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Spanish Outreach at Fermilab

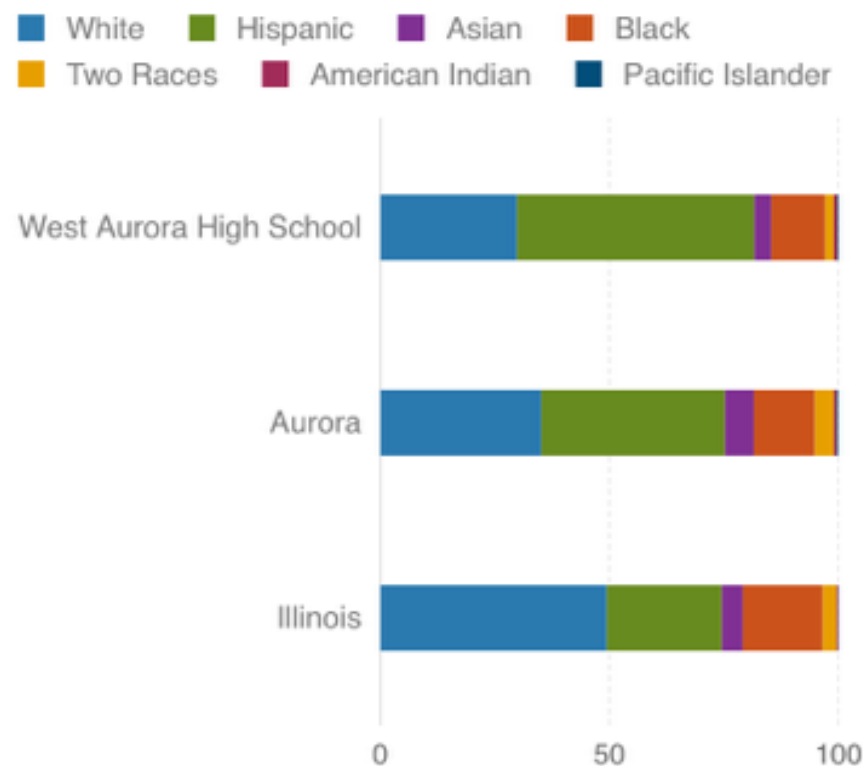
Minerba Betancourt, Fermilab

August 3, 2017

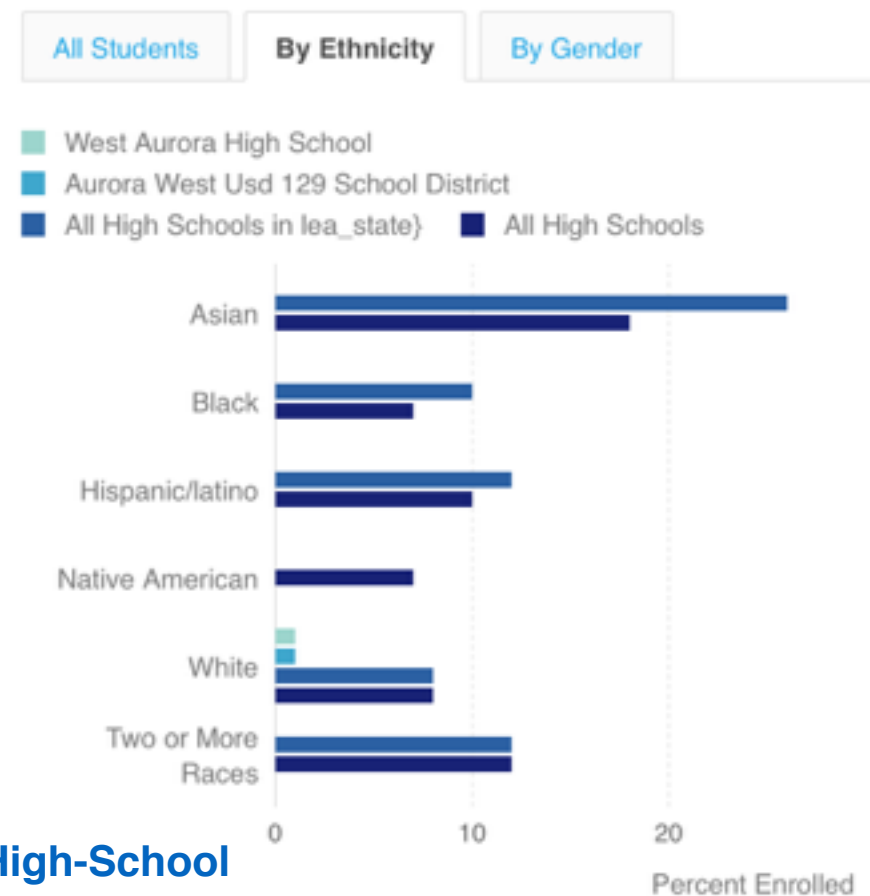
Introduction

- Fermilab is surrounded of a rich Hispanic population:
 - For example: Aurora schools
 - 51.8% of the student population at West Aurora High School identify themselves as Hispanic, making up the largest segment of the student body
 - 1% of students at West Aurora High school are enrolled in physics

Ethnic Distribution



Physics Enrollment

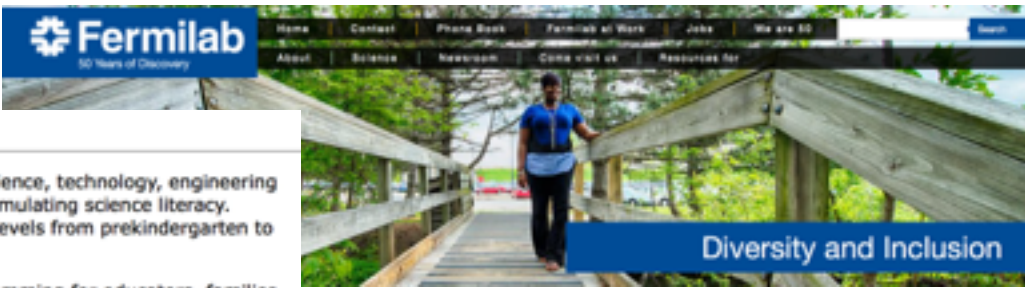


<http://public-schools.startclass.com/I/27295/West-Aurora-High-School>

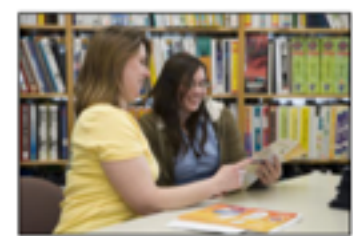
- Hispanic population is big, but very few students are enrolled in STEM related careers

Overview

- Fermilab has a rich outreach program
 - What about Spanish?
 - This talk present some examples of ongoing efforts
- Different efforts are part of the diversity and inclusion, education and outreach Fermilab and communication office
- The lab contains a Hispanic/Latin group of users and lab employees
- We also received help from graduate students and postdocs from USA and Latin institutions



Office of Education and Public Outreach



Fermilab is committed to developing the science, technology, engineering and mathematics (STEM) workforce and stimulating science literacy. Laboratory programs serve students at all levels from prekindergarten to graduate school.

Fermilab's Education Office supports programming for educators, families, young people and the general public. Our programs provide avenues for technical staff to engage these audiences with Fermilab's science and technology. Themes include scientific discovery, practical applications, and scientific and engineering practices. Because the next generation STEM workforce is in school today, educator programs must strengthen teaching and learning in science, technology, engineering and mathematics. Our programs are a catalyst for change and a resource to schools and districts nationwide.

Thanks to everybody!

Thanks to Reidar Hahn and Jesus Orduna for the pictures

Program Areas
Research Internships
Educator Professional Development
Guided Tours
Exploratory instructional units, including optional field trips
Quarks to Quasars hands-on exhibits
Classroom presentations
Informal Classes
Special events
Teacher Resource Center
Online resources

Pipeline programs
Saturday Morning Physics
TARGET >
Community College VetTech Intern
SIST >
Undergraduate Co-Op Program
Graduate programs and fellowships

Volunteers



Dear To Dream STEM Conference

- **Annual STEM conference:**

- A DuPage County nonprofit organization partner with Fermilab and the lab hosts the Dare to Dream: Get Educated!
- One day workshop for middle school Latina girls (and their parents!)
- The goal of the event is to encourage the participation, retention and advancement of the number of Latina girls in science, technology, engineering and math
- The event is led by member of Fermilab latino group with the help of graduate students, postdocs and personal from Lederman



Dear To Dream STEM Conference

- We have several activities for the girls and their parents during the one-day workshop
- The agenda covers:
 - Tours to the different facilities at the lab
 - Panel for all parents and girls
 - Workshop at Lederman Center for the girls
 - Workshop for the parents



Tours

- Tours are led by graduate students and postdocs
 - Groups of 10 girls with parents attend the tours
 - Main control room and Wilson Hall 15th floor display area
- Girls get the chance to see a little about the lab, meet scientists and ask them interesting questions



Activities at the Lederman Center

- One hour workshop at Lederman center
 - Small teams of 5 girls and a mentor to guidance different activities
 - An example of an activity: Students analyze tracks and other evidence left by moving objects to model how Fermilab physicists use electronically recorded data and how they use bubble chambers and cloud chambers to identify and learn about particles
 - Mentors give a quick introduction about the problem to solve and explain the scientific method
 - Students write a detail summary of the method and conclusions



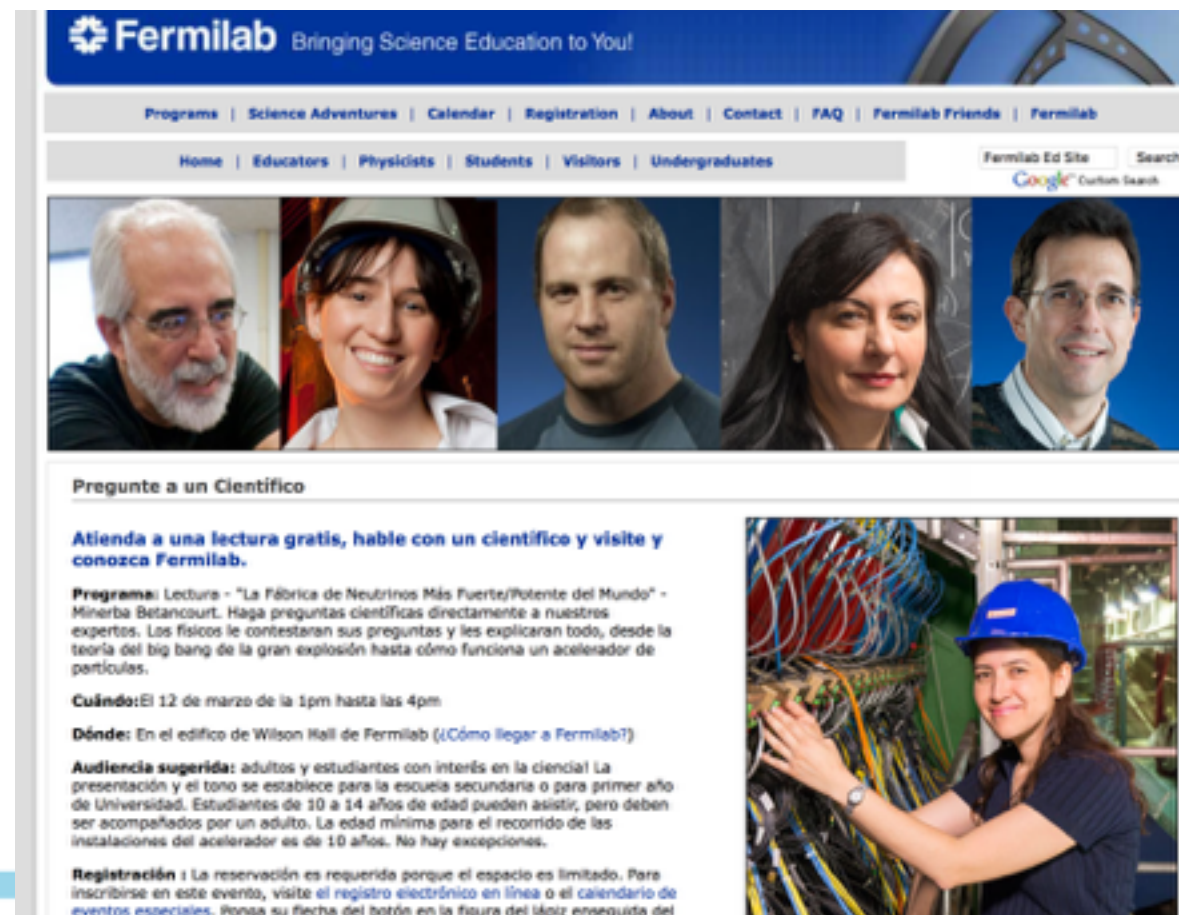
Women in STEM Panel

- Panel for parents and girls
 - Panel comprised from diverse backgrounds and nationalities
 - Lab employees Aria Soha and Jeny Teheran, as well as Erika Cataño (graduate student from Iowa State University)
 - Panelists shared their experiences and challenges as well as how they were able to overcome
- Provided inspiration for STEM careers!



Ask-a-Scientist in Spanish

- **First Ask-a-Scientist in Spanish on March 12, 2017**
 - The world's most powerful neutrino factory, 30 min talk. Speaker: Minerba Betancourt
 - We provided tours around the lab facilities led by scientists, graduate students and post-doc in Spanish
- **Second Ask-a-Scientist in Spanish on November 5, 2017**
 - Dark Matter and Dark Energy. Speaker: Juan Estrada
 - We are planning to have 10 scientists for Q&A



The screenshot shows the Fermilab website with the header "Fermilab Bringing Science Education to You!". The navigation bar includes links for Programs, Science Adventures, Calendar, Registration, About, Contact, FAQ, Fermilab Friends, and Fermilab. Below this is a secondary navigation bar with Home, Educators, Physicists, Students, Visitors, and Undergraduates. A search bar is also present. The main content area features a row of five portraits of scientists. Below the portraits, the section is titled "Pregunte a un Científico". The text describes a free lecture and Q&A session with Minerba Betancourt on March 12, 2017, at 1pm to 4pm, in Wilson Hall. The audience is targeted at high school and college students, with a minimum age of 10. Registration is required, and a link to the registration page is provided. An image of a scientist working on a large piece of equipment is also shown.

Ask a Scientist in Spanish

- Well attended lecture at Sunday afternoon
- 100+ people, students, parents and general public
- Welcome in Spanish by Fermilab Director Nigel Lockyer
- People attending from Mexico, Argentina, Cuba, Peru, Colombia and Venezuela

¡Bienvenidos!



Saturday Morning Physics

- Saturday morning started in the early 80's by Lederman
- Lecture topics include: Detectors, accelerator particle physics, neutrinos, cosmology, modern physics...
- The lectures are aimed at high school students

<http://saturdaymorningphysics.fnal.gov>

- New Saturday Morning Physics lecture in Spanish!

Session I: Fall 2017

March 31, 2017 | Elliott

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September – December, 2017

This schedule is tentative at this time.

Date	Topic	Speaker	Tours
Sept 23*	Fermilab Open House		
Sept 30	Introduction to Science at Fermilab	Dan Hooper, University of Chicago	Wilson Hall, Accelerator Division
Oct 7	Modern Physics	Pilar Coloma, Fermilab Particle Physics Division	Accelerator Division, Wilson Hall
Oct 14	Particle Physics	Cecilia Gerber, University of Illinois at Chicago	TBD
Oct 21	Neutrinos	Leo Allaga, Fermilab Scientific Computing Division	TBD
Oct 28	Accelerators	Cindy Joe, Fermilab Neutrino Division	TBD
Nov 4	Energy and Climate	Erik Ramberg, Fermilab Particle Physics Division	TBD
Nov 11	Cosmology	Brian Nord, Fermilab Particle Physics Division	TBD
Nov 18*	Introducción a la ciencia en Fermilab**	Marcela Carena, Fermilab división de física de partículas	TBD
Nov 25	Thanksgiving Break		
Dec 2	Detectors: Seeing the invisible	Angela Fava, Fermilab Neutrino Division	TBD
Dec 9	Physics and society	Pushpa Bhat, Fermilab Director's Office	No tours: Graduation Ceremony



November 18 – Marcela Carena: “Introducción a la ciencia en Fermilab”

What is science? What is Physics? What do we do at Fermilab? How about at CERN? Carena, a native of Argentina whose mother tongue is Spanish, and Fermilab SMP invite any and all heritage Spanish speakers from our area high schools to come: Listen to Fermilab's director of International Relations, and one of the leading Neutrino Physicists in the world, answer these questions, and your questions, at this special SMP lecture. Parents and teachers are also encouraged to attend this special lecture.

As part of the event, there will also be an opportunity to interact and get to know other Spanish speaking physicists and staff at Fermilab who will answer your questions and share their day-to-day experiences as physicists at Fermilab

Summer Programs

- We have different programs during the summer for students
- In addition, to all the tours and workshop we provide mentoring through the Target and SIST, SULI programs
- Students spend two months at the lab doing research
- This year I got a fabulous team, I got two students from latin origin



Result of the Week in Spanish

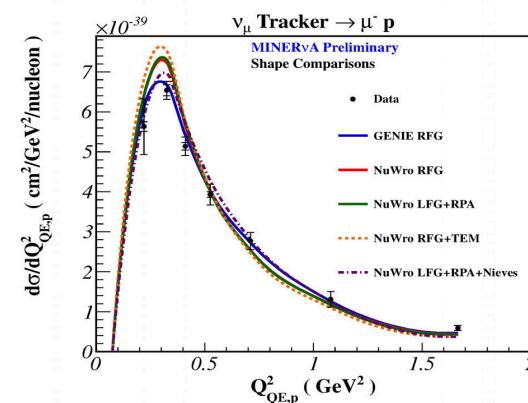
- Many experiments produce a short announcement for the public with the new results
- The article goes to the Fermilab today news
- The article has a Spanish translation
- Example from the MINERvA experiment

La historia del neutrino narrada por el protón!

Los neutrinos son difíciles de estudiar porque su interacción con la materia es extremadamente extraña. Sin embargo, los experimentos de neutrinos hacen lo que pueden para incrementar la probabilidad de detección, como elevar la energía o construir detectores con tantos protones y neutrones como sea posible. Algo que estos detectores tienen en común es que no observan nada incidente, solo algo que sale cuando un neutrino interactúa en el detector.

Usando los productos finales, los científicos hacen una reconstrucción para estudiar el neutrino y su interacción con la materia. Una de estas interacciones, conocida como ión cuasielástica, ocurre cuando el neutrino es dispersado por el neutrón produciendo un muon y un protón.

Desde los años 1970, muchos experimentos han medido la probabilidad de esta interacción usando diferentes tipos de detectores. Los experimentos viejos usaron deuterio (el cual contiene exactamente un protón y un neutrón) como blanco. Los experimentos modernos usan núcleos más complejos tal como el carbono (seis protones y seis neutrones), lo cual hace



Esta gráfica muestra la sección eficaz (probabilidad) de producir un protón con respecto al Q^2 , el momento transferido al protón (medido usando el protón). Diferentes modelos se muestran, donde cada modelo ha sido normalizado con los datos.

Fermilab
at work

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At work: Quick Links | Life | Organization | Policies | Manuals | Forms | Experiments | News

News at work

A neutrino tale as told by a proton

May 16, 2014 | Minerba Betancourt

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Para una versión en español, haga [clic aquí](#). Para a versão em português, clique [aquí](#).

Neutrinos are difficult to study because their interaction with matter is extremely rare. Nonetheless, neutrino experiments do what they can to improve the odds: They use a neutrino beam with as high an energy as possible and build detectors filled with as many protons and neutrons as possible. One thing these detectors have in common is that they see nothing coming in, only something going out when a neutrino does interact in the detector.

Neutrino scientists have to work their way back from those end products to study the neutrino and its interaction with matter. One of these interactions, known as a quasielastic interaction, takes place when the neutrino completely scatters off a neutron in an atom's nucleus, producing a muon and a proton.

In this candidate event from data, the neutrino scatters off a nucleon and produces a muon and a proton. The muon exits through the side of the detector.

Upcoming events

Jul	MicroBooNE
27	Collaboration Meeting
	Wilson Hall
Thu	8:00 am

<http://news.fnal.gov/2014/05/a-neutrino-tale-as-told-by-a-proton/>

2-minute LBNF/DUNE animation in Spanish!



<https://youtu.be/rP9MMjCBFIc>

Summary

- Fermilab is located at special location surrounded by a rich hispanic population
- That give us the opportunity to provide an excellent outreach to change the low number of students in STEM careers
- The lab is engaged with many of the Spanish activities
- We provided different outreach activities for students, parents and general public
 - Fermilab hosts a STEM workshop for middle school Latina girls in 7th, 8th and 9th grade and their parents
 - Ask-a-scientist in Spanish lecture and tours in Spanish
 - New lecture at the Saturday Morning Program in Spanish
 - News from the experiments at Fermilab today in Spanish
- We are planning to extend and create new programs in Spanish!



Muchas Gracias!