

Elementary Particle Physics at the Intensity Frontier

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Elementary Particle Physics is examined at a number of experimental and theoretical frontiers, namely the Energy Frontier, the Cosmic Frontier, and the intensity Frontier. This report will focus on the Intensity Frontier and highlight the exploration of fundamental particles and forces by using intense accelerated particle beams and advanced particle detectors to study the fundamental nature of energy, matter, space and time. Characteristic experiments focus on the study of neutrinos, muon particles, symmetry properties, and rare particle decays, all of which are part of the current or future programs and accelerator systems at Fermilab and other research facilities around the world. This presentation will present up-to-date information on some of these ideas and proposals. The talk will also highlight the leadership of many colleagues with reference to gender in these scientific efforts.

References



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Dr. Herman B. White

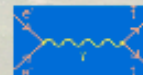
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Introduction and Motivation



$$E=mc^2$$

appearance of **real** new particles



Low energy model

$$AE\Delta t \geq \hbar$$

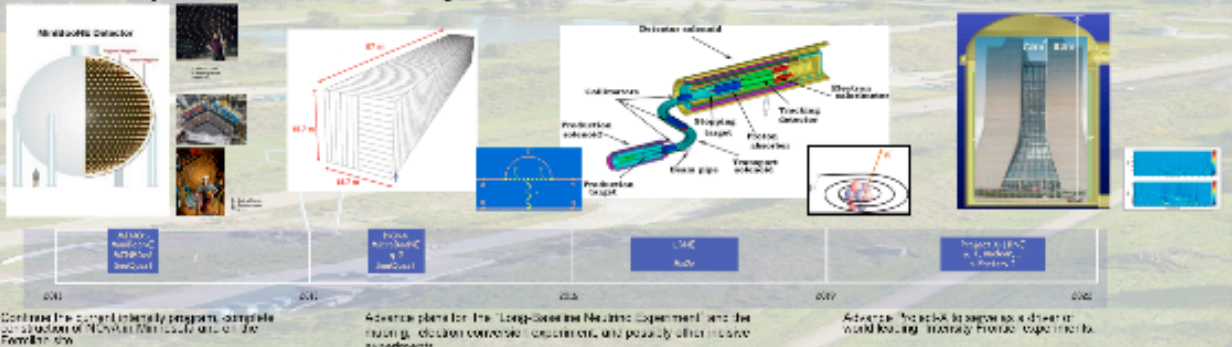
appearance of **virtual** new particles



High energy model

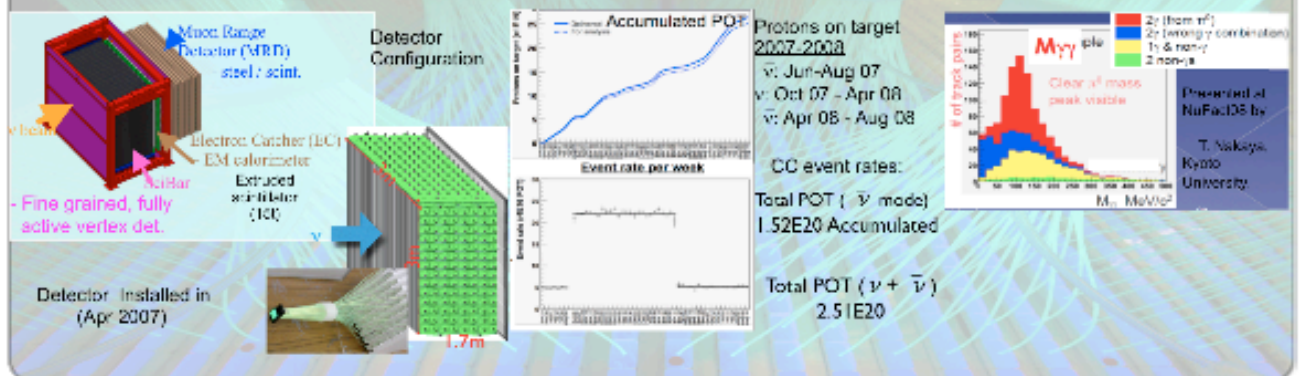
Frontier Physics

Fermilab experiments at the Intensity Frontier



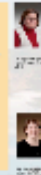
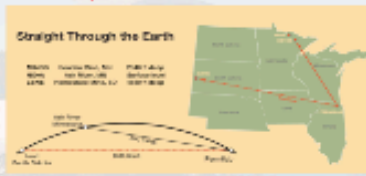
SciBooNE Neutrino Experiment Example

Precision ν_e , $\bar{\nu}_e$ measurements at ~ 1 GeV



Fermilab aims to be the best laboratory in the world for the study of neutrino physics and the ultra-rare behavior of particles.

Intensity Frontier:
Sending neutrinos through 500 miles of earth to study their behavior



Switzerland, Minnesota



Women in Physics



ICWIP 2011

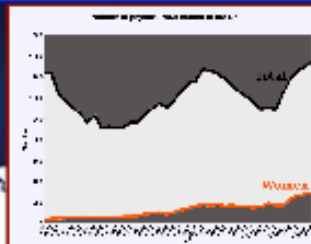
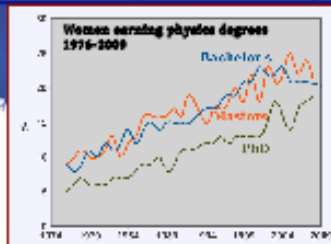
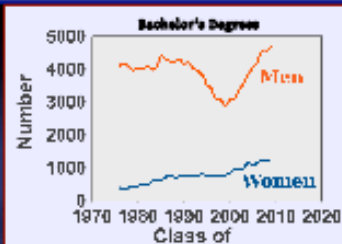
Kim Coble • Cynthia Correa • Beth Cunningham • Melissa Dancy • Elizabeth Freeland • Bev Hartline • Ted Hodapp • Ariel Hodari • Jarita Holbrook • Renee Horton • Rachel Ivy • Ivy Krystal Jones • Elaine Lalanne • Luz Martinez-Miranda • Rhiannon Meharchand • Mia Ong • Sara Petty • Idalia Ramos • Susan Seestrom • Sally Seidel • Elizabeth Simmons • Michael Thoennessen • Meg Urry • Herman White

in the

United States

AMERICAN WOMEN IN PHYSICS OVERALL

- The participation percentage of American women in physics has plateaued in recent years (Hodapp, 2010)
- This plateau is due to a slower increase than men entering physics
- The fraction of women earning bachelor degrees in physics has declined from 22.6% (2002) to 19.3% (2009)
- The absolute number has increased from 908 to 1036 (Integrated Postsecondary Education Data System [IPEDS], 2010).



The National Science Foundation (NSF) Reauthorization in 2010 mandated new public policies and initiatives:

- Training staff and review panels on gender bias in grant reviews and awards, academic advancement and research honors;
- Directing the President's Office of Science and Technology Policy to evaluate the effectiveness of gender equity workshops;
- Providing support for researchers who are caregivers (America COMPETES Act, 2010)

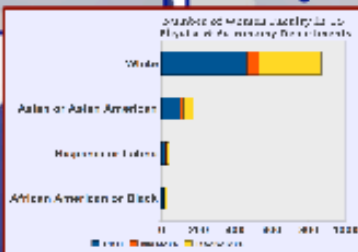
AMERICAN WOMEN AS FACULTY

- The percentage continues to increase: 14% in 2010
- Women are 22% of assistant professors in physics
- The low percentage of full professors (8%) reflects the number of PhDs earned in the past
- 54% of women are employed at PhD departments, compared to 60% of men

Percentage of physics faculty by rank and gender	1990	2000	2010
Assistant Prof.	22	22	22
Associate Prof.	10	10	10
Full Professor	8	8	8
Emeritus/Adjunct	15	15	15
Overall	14	14	14

WOMEN OF COLOR & STEM

- Women of Color are clearly an untapped resource
- 60% of Asian women faculty, compared to 50% and 48% of Latinas and African American women faculty are in PhD physics departments
- The greatest point of loss of women in color is transitioning into the college level (Ong, 2010)



Number of women faculty by race/ethnicity in physics departments	Asian or Asian American	Hispanic or Latina	African American or Black
Number	600	400	200

US TEAM STRATEGIES FOR REVERSING TRENDS

- Broaden the reach beyond groups and gatherings already focused on gender equity as to connect with others in the community.

Examples of these associations include:

- APS Forums on Education, Outreach & Engaging the Public • Physics & Society • APS Public Affairs Office • Optical Society of America • American Astronomical Society

Professional organizations that link to physics education research:

- American Association of Physics Teachers • National Association for Research in Science Teaching • American Association of University Administrators • University Council for Education Administration

