enable a steady stream of exciting new results for many years to come and will maintain U.S. leadership in key areas.



Particle physics is both global and local. Scientists, engineers, and technicians at more than 175 universities, institutes, and laboratories throughout the U.S. are working in partnership with their international colleagues to build high-tech tools and components, conduct scientific research, and train and educate the next generation of innovators. Valuing equity, diversity, and inclusion, the field is committed to increasing participation of underrepresented groups. Particle physics activities in the U.S. attract some of the best scientists from around the world.

Top three priorities: **Core research, HL-LHC, LBNF/Dune/PIP-II**
Our achievements in physics and advances in project
Looking forward: Theory, Experiment, AI, QIS, P5/Snowmass

Many applications of expertise in our everyday life

New: PP community is helping in **fight against COVID-19**

Specific examples of **outreach and education**: REU, SULI, QuarkNet, Big Bang Science Fair
 Stories of people with PhD in physics contributing to **medicine, manufacturing, technology**

MEDICINE



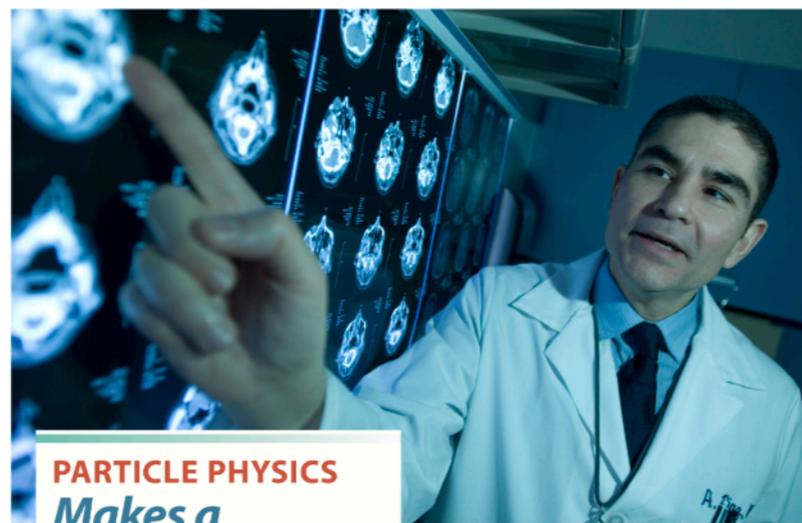
Mechanical ventilator, image courtesy MVM Collaboration

- ▶ Advanced technologies and expertise from the particle physics community are **helping in the fight against COVID-19**. A simplified ventilator design was taken from concept through U.S. FDA approval. Computing resources are helping determine how the virus proteins fold.
- ▶ **The pharmaceutical industry** uses X-ray beams created by particle accelerators to develop more effective drugs to fight disease.
- ▶ Next-generation **medical imaging devices** are being powered by detectors and computational methods developed for particle physics experiments.
- ▶ **Radiation treatment plans for cancer** are powered by software originally developed to model particle detectors, and treatments with gamma rays and protons are delivered using particle accelerator technology.



Proton therapy for cancer

SENSORS



PARTICLE PHYSICS
Makes a Difference in Your Life

Global science, local impact

Particle physics is a global discovery science central to the modern innovation ecosystem. It drives national, regional, and local progress in science and industry. And it improves your quality of life.



Sparking interest in STEM

Through diverse activities, we share the thrill of exploring the unknown and making new discoveries. Reaching tens of thousands of people every year, our public engagement programs promote scientific literacy and show how science makes a difference in all of our lives.



The SAGE-S summer camp introduces high school girls to the work and daily life of National Laboratory scientists and engineers. We complement technical activities that foster creativity with insights about professional growth. SAGE students



How do you make science a regular activity in your community? The Big Bang Science Fair caters to all ages. It brings together art, science, and music, and is held between them. This event engages thousands of people every year. Families can enjoy learning about science together on a Saturday evening.

—Meenakshi Narain



I am passionate about community outreach. I've made it my mission to make science more accessible to minority populations. In my story, I hope to inspire young people to encourage them to reach their full potential.

—Jessica Esquivel, Syracuse University

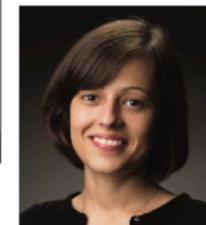
Contributing to the innovation economy

We develop our students' analytical and technical skills, enabling them to excel in today's technology-driven economy. Particle physics students pursue many career paths and become leaders in their fields. Their contributions spur innovation in medicine, manufacturing, and technology.



I work a thousand feet underground in a room full of electronics and lasers on experiments that help certify our nuclear weapons stockpile. It directly ties into national security. My analytic, experimental, and leadership training from high-energy physics has allowed me to navigate easily into nuclear stockpile stewardship.

—Andrea Albert, Los Alamos National Laboratory



I work on Waymo's LIDAR team. LIDAR is one of the "senses" that self-driving car systems use to map the 3D world around them. I use my research experience in light detection to build custom sensors that enhance the safety of self-driving cars. I find that people value the data analysis skills and multidisciplinary background I bring to the team as a particle physicist.

—Kanika Sachdev, Waymo



I am the director and co-founder of INQNET, a collaboration between AT&T Foundry and Caltech, to develop intelligent quantum networks and technologies. Bringing together diverse expertise to solve this challenging problem was inspired by my experience working with physicists from around the world in the massive ATLAS collaboration at CERN.



Part of my job is to understand detector physics and how it can be used to create new medical imaging technology. We're able to image anything where there's a lot of blood flow by using radioactive tracers. This technique is based on the physics of the particle detection experiments I worked on at Fermilab. My job is deeply rooted in physics, and I like that my skills are transferable.

—Wesley Gohn, Siemens Medical Solutions, USA

—Rishiraj Pravahan, INQNET

FNAL Procurement and Grant Letters



The Honorable Adam Kinzinger
United States House of Representatives
2245 Rayburn House Office Building
Washington, D.C. 20515

Keti Kaadze

Fermilab Users Executive Committee
Fermi National Accelerator Laboratory
P.O. Box 500 - MS 220
Batavia, IL 60510
Phone: 785 320 9107
E-mail: ketino.kaadze@cern.ch

March 17, 2020

Dear Representative Kinzinger:

In fiscal year 2019, Fermilab spent \$281 million in the United States to purchase goods and services in 44 states and the District of Columbia. Please find below specific information about goods and services purchased by Fermilab from your State or district during this time.



The Honorable Adam Kinzinger
United States House of Representatives
2245 Rayburn House Office Building
Washington, D.C. 20515

Keti Kaadze

Fermilab Users Executive Committee
Fermi National Accelerator Laboratory
P.O. Box 500 - MS 220
Batavia, IL 60510
Phone: 785 320 9107
E-mail: ketino.kaadze@cern.ch

March 17, 2020

Dear Representative Kinzinger:

The DOE Office of Science and NSF Directorate for Mathematical and Physical Sciences (MPS) directly support scientists, engineers, and students in all 50 States, the District of Columbia, and Puerto Rico through research grants to academic institutions and contracts to supporting industries. In fiscal year 2019, the Department of Energy (DOE) Office of Science had a budget of \$980 million for High Energy Physics, and the National Science Foundation (NSF) had a budget of \$8.075 billion.



Institutions receiving DOE HEP grants during FY19

Please find below specific information about grants and contracts that were awarded by the DOE Office of Science and NSF to institutions and businesses in your district during FY19 and preceding years.

Illinois's 16th Congressional District

Vendor	ZIP Code	Amount (\$)
Whittaker Construction & Excavating Inc	60518	\$846,758
Northern Illinois University	60115	\$796,821
Mechanical & Industrial Steel Services Inc	60410	\$248,105
Burns Machine Company	61350	\$207,719
Comet Fabricating & Welding	61109	\$141,905
Dial Machine	61125	\$93,167
Northern Illinois University	60115	\$54,689
Primus Electronics Corporation	60450	\$50,717
Advanced Crane Technicians Inc	61024	\$9,985
Crystal Precision Drilling Inc	61111	\$8,374
Precision Repair Service Inc	61325	\$7,328
Tek Matic Inc	61111	\$6,219
Nature Conservancy	61031	\$6,200
Micro Surface Corp	60450	\$3,572
Forest City Gear	61073	\$3,314
Elite Tool & Wire	61109	\$3,020
Interstate Chemical Co	60410	\$2,784
Inman Electric Co	61301	\$2,375
Gould Clinics Ltd DbA Ashton Animal Clinic	61006	\$2,197
Scope Shoppe Inc	60115	\$1,255

Illinois State

Vendor	ZIP Code	Amount (\$)
Kiewit Infrastructure Co	60631	\$93,508,209
Aacom Technical Services Inc	60601	\$8,975,912
Blue Cross Blue Shield of Illinois	60601	\$3,229,441
Perkins & Will	60611	\$2,618,090
Clorica Management Corporation	60154	\$2,159,323
Koi Computers Inc	60148	\$1,941,920
Argonne National Laboratory	60439	\$1,921,683
Patrick Engineering Inc	60532	\$1,801,260
Leyden Electric Inc	60119	\$1,351,920
Aon Risk Services Central Inc	60601	\$1,269,233
Steiner Security Services Inc	60445	\$1,224,495
Moritz Edm	60084	\$1,144,236
Applications Software Tech Corp	60563	\$1,135,000
Gensler Architecture Design & Planning Pc	60602	\$910,081
V3Gate LLC	60675	\$908,958
Rachke Piping And Mechanical Inc	60436	\$860,969
Whittaker Construction & Excavating Inc	60518	\$846,758
Stark & Son Trenching	60140	\$829,410
Northern Illinois University	60115	\$796,821
Mott Macdonald, LLC	60606	\$780,177
R C Wegman Construction Co	60506	\$691,332
Prism Mechanical Corp	60543	\$686,346
Jacobs Project Management Co	60661	\$684,133
Ecs Inc	60523	\$659,997
Mcmaster Carr	60680	\$615,798
Sterling Staffing Inc	60154	\$612,111
Resource Communications Inc.	60532	\$600,955
Dsn Group Inc	60047	\$579,894
Johnson Controls Inc	60005	\$546,674
At&T	60197	\$541,000
Northwestern University	60208	\$491,871
Partnership Employment	60602	\$434,182
Ecs Inc	60522	\$423,040
Siemens Industry, Inc	60056	\$413,250
Mid American Elevator Company Inc	60622	\$405,450
Unified Tool & Die Mfg	60176	\$402,665
Softcon Usa Inc	60068	\$397,800
Lindblad Construction of Joliet Inc	60432	\$396,560
Live Clean Inc	60610	\$373,480
University of Chicago	60637	\$363,975

Illinois's 16th Congressional District

In the past 6 years, this district has been awarded:

- DOE Office of Science HEP research grants totaling: **\$2,312,000**
Grants to researchers in your district from the DOE Office of High Energy Physics
- DOE Office of Science contracts totaling: **\$NA**
Contracts with companies in your district, primarily related to the operation of DOE National Laboratories
- NSF MPS research grants totaling: **\$5,728,568**
Grants to researchers in your district from the NSF Directorate for Mathematical and Physical Sciences

DOE Office of Science HEP Research Grants

Institution	Amount (\$)	Start	End	Principal Investigator
Northern Illinois University	225,000	2019	2020	Erdelyi, Bela
Northern Illinois University	220,000	2019	2020	Erdelyi, Bela
Northern Illinois University	340,000	2018	2020	Piot, Philippe
Northern Illinois University	15,000	2017	2018	Piot, Philippe
Northern Illinois University	272,000	2017	2020	Piot, Philippe
Northern Illinois University	5,000	2017	2018	Zutshi, Vishnu
Northern Illinois University	400,000	2016	Ongoing	Chattopadhyay, Swapan
Northern Illinois University	210,000	2015	2020	Piot, Philippe
Northern Illinois University	0	2015	2016	Zutshi, Vishnu
Northern Illinois University	325,000	2014	2018	Eads, Michael
Northern Illinois University	300,000	2014	Ongoing	Erdelyi, Bela
Northern Illinois University	0	2014	2015	Piot, Philippe

NSF MPS Research Grants

Year	Institution	Amount (\$)
2019	Northern Illinois University	1,029,118
2018	Northern Illinois University	679,528
2017	Northern Illinois University	1,461,293
2017	Pii Redacted	100,000
2016	Northern Illinois University	358,160
2015	Northern Illinois University	767,751
2014	Northern Illinois University	377,757
2013	Northern Illinois University	954,961

SULL & CCI Students

Name	College	Host Lab
Sammuel James Carani	Northern Illinois University	Argonne National Laboratory
Amanda Paige Medendorp	Northern Illinois University	Argonne National Laboratory
Austin Paugs	Northern Illinois University	Argonne National Laboratory
Susanna Eschbach	Kishwaukee College	Fermi National Accelerator Laboratory
Sammuel James Carani	Northern Illinois University	Argonne National Laboratory
Curt Michael Cheffer	Sauk Valley Community College	Fermi National Accelerator Laboratory
Derek Seaton	Northern Illinois University	Argonne National Laboratory
Mae McKinnon	Northern Illinois University	Argonne National Laboratory

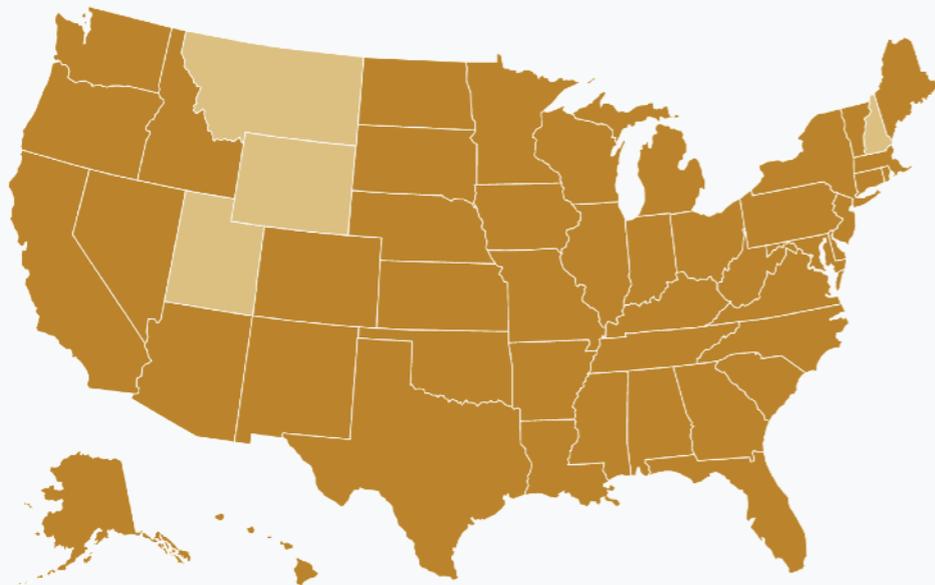


SULL/CCI students from institutes in the State are hosted by national labs across the country

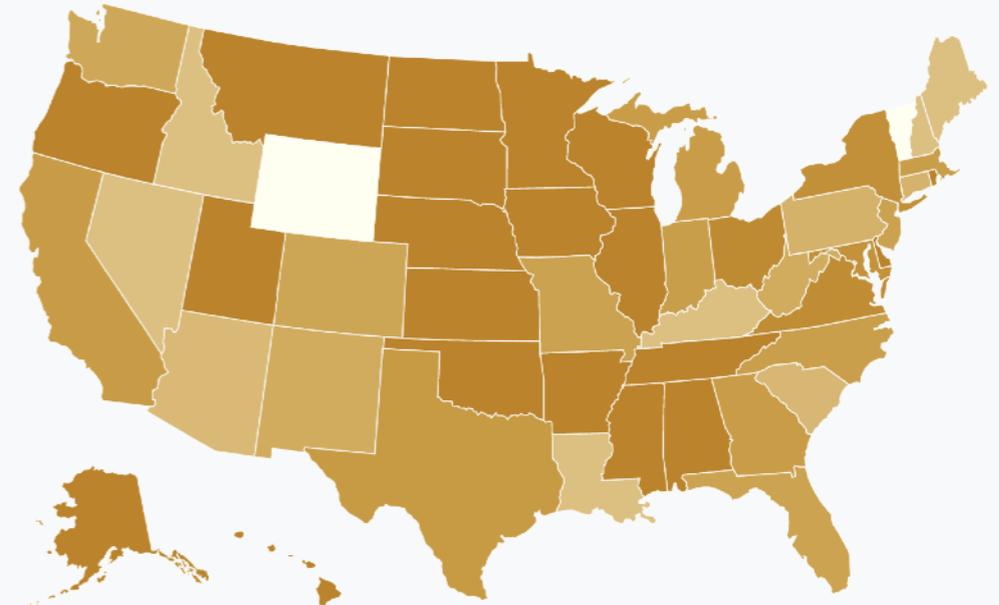
Status of Advocacy

Coverage and Status

Senate Connection Coverage — 96.0%



House Connection Coverage — 80.5%



2021 Advocacy effort status:

- 435 contacted → 298 scheduled/met (~69%)
- Packets delivered to 328 out of 537 offices (~61%)

Very similar stats compare to last year

- Meetings over zoom longer and in some cases more engaging

SCHEDULING PROGRESS



Rejected: 29 Scheduled: 298 Contacted: 435 Assigned: 455 Unassigned: 82

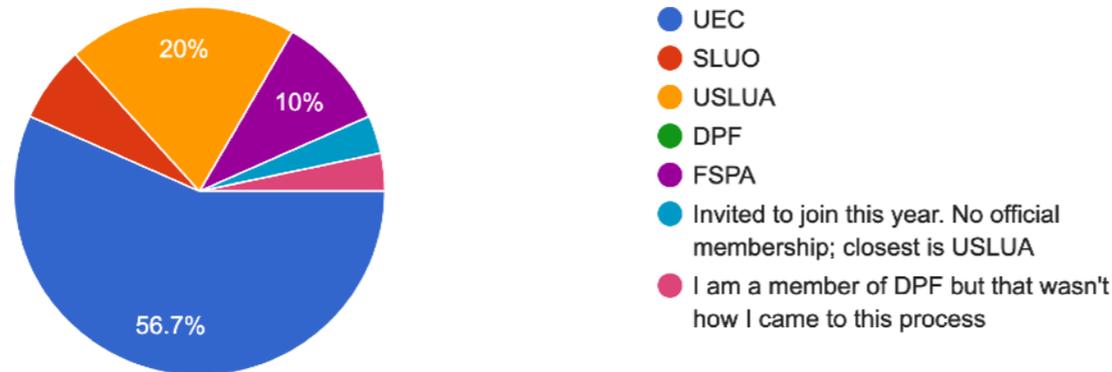
PACKET DELIVERY PROGRESS



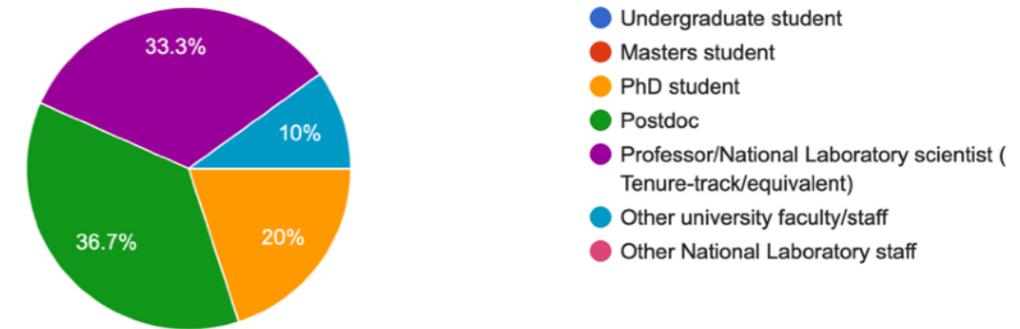
Packets Delivered: 328 / 537

Participation

Organization
30 responses

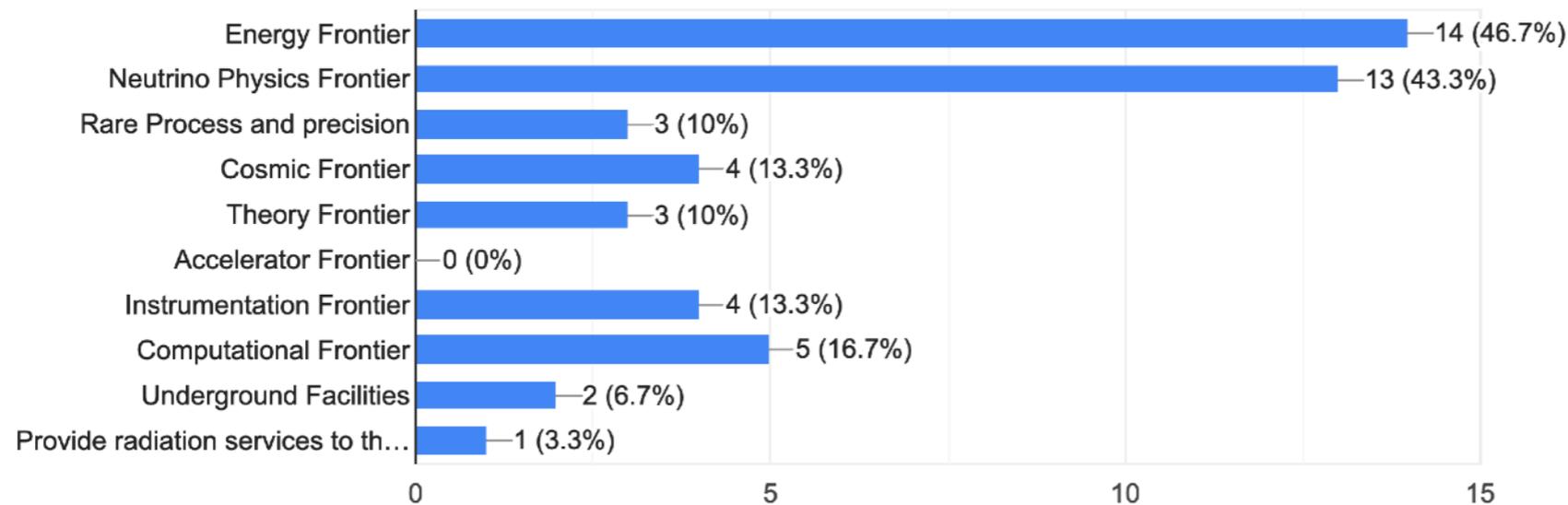


Please select your career level
30 responses



Which research areas are you affiliated with? (Check all that apply; these are borrowed from the Snowmass 2021 categorization)

30 responses



73 Total Participants
34 Female Participants

General Impressions from Offices

- Overall impressions were very positive. Congressional offices show strong support to funding for HEP.
- They highly appreciate our reaching out to the Congress to update them on progress and priorities of the field. Material found very valuable:
 - District specific letters on DOE/NSF funding and FNAL procurements
 - Particle Physics makes difference in our everyday life
 - STEM education, Fermilab VetTech and Visiting Faculty programs
 - Very highly appreciated world-wide leadership of the U.S. in the field
- The role of the DOE Office of Science in supporting fundamental research, especially in the physical sciences, is unclear in some offices. We need to continue to work on this.
- Overall impact on the community from COVID

Appropriations sub-committee meetings

- These high-impact meetings provide feedback on our message and give insight into the appropriations process

- Our organization is exemplary in our advocacy! We are the best at having a unified agenda and clear communication (even with a topic like HEP!)
- Multiple committees wanted to hear more about new admin.'s NSF priorities
- Hard to sell NSF big number, more details could help
- To restore core research we need to emphasize and make it is a priority and not a remainder
- COVID impact on projects.

Committee
Senate Science, Oceans, Fisheries, and Weather
House Energy
House Research and Technology
House Energy and Water Development, and Related Agencies
Senate Energy
Senate Commerce, Justice, Science, and Related Agencies
House Commerce, Justice, Science, and Related Agencies
Senate Energy and Water Development

Arranged by
Prof. Breese Quinn



Executive/Agency Meetings

Arranged by
Prof. Harvey Newman

- The meetings were very positive
- EDI was discussed rather extensively with both congressional offices and OSTP
 - Step forward from us to develop a dedicate brochure discussing stories from our community, what do we do to promote and maintain inclusive and diverse environment
- Better communicating return of investment of fundamental science both to the Congress and public
 - OSTP: “We can never do too much on clarifying this.”



Office

Department of Energy Office of High Energy Physics

Office of Science and Technology Policy

Office of Management and Budget

National Science Foundation

Department of Energy Headquarters

“Dear Colleague” Letters

- During the “visits” we ask offices consider supporting respective “Dear Colleague” letters

- A number of signatories is a good source of feedback

- House letters got less signatures than last last 2y, though still higher than for FY19
- Senate letters got similar support as in past a few years

DOE Office of Science House Letter Congress of the United States Washington, DC 20515 **112 Signatures**

April 28, 2021

The Honorable Marcy Kaptur
Chairwoman
Energy and Water Development
House Appropriations Committee
H-305, U.S. Capitol
Washington, DC 20515

Dear Chairwoman Kaptur and Ranking Member Cartwright:

As you begin work on the Fiscal Year 2022 Commerce, Justice, Science, and Related Agencies Appropriations bill, we express our strong support for robust funding for the DOE Office of Science.

The Honorable Matt Cartwright
Chairman
Subcommittee on Commerce, Justice, Science, and Related Agencies
H-310, The Capitol
Washington, D.C. 20515

The Honorable Robert B. Aderholt
Ranking Member
Subcommittee on Commerce, Justice, Science, and Related Agencies
1036 Longworth House Office Building
Washington, D.C. 20515

DOE Office of Science Senate Letter United States Senate WASHINGTON, DC 20510 **30 Signatures**

May 17, 2021

Senator Dianne Feinstein
Chairman
Subcommittee on Energy and Water Development
Senate Committee on Appropriations
188 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Feinstein and Ranking Member Kennedy:

As you begin work on the Fiscal Year 2022 Energy and Water Development Appropriations bill, we write to express our strong support for robust and sustained funding for the DOE Office of Science and request at least \$7.7 billion for the FY2022 budget.

Throughout the COVID-19 pandemic, the DOE Office of Science has been an essential asset to the United States' response. The DOE Office of Science's disciplinary expertise of our national labs, industry, and academia, along with local efforts to combat the virus. Scientists and researchers provided key modeling for disease transmission and medical research, and their work prevented supply chain bottlenecks for equipment like ventilators that saved many thousands of lives.

Senator John Kennedy
Ranking Member
Subcommittee on Energy and Water Development
Senate Committee on Appropriations
188 Dirksen Senate Office Building
Washington, DC 20510

Ranking Member Aderholt:

We request that the National Science Foundation (NSF) receive an appropriation of at least **\$1.2 billion** in the Fiscal Year (FY) 2022 Commerce, Justice, Science, and Related Agencies Appropriations bill.

NSF is an independent federal agency created by Congress to promote the progress of science, secure the national defense, and advance the nation's health, prosperity, and welfare. It is also the only federal research agency that supports fundamental research in these important fields – biology, computer science, economics, engineering, educational research, geosciences, mathematics, and social and behavioral sciences. The scientific research and educational programs supported by NSF are integral to the continued success of America's innovation enterprise.

NSF Senate Letter United States Senate **41 Signatures**

June 16, 2021

The Honorable Jeanne Shaheen
Chair
Subcommittee on Commerce, Justice, Science, and Related Agencies
U.S. Senate Committee on Appropriations
Washington, D.C. 20510

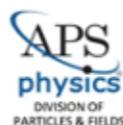
The Honorable Jerry Moran
Ranking Member
Subcommittee on Commerce, Justice, Science, and Related Agencies
U.S. Senate Committee on Appropriations
Washington, D.C. 20510

Dear Chair Shaheen and Ranking Member Moran:

We write to respectfully request that the National Science Foundation (NSF) receive an appropriation of at least **\$10.2 billion** in the Fiscal Year (FY) 2022 Commerce, Justice, Science, and Related Agencies Appropriations bill.

The NSF is an independent federal agency created by Congress to promote the progress of science, secure the national defense, and advance the nation's health, prosperity, and welfare. It is also the only federal research agency that supports fundamental research in these important fields – biology, computer science, economics, engineering, educational research, geosciences, mathematics, and social and behavioral sciences. The scientific research and educational programs supported by NSF are integral to the continued success of America's innovation enterprise.

Following Up



June 25, 2021

Chairwoman Marcy Kaptur
Subcommittee on Energy and
Water Development
Committee on Appropriations
2362-B Rayburn House Office Building
Washington, D.C.

Ranking Member Michael K. Simpson
Subcommittee on Energy and
Water Development
Committee on Appropriations
2362-B Rayburn House Office Building
Washington, D.C.

Dear Chairwoman Kaptur and Ranking Member Simpson:



We are writing now to emphasize the urgency of our requests, as the FY 2022 President's Budget Request (PBR) falls far short of the needs in three critical respects:

- Funding for the Office of Science, which is the major federal funder of research in the physical sciences: The proposed level in the PBR is far short of the needs to maintain, let alone advance leading edge physical science research and development. The level proposed is in sharp contrast with the research community's request of \$7.7 billion let alone the forward-looking plan in the DOE Science for the Future Act, which authorizes funding rising from \$8.829 billion in FY 2022 followed by a positive trajectory to \$10.961 billion by FY 2026.
- Funding for High Energy Physics within the Office of Science: The President's request is again in stark contrast with the HEP community request of \$1.180 billion as well as the DOE Science for the Future Act, which authorizes funding levels sufficient to drive the recovery and advance the field of HEP while promoting U.S. leadership, namely \$1.346 billion in FY22 with a positive trajectory to \$1.651 billion by FY26.
- Funding for the High Luminosity Upgrade projects at the Large Hadron Collider: the PBR has these top priority projects slated to be cut in FY 2022 to a level which is 63% below the required and planned level. The cuts proposed in the PBR would immediately damage and potentially halt progress in the P5 Plan and in these projects, which until now have been remarkably successful in their progress and execution within their carefully planned and managed budget profiles and schedules, overseen by the DOE.



October 26, 2021

Chairwoman Dianne Feinstein
Subcommittee on Energy and
Water Development
Committee on Appropriations
331 Hart Senate Office Building
Washington, D.C. 20510

Ranking Member John Kennedy
Subcommittee on Energy and
Water Development
Committee on Appropriations
416 Russell Senate Office Building
Washington, D.C. 20510

Dear Chairwoman Feinstein and Ranking Member Kennedy:



We are writing now to emphasize the urgency of our requests, as the House and Senate bills fall short of the needs for HEP by approximately \$100 million in FY 2022. A particular area of concern is funding for the High Luminosity Upgrade projects at the Large Hadron Collider, which are the highest priority near-term projects in the P5 Plan. These projects are slated to be cut to a level which is more than 60% below the required and planned level and could potentially halt the projects' progress. It is also noteworthy that these projects, overseen by DOE, have until now been remarkably successful in their progress and execution within their carefully planned and managed budget profiles and schedules.

In addition to annual appropriations, we strongly support funding included for the DOE Office of Science and HEP in the House Space, Science, and Technology Committee's (SSTC) reconciliation bill of the. The SSTC reconciliation bill includes \$15.5 billion for the Office of Science laboratory infrastructure and research and development activities. Specifically, the bill would provide \$224 million for the LHC upgrade projects, \$1.3 billion for LBNF/DUNE, \$581 million for PIP-II, and \$237 million for CMB-S4, as well as \$3.2 billion for quantum computing and other national priority R&D areas. Fermilab would also receive \$127 million for general laboratory infrastructure.

Summary Of 2021 Congressional “Visit”

- Despite difficult circumstances we were able to hold virtual advocacy effort quite successfully.
 - While scheduling of meetings was a bit more challenge, the length and engagement during the meetings were sometimes better than in some in-person meetings.
- We want to build on our experience and improve preparatory step (selection/training/etc.) of attendees for future advocacy.
- Preparation of material is an important step. We aim to address the impressions from 2021 virtual “visit” for the following year.
- Major concern from FY22 process is major cuts for the LHC projects and continued pressure on research.
 - However, newest version of the reconciliation package is disappointing: ~\$12B for projects were eliminated. Work with the House and Senate is still ongoing with the hope to restore the funding and provide more flexibility for R&D funding.

Thank you for your support to this effort!

Additional Material

Top three priorities: **Core research, HL-LHC, LBNF/Dune/PIP-II**

Our achievements in physics and advances in project

Looking forward: Theory, Experiment, AI, QIS, P5/Snowmass



Strategic Plan for
U.S. Particle Physics
in the Global Context

usparticlephysics.org

The P5 Report provides the strategy and priorities for U.S. investments in particle physics for the coming decade.

The top three priorities in 2021

Strengthen support for particle physics research at universities and national laboratories, which includes data analysis, R&D, design of new experiments, and a vibrant theory program. As emphasized in the P5 Report, these activities are essential for the success of the field. They are crucial for extracting scientific knowledge from all the great new data, developing new methods and ideas, maintaining U.S. leadership, and training the next generation of scientists and innovators.

Advance the High-Luminosity Large Hadron Collider (HL-LHC) accelerator and ATLAS and CMS detector upgrade projects on schedule, continuing the highly successful LHC program and bilateral partnership with CERN.

Advance the Long-Baseline Neutrino Facility (LBNF), Deep Underground Neutrino Experiment (DUNE), and Proton Improvement Plan-II (PIP-II), working with international partners on the design, prototypes, initial site construction, and long-lead procurements.

These carefully chosen investments will enable a steady stream of exciting new results for many years to come and will maintain U.S. leadership in key areas.



Particle physics is both global and local. Scientists, engineers, and technicians at more than 175 universities, institutes, and laboratories throughout the U.S. are working in partnership with their international colleagues to build high-tech tools and components, conduct scientific research, and train and educate the next generation of innovators. Valuing equity, diversity, and inclusion, the field is committed to increasing participation of underrepresented groups. Particle physics activities in the U.S. attract some of the best scientists from around the world.

The P5 strategy has been very successful. Even with extraordinary challenges due to COVID-19, there was great progress.

Recent results

The LHC experiments reported many important and precise results. The remarkably productive ATLAS and CMS experiments have each produced about 1,000 refereed publications, including the recent evidence of Higgs boson decays to muon pairs and other processes that test the foundations of the underlying theory. The LHCb experiment also published many new results, including studies of B-meson processes that are sensitive to new physics.

Program advances in 2020

Building upon the historic 2015 and 2017 bilateral U.S.-CERN agreements, U.S. and CERN scientists successfully continued their cooperative partnership at the LHC and the international neutrino program hosted by Fermilab. ProtoDUNE published results demonstrating that the design meets the requirements needed by the LBNF/DUNE far detector in South Dakota for neutrinos produced at Fermilab.

Important advances toward the next generation of colliders were achieved, including new world records in high-gradient

Looking forward

All eyes are on the LHC, as its sensitivity to new physics will continue to improve through vastly greater data volumes and new deep-learning data analysis methods. The experiments will extend their discovery reach and probe the Higgs boson's properties with ever greater precision for many years to come. The HL-LHC upgrade projects are on track.

Eagerly anticipated new data from operating experiments will advance the understanding of the intertwined Science Drivers identified in the P5 Report. In addition, this year the Dark Energy Spectroscopic Instrument (DESI) is starting operations, and the first results of the Muon g-2 experiment are expected to provide the most precise experimental measurement of the muon's magnetic moment.

Particle physicists are expanding efforts to develop and apply artificial intelligence (AI) techniques to the operation of accelerators and experiments, data analysis, and simulations, opening new avenues for scientific discovery.

Theoretical physicists have gained insight into how evaporating black holes can radiate their quantum information, suggesting new aspects of quantum gravity. They also have proposed new candidates for the dark matter and new ways to search for them.

The High-Altitude Water Cherenkov (HAWC) Observatory detected the highest energy cosmic gamma ray ever seen. Such observations can be used to test fundamental symmetries and to constrain quantum gravity models.

superconducting acceleration technology and in high-field superconducting accelerator steering magnets.

The DESI and Vera C. Rubin/LSST Camera cosmic survey projects have successfully transitioned from construction to commissioning and operations, as has the LZ dark matter experiment.

The next-generation cosmic microwave background facility, CMB-S4, moved forward with the selection of LBNL as the host laboratory. CMB measurements uniquely probe physics of the early Universe at energies well beyond those of earth-bound accelerators and can also reveal neutrino properties.

Theoretical and experimental particle physicists are advancing Quantum Information Science (QIS), providing solutions to problems in computation, data analysis, sensors, and simulations.

The particle physics theory community will continue to play key roles in interpreting results from current experiments, motivating future experiments, and pursuing answers to the deepest questions.

Looking beyond the current P5 horizon, and guided by new results, the US has begun the next Snowmass community process, in which the opportunities in all areas of the field are discussed in depth. To inform choices, the US is also working with partners worldwide on development of concepts for facilities that could be hosted here and abroad. In addition to the well-studied International Linear Collider (ILC) in Japan, there are proposed facilities such as the Future Circular Collider (FCC) at CERN, which is part of the recently completed European Strategy for particle physics.

U.S. researchers are pursuing R&D on advanced technologies to enable future generations of accelerators and detectors with a wide variety of applications in science, medicine, and industry.



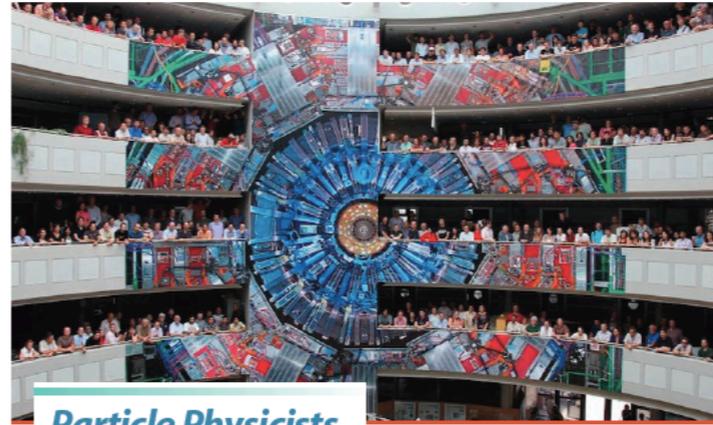
Strategic Plan for
U.S. Particle Physics
in the Global Context

usparticlephysics.org

How working as **collaborations** and the **interplay between universities and labs** is a key for success of our field

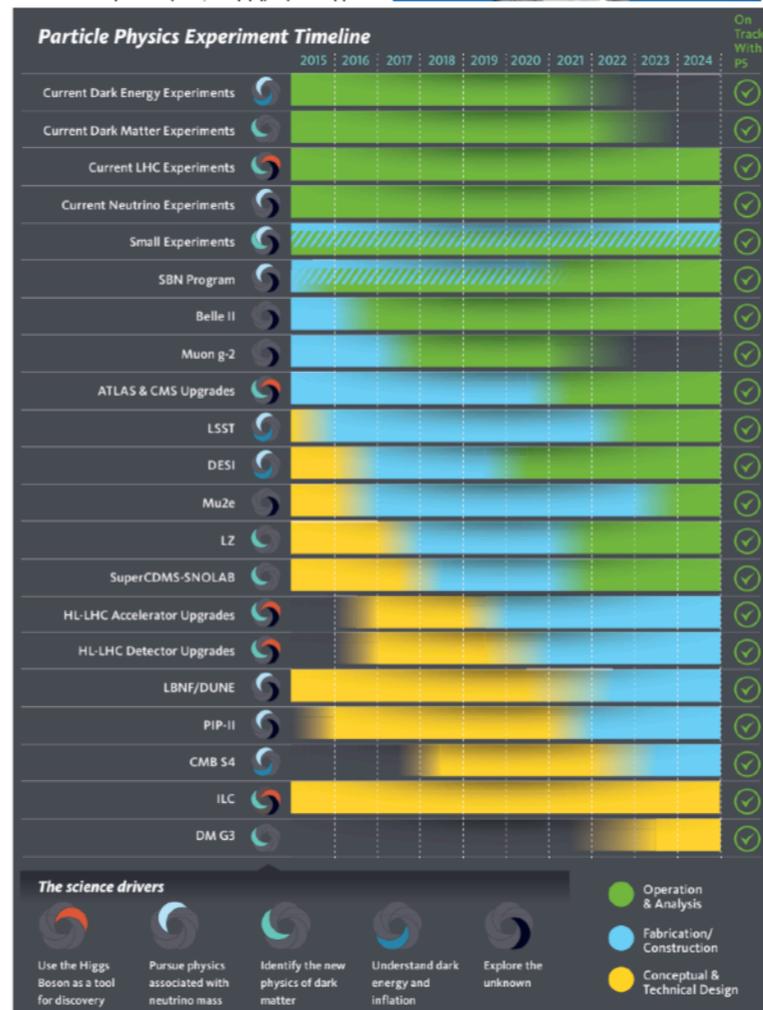
P5 timeline of all our projects

The particle physics community is committed to creating and sustaining a **diverse, equitable, and inclusive** environment and will continue to take concrete steps within our field to increase awareness, reduce bias, and eliminate inequities.



Particle Physicists Deliver Discovery Science Through Collaboration

Particle physicists seek to discover the fundamental laws of nature by making observations at the largest and smallest distances ever probed by humans. To meet this challenge, particle physicists from the U.S. and around the world join together in groups large and small. These collaborations have been incredibly successful at developing highly



The science drivers

- Use the Higgs Boson as a tool for discovery
- Pursue physics associated with neutrino mass
- Identify the new physics of dark matter
- Understand dark energy and inflation
- Explore the unknown

Legend: Green = Operation & Analysis, Blue = Fabrication/Construction, Yellow = Conceptual & Technical Design



Delivering Discovery Science

Collaborations bring experiments from concept to reality. Scientists, students, engineers, and technicians work in concert throughout the course of an experiment, from design, through construction, to operations and analysis of data.



Their coordinated efforts allow the U.S. particle physics community to deliver on the long-term strategic plan of the Particle Physics Project Prioritization Panel (P5). The P5 strategy enables a steady stream of exciting new results across five intertwined science drivers.



The particle physics community is committed to creating and sustaining a **diverse, equitable, and inclusive environment** as the foundation for successful scientific collaborations and takes concrete steps to increase awareness, reduce bias, and eliminate inequities.

Building a collaboration
Particle physics collaborations bring together many different partners. Each contributes essential skills and resources that enable scientists to answer fundamental questions about the universe.

Inspiring future experiments.

Inspiring future experiments.

Over a thousand U.S. scientists work on LHC experiments.

Industry partners will excavate an underground site for DUNE.

Operating MicroBooNE.

National Laboratories
Scientists and engineers at U.S. National Laboratories develop, build, and operate some of the most advanced equipment of modern science including world-class accelerators and ultra-sensitive detectors.

International Partners

International partners bring their unique expertise to U.S.-hosted experiments and collaborate with U.S. scientists on world-class experiments hosted elsewhere.

Private contributions enabled early work on LSST.

Universities
University researchers inspire, develop, and build experiments that push the frontiers of discovery science and play a vital role in training the next generation of scientists and engineers.

Building SuperCDMS-SNOlab.

International partners join U.S. scientists on NOVA.

Upgrading ATLAS at the LHC.

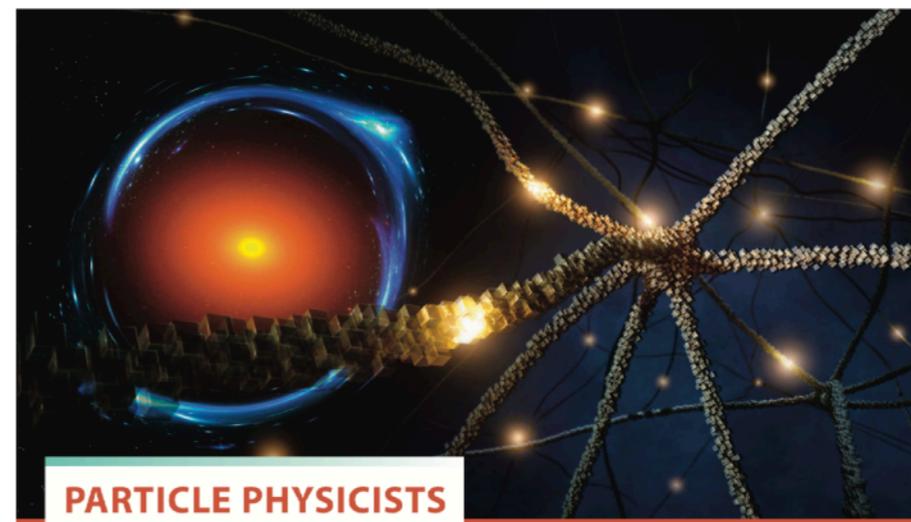
The Packet:

- The Ask
- Particle Physics: Building for Discovery
- Particle Physicists Deliver Discovery Science Through Collaboration
- Particle Physics Makes a Difference in Your Life
- Particle Physics Builds STEP Leaders
- **Particle Physicists Advance AI**
- Particle Physics and QIS

Particle physics faces **specific challenges** (large datasets, high speed data taking, harsh environment) that needs innovative solutions, which further feeds to industry

AI is used for years in HEP to address these challenges: operate complex machines, perform rapid image processing, improve analysis of particle collisions, etc.

Examples of **collaboration with industry** and providing them workforce experienced in AI



PARTICLE PHYSICISTS Advance Artificial Intelligence

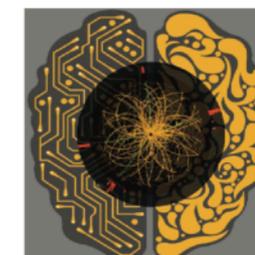
Particle physicists advance artificial intelligence in their quest to explore the frontiers of science. They face unique challenges in operating complex accelerators and detectors and in analyzing massive streams of data. They meet these challenges with innovative techniques that have applications in other areas of science and in industry.



Particle Physicists collaborate with industry leaders

Researchers in industry work together with particle physicists to develop new AI technology for these challenging applications.

Xilinx constructs advanced hardware that enhances the rapid data processing needed for the CMS experiment at the Large Hadron Collider (LHC).



Particle physicists are using the advanced AI processors on Microsoft's Azure cloud service to process LHC data in record time.

Particle Physics trains an AI-ready workforce

Particle physicists who work with AI bring their effective, multidisciplinary skills to other fields and industries.



AI is important because it can help you discover things your brain and other techniques can't. There are many algorithms, but you have to know which one to use and understand where it's applicable. Industry needs this expertise, and I've already worked with Boeing, Lockheed Martin, and companies in the energy sector.

—Sandra Biedron, University of New Mexico and Element Aero



At Tesla, I transformed enormous data sets into detailed road maps for self-driving cars and at DeepMind, I am building AI systems that imagine and plan. My experience in particle physics trained me to tackle these complex problems while dealing with the noisy and uncertain data of the real world.

—Alex Mott, DeepMind

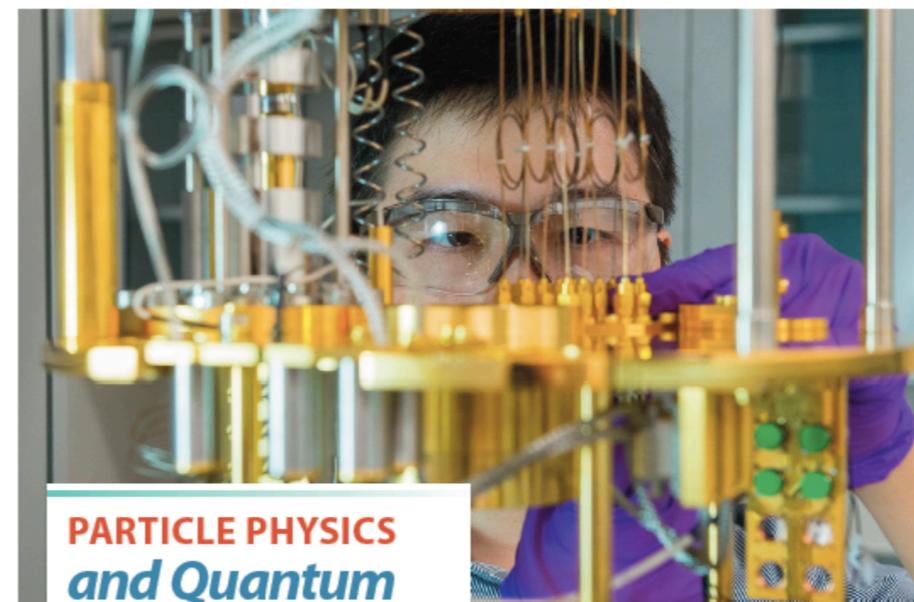
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- Particle Physicists Advance AI
- **Particle Physics and QIS**
- Particle Physics is Discovery Science

Particle Physics and QIS are tightly connected: Physicists bring ideas, technologies, expertise to construct sophisticated, large-scale instruments. QIS offers solutions to our fundamental problems (interactions of quarks, birth & death of BH, etc).

Particle Physicists have constructed **world's largest superconducting systems** or developed **superconducting quantum sensors** to search for DM. Superconducting cavities maintained qubits for world-record times (secs.)

QIS Research centers already benefit from expertise and workforce in our field!

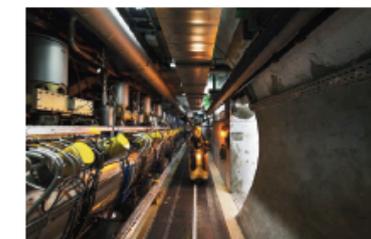
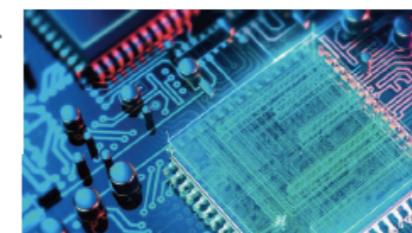


PARTICLE PHYSICS
and Quantum
Information
Science

ics and Quantum
re tightly connected.
Quantum Initiative
QIS to the nation's
c competitiveness.
this effort specific
d the ability to
ge-scale instruments.
ns to fundamental
m the interactions
eath of black holes.



ATES sensor mounted at the SLAC X-ray synchrotron.



Superconducting systems at the Large Hadron Collider.

sensors now have **wide applications as detectors** for measurements ranging from the earliest radiation of the universe to X-ray imaging of key biological processes such as photosynthesis. TES sensors for gamma rays also have applications to national security.



Superconducting cavities at the Fermilab quantum lab.

Many applications of expertise in our everyday life

New: PP community is helping in **fight against COVID-19**

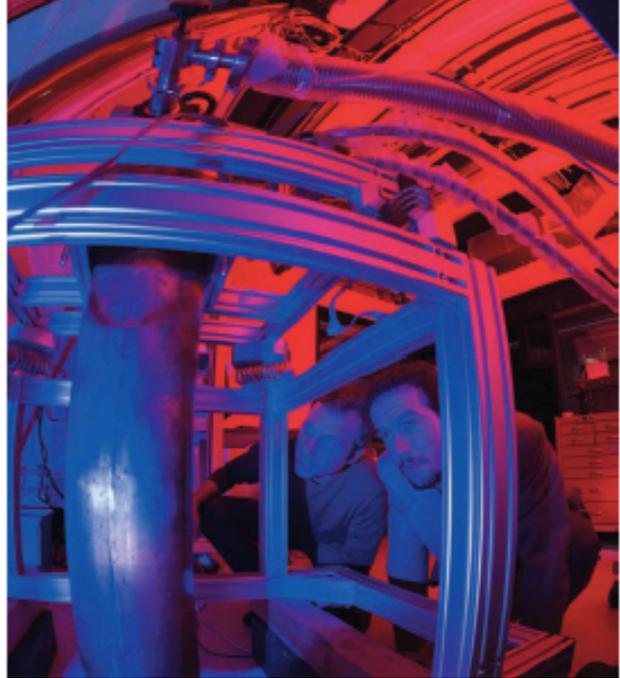
MEDICINE



Mechanical ventilator, image courtesy MVM Collaboration

- ▶ Advanced technologies and expertise from the particle physics community are **helping in the fight against COVID-19**. A simplified ventilator design was taken from concept through U.S. FDA approval. Computing resources are helping determine how the virus proteins fold.
- ▶ **The pharmaceutical industry** uses X-ray beams created by particle accelerators to develop more

SENSORS



PARTICLE PHYSICS
Makes a Difference in Your Life

Global science, local impact

Particle physics is a global discovery science central to the modern innovation ecosystem. It drives national, regional, and local progress in science and industry. And it improves your quality of life.



COMPUTING AND SIMULATION



Simulating radiation exposure

- ▶ **The World Wide Web** was first developed by particle physicists to share information quickly and effectively around the world. Particle physicists continue to push the frontiers of big data analysis with global grids and cloud computing.
- ▶ **Radiation exposure for spacecraft** is simulated using software originally developed to model particle detectors.
- ▶ **Atomic and nuclear physics advances** benefit from precise mathematical techniques developed by particle physicists, now used to predict new materials and molecules.
- ▶ Particle physics theorists are developing foundational concepts that will **advance quantum information science** and enable quantum simulation experiments that will provide new ways to explore scientific problems.



High performance computing

MANUFACTURING



Manufacturing durable materials

- ▶ **Precise, customized medical implants** are manufactured using electron beams from particle accelerators.
- ▶ **The food industry** has used particle accelerators for decades to produce the sturdy, heat-shrinkable film that turkeys, fruits, vegetables, and baked goods come wrapped in.
- ▶ **Ink curing companies** use particle accelerators as an environmentally friendly way to produce the colorful packaging on many grocery store items, including cereal boxes.



Ink curing for packaging



Screening at cargo ports

NATIONAL SECURITY

- ▶ Particle physics detector technology improves homeland security by enabling **advanced cargo screening**.
- ▶ The WATCHMAN experiment, a U.S.-UK partnership, will demonstrate the use of neutrino detectors to remotely monitor nuclear reactors, **supporting nonproliferation efforts**.
- ▶ U.S. scientists helped create a muon detector system to **safely look inside the nuclear reactors** in Fukushima after the earthquake and tsunami in Japan.



Muon scanning at Fukushima

Images courtesy Fermilab, NASA, TEPCO, Shutterstock

For more examples of particle physics in society: www.symmetrymagazine.org/applied

Sparking interest in STEM

Through diverse activities, we share the thrill of exploring the unknown and making new discoveries. Reaching tens of thousands of people every year, our public engagement programs promote scientific literacy and show how science makes a difference in all of our lives.



How do you make science a regular activity in the community? The Big Bang Science Fair caters to ages 3 to 99. It brings together art, science, and music, drawing parallels between them. This event engages thousands of people every year. Families can enjoy learning about science together on a Saturday evening.

—Meenakshi Narain, Brown University



I am passionate about community education and outreach. I've made it my mission to make science more accessible to minority populations. By sharing my story, I hope to inspire young people and encourage them to reach their full potential.

—Jessica Esquivel, Syracuse University



The SAGE-S summer camp introduces high school girls to the work and daily life of National Laboratory scientists and engineers. We complement technical activities that foster creativity with insights about professionals growth. SAGE students discover how their passion for STEM can become a career that impacts their community and the world.

—Diana Gamzina and Giulia Lanza, SLAC National Accelerator Laboratory



We created VENU as an outreach tool to share the world of particle physics. It lets people explore the MicroBooNE neutrino experiment in 3D to see how it collects data for science. Learning how scientists use data to make discoveries can be as important as the discoveries themselves. In VENU you can see what the real data look like.

—Thomas Wester, Boston University

Supporting aspiring STEM leaders

We offer programs for teachers that enable them to enrich their students' classroom experiences. We bring undergraduate and high school students into our research teams. We make our data and analysis tools available in formats for outreach, classroom exercises, and scientific analysis.



As part of the QuarkNet program, we invite high-school students to do a crash-course in particle physics. We teach them about the ATLAS experiment at the LHC and show them how to identify what the different particles look like in the detector. Then they get to analyze real data on the computer. They're always really excited to learn.

—Joe Haley, Oklahoma State University



We have a responsibility to share our data—scientific knowledge is for everyone. I help make our research more accessible by creating interactive visualizations of collision events and by preparing experimental data for educational programs that inspire the next generation of scientists.

—Tom McCauley, University of Notre Dame



In my third year of college, my physics professor recruited me for a Research Experience for Undergraduates program. The adventure of a real summer job in research inspired me to pursue science as a career. Now, as a scientist at Fermilab, I find it rewarding to work with summer students and try to inspire them in the same way I was.

—Michelle Stancari, Fermilab



I worked with students in a chamber that does not allow anyone. We ran "Physics in the Classroom" where we brought high school teachers where they could use in their classroom.

Contributing to the innovation economy

We develop our students' analytical and technical skills, enabling them to excel in today's technology-driven economy. Particle physics students pursue many career paths and become leaders in their fields. Their contributions spur innovation in medicine, manufacturing, and technology.



I work a thousand feet underground in a room full of electronics and lasers on experiments that help certify our nuclear weapons stockpile. It directly ties into national security. My analytic, experimental, and leadership training from high-energy physics has allowed me to navigate easily into nuclear stockpile stewardship.

—Andrea Albert, Los Alamos National Laboratory



I work on Waymo's LIDAR team. LIDAR is one of the "senses" that self-driving car systems use to map the 3D world around them. I use my research experience in light detection to build custom sensors that enhance the safety of self-driving cars. I find that people value the data analysis skills and multidisciplinary background I bring to the team as a particle physicist.

—Kanika Sachdev, Waymo



I am the director and co-founder of INQNET, a collaboration between AT&T Foundry and Caltech, to develop intelligent quantum networks and technologies. Bringing together diverse expertise to solve this challenging problem was inspired by my experience working with physicists from around the world in the massive ATLAS collaboration at CERN.

—Rishiraj Pravahan, INQNET



Part of my job is to understand detector physics and how it can be used to create new medical imaging technology. We're able to image anything where there's a lot of blood flow by using radioactive tracers. This technique is based on the physics of the particle detection experiments I worked on at Fermilab. My job is deeply rooted in physics, and I like that my skills are transferable.

—Wesley Gohn, Siemens Medical Solutions, USA

Specific examples of **outreach and education:**
 REU, SULI, QuarkNet, Big Bang Science Fair

Stories of people with PhD in physics contributing to **medicine, manufacturing, technology**

Fermilab provides a great **career opportunity for veterans (VetTech)** to build and enhance their technical and computing career options through paid summer internships.

Visiting Faculty Program (VFP) at Fermilab is great opportunity for faculty and students from community colleges and 4-year teaching universities.

Fermi National Accelerator Laboratory

VetTech Program at Fermilab

Are you a veteran with technical or computing skills? Do you want to pursue a career at the leading edge of technology and innovation? Then we want to hear from you.

VetTech Internships

Every year, Fermilab's VetTech internship program provides training and career opportunities for military veterans seeking to build or enhance their technical and computing career options. The program places veterans in a wide range of jobs, from mechanical to electrical to computing and software development. The program's aim is twofold: identify skilled people to fill open positions at Fermilab, and provide valuable job experience to veterans who plan to pursue a degree in a technical field.

VetTech interns may fabricate, assemble, calibrate, operate, test, repair or modify electronic or mechanical equipment, systems, devices or databases. The interns may also work in information technology, procurement or perform environmental, safety and health duties.

The VetTech internships are paid 10-week, full-time internships that start in June. The application period runs from November to January.



[Learn More](#)

Fermilab is located 40 miles west of Chicago in Batavia, Illinois. Our laboratory is home to particle physics research, a herd of buffalo and 1,100 acres of prairie. To find out more about our VetTech program and to apply, visit diversity.fnal.gov/VetTech. To browse our current job openings, go to jobs.fnal.gov.

Diverse people. Diverse jobs. Great science.

U.S. DEPARTMENT OF ENERGY

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- **Particle Physics is Discovery Science**
- Particle Physics in the US Map
- Neutrinos
- DUNE
- Cosmology
- Dark Matter
- Vera C. Rubin Observatory (LSST)
- USLHC
- SLAC
- About Fermilab
- Fermilab Vet Tech Program



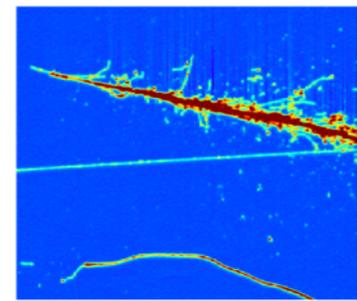
This is an introductory brochure that tells that we have a goal and a clear plan, we work together and are united to achieve our big picture goal, our work has impact in everyday life.

Other brochures are talking about all these aspects in more detail

The Packet:

- The Ask
- Particle Physics: Building for Discovery
- Particle Physicists Deliver Discovery Science Through Collaboration
- Particle Physics Makes a Difference in Your Life
- Particle Physics Builds STEP Leaders
- Particle Physicists Advance AI
- Particle Physics and QIS
- Particle Physics is Discovery Science
- Particle Physics in the US Map
- **Neutrinos**
- **DUNE**
- **Cosmology**
- **Dark Matter**
- **Vera C. Rubin Observatory (LSST)**
- **USLHC**
- **SLAC**

- **About Fermilab**
- Fermilab Vet Tech Program

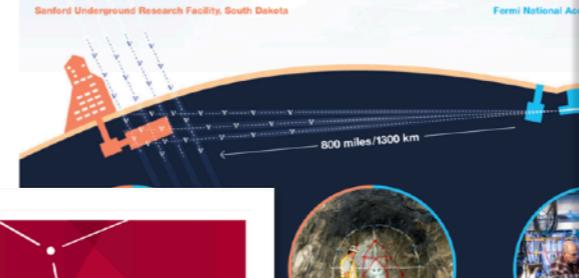


Understanding nature's most mysterious particle

Building an International Flagship Neutrino Experiment

Fermilab

An international team of over 1,000 scientists and engineers from more than 40 countries is building the most advanced neutrino experiment in the world, which will help us understand the universe. Groundbreaking for this revolutionary experiment was announced by the U.S. Department of Energy's Fermilab with contributions from around the globe—took place in July of 2017. The first of two large prototype detectors started recording data in Sept. 2018.



Cosmic Acceleration

The Confounding Mystery of Cosmic Acceleration

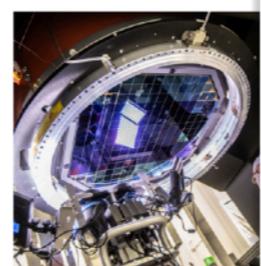
Recent discoveries suggest that there may be new, unexplained forces of nature at work in the Universe. When we throw a ball up in the air, we expect the Earth's gravity to pull it back. But when it comes to the Universe as a whole, what goes up does not always come down: an unknown force dubbed Dark Energy is causing the Universe to expand faster and faster, the equivalent of the ball shooting up into the sky rather than falling to the earth. The data also suggest there was a similar period of accelerated expansion early in the history of the Universe. Cosmic acceleration is one of the biggest unsolved mysteries in science today, and understanding it is the focus of

SLAC NATIONAL ACCELERATOR LABORATORY

Vera C. Rubin Observatory

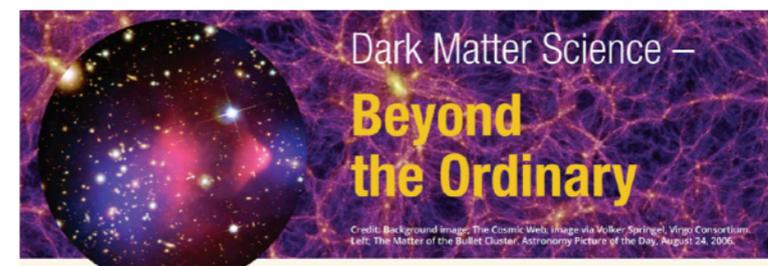
The Legacy Survey of Space and Time (LSST)

Rubin Observatory's Legacy Survey of Space and Time (LSST) will scan the entire visible southern sky every few days for a decade – the widest, fastest and deepest view of the night sky ever observed. Its vast public archive of data will dramatically advance our knowledge of the dark energy and dark matter that make up 95% of the universe, as well as galaxy formation and potentially hazardous asteroids.



A National Priority
The National Research Council's Astronomy and Astrophysics Decadal Survey "New Worlds, New Frontiers" identified the Rubin Observatory, formerly known as the Large Synoptic Survey Telescope, as the top ground-based astronomy project for the current decade.

3-billion-pixel Camera
SLAC National Accelerator Laboratory is leading the construction of the LSST Camera, the Synoptic Survey Telescope. The camera, weighing more than 3 tons, is the largest digital camera ever built for astronomy. Displaying just one of the camera's 170 million pixels requires over 1,500 high-definition monitors.



Dark Matter Science – Beyond the Ordinary

The mystery of the dark matter

What is dark matter? We don't know. It's completely unlike the matter that makes up the stars and the galaxies. Dark matter doesn't emit any light at all; this is why we can't see it.

How do we know dark matter exists? We can see its profound gravitational effects on the galaxies and the universe as a whole.

Fermilab National Accelerator Laboratory

January 2020

Fermilab is America's premier laboratory for particle physics and accelerator research, funded by the U.S. Department of Energy. Thousands of scientists around the world collaborate with Fermilab on research at the frontiers of discovery.



Particle physicists aim to discover what the universe is made of and how it works. They study the smallest building blocks of matter using some of the largest and most complex machines in the world. Fermilab hosts a range of cutting-edge experiments and develops and builds technologies that support particle physics research at locations around the world, including deep underground laboratories in South Dakota and Canada, the Large Hadron Collider in Europe, and the South Pole Telescope.

Together with our international partners, we expand humankind's understanding of matter, energy, space and time, capturing imaginations and inspiring future generations.

The world comes to Fermilab

More than 4,000 scientists from over 50 countries use Fermilab and its accelerators, detectors and computing facilities. Almost 1,000 university students participate in our research and programs every year.

Fermilab reaches more than 40,000 K-12 students every year through its education, outreach and tour programs.

More than 2,300 graduate students have received their Ph.D. degrees based on research at Fermilab.

The United States at the Large Hadron Collider



Why the Large Hadron Collider at CERN?
The LHC, located near Geneva, Switzerland, is the world's most powerful particle collider. It accelerates and smashes atomic nuclei together, recreating the



What are the smallest things that exist?
The subatomic world is a complex mosaic of fundamental particles, fields and forces. But there are still many pieces we don't understand.

How can we find these particles?
Albert Einstein discovered that energy and mass are two sides of the same coin. Pack enough energy into a tiny region of space, and new particles will pop into existence.

What does this research accomplish?

- **Uncovers** the ultimate laws of nature
- **Charts** the origins of the universes
- **Explores** the properties of matter and energy