



# Fermilab: A Frontier History

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Presentation at The Holmstad

14 October 2016

# What is Fermilab?

America's Particle Physics and Accelerator  
Laboratory

What are we made of?

# What is Fermilab?

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Laboratory

How did the universe begin?

# What is Fermilab?

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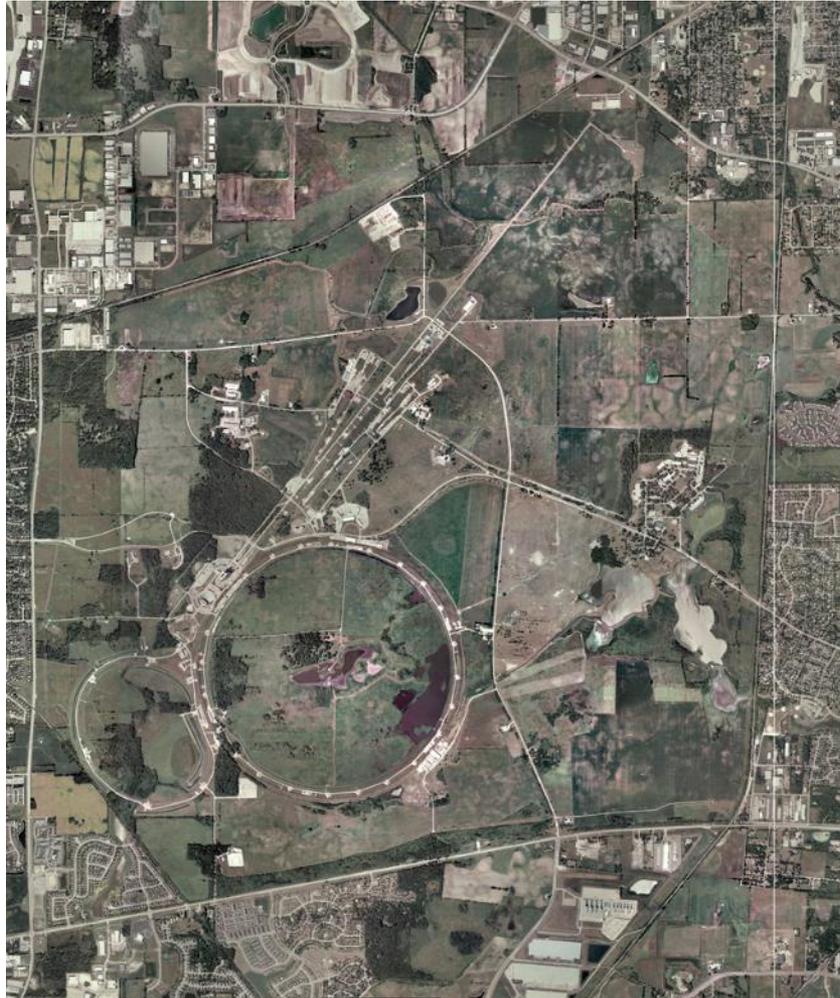
What secrets do the smallest, most elemental particles of matter hold, and how can they help us understand the intricacies of space and time?

# What is Fermilab?

## America's Particle Physics and Accelerator Laboratory

- Managed by the U.S. Department of Energy
- 1,750 employees, including scientists and engineers from all around the world
- Collaborates with more than 20 countries on physics experiments based in the U.S. and elsewhere

# What is Fermilab?



**6,800-acre site located in Batavia, Illinois**

# What is Fermilab?

## Vision Statement:

Our vision is to solve the mysteries of matter, energy, space and time for the benefit of all. We strive to:

- lead the world in neutrino science with particle accelerators
- lead the nation in the development of particle colliders and their use for scientific discovery
- advance particle physics through measurements of the cosmos

# What is Fermilab?

## Mission Statement:

Our mission is to drive discovery by:

- building and operating world-leading accelerator and detector facilities
- performing pioneering research with national and global partners
- developing new technologies for science that support U.S. industrial competitiveness

# Fermilab Prehistory

- April 1963: Ramsey Panel
- June 1963: Leon Lederman's "truly national laboratory"
- June 1965: Berkeley design study
- November 1965: URA organized to manage lab
- December 7, 1966: AEC selects Weston, Illinois as the site for the new accelerator

# Site Selection



Aerial view of Weston, IL

# Site Selection



**Mensing**



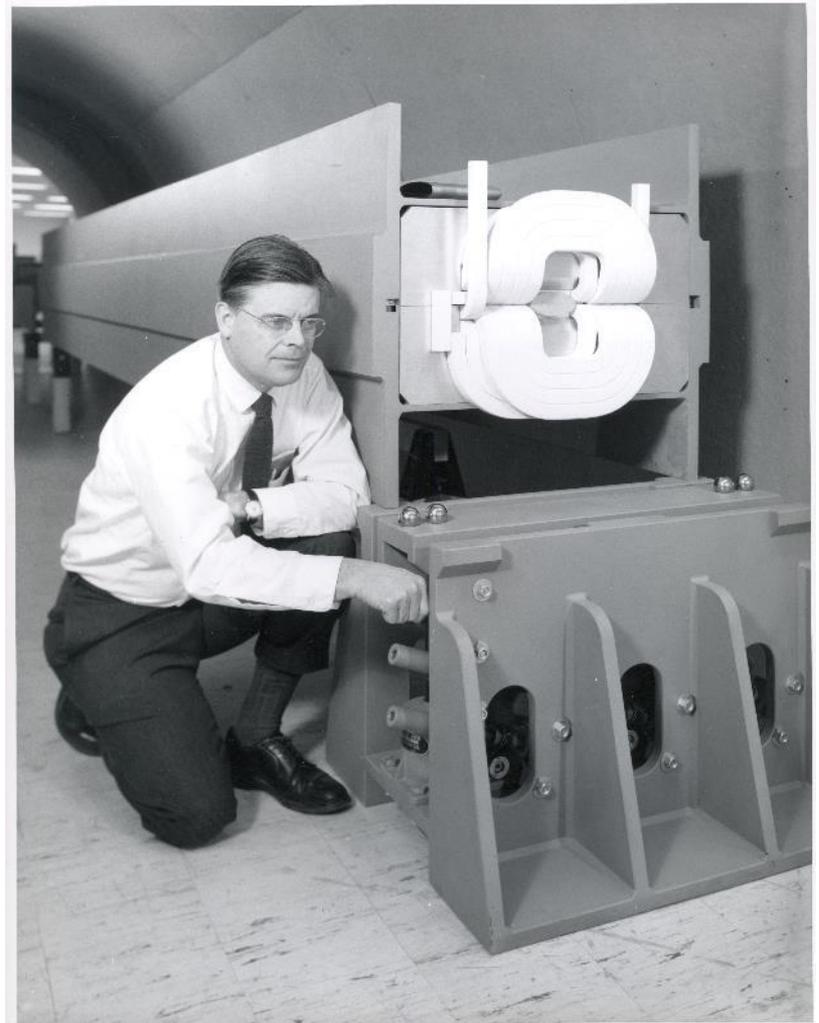
**Brummel**



**Kuhn**

Some of the other houses on the site.

# Director Selection



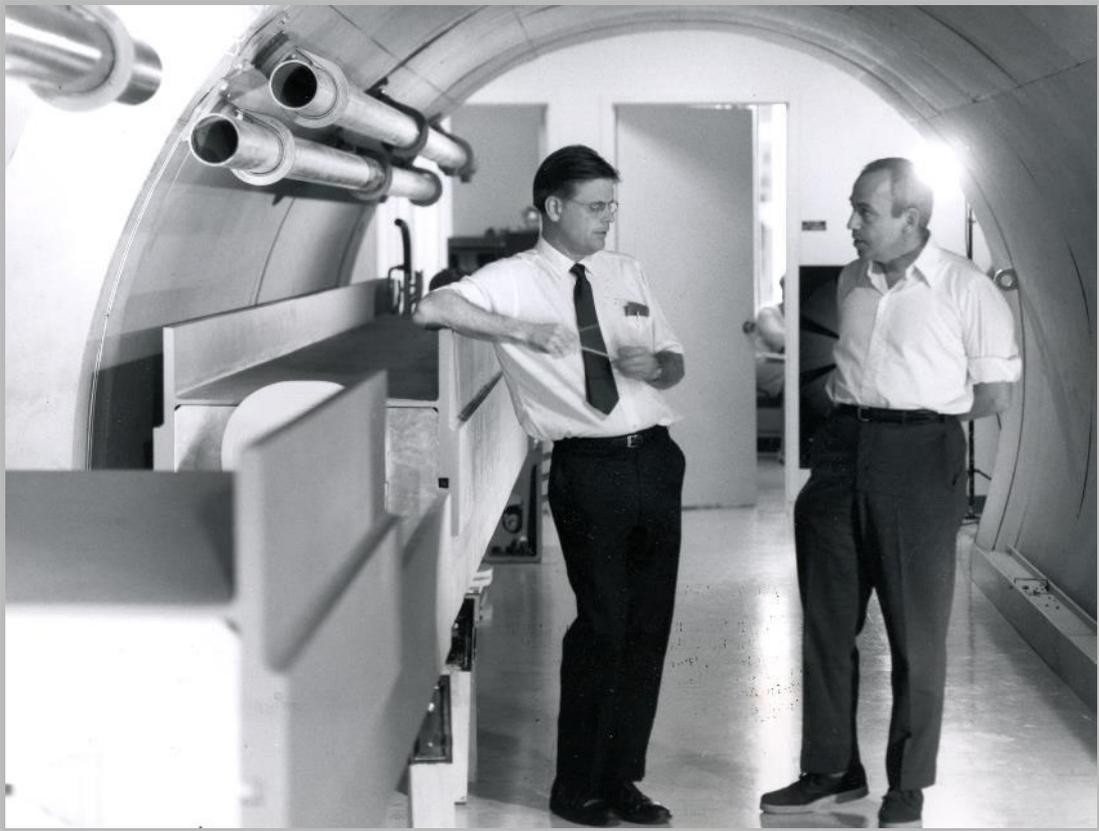
**Robert R. Wilson accepted the directorship on February 28, 1967 and served until 1978**

# Robert R. Wilson



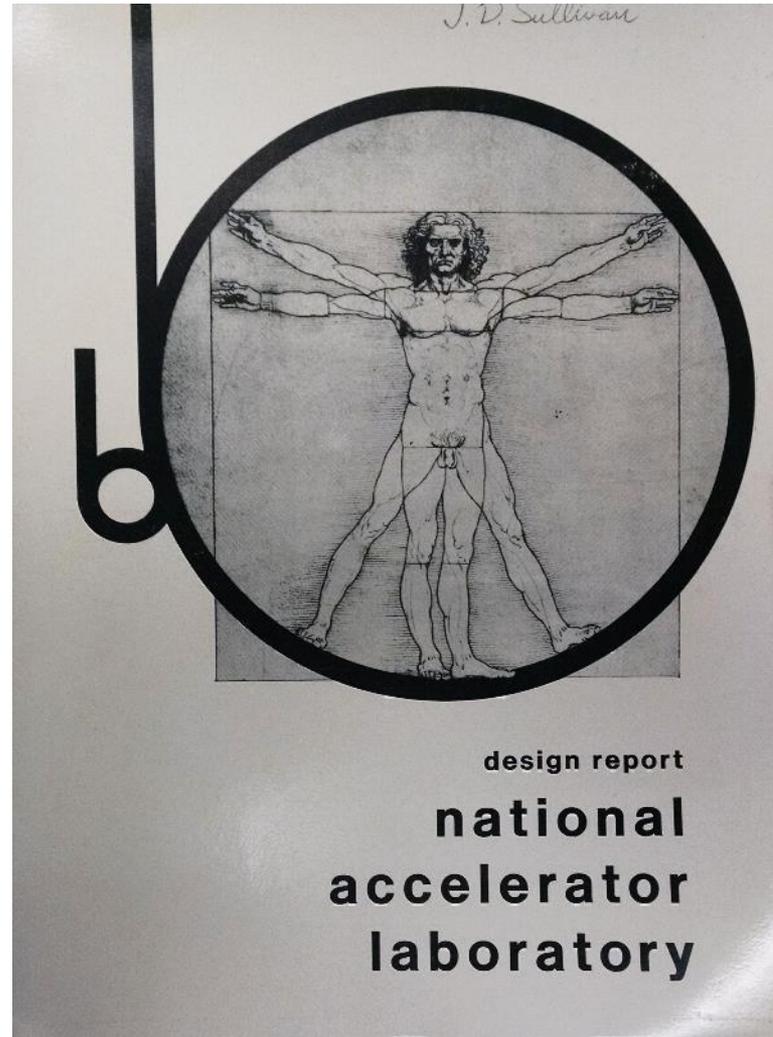
**Robert R. Wilson accepted the directorship on February 28, 1967 and served until 1978**

# Oak Brook Offices



**NAL staff started work at offices in Oak Brook on June 15, 1967**

# NAL Design Report



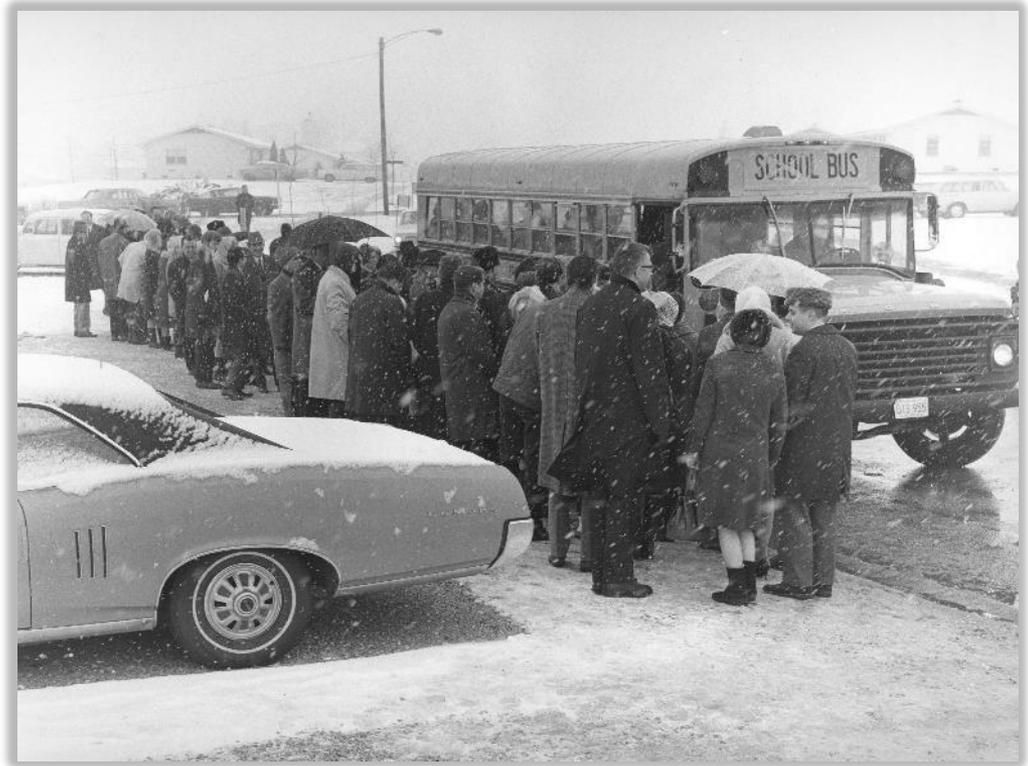
**NAL staff completed the NAL Design Report in January 1968**

# Move to Lab Site



Flag raising on September 24, 1968

# Linac Groundbreaking



December 1, 1968

# Main Ring Groundbreaking



October 3, 1969

# Main Ring Construction



# Main Ring Construction

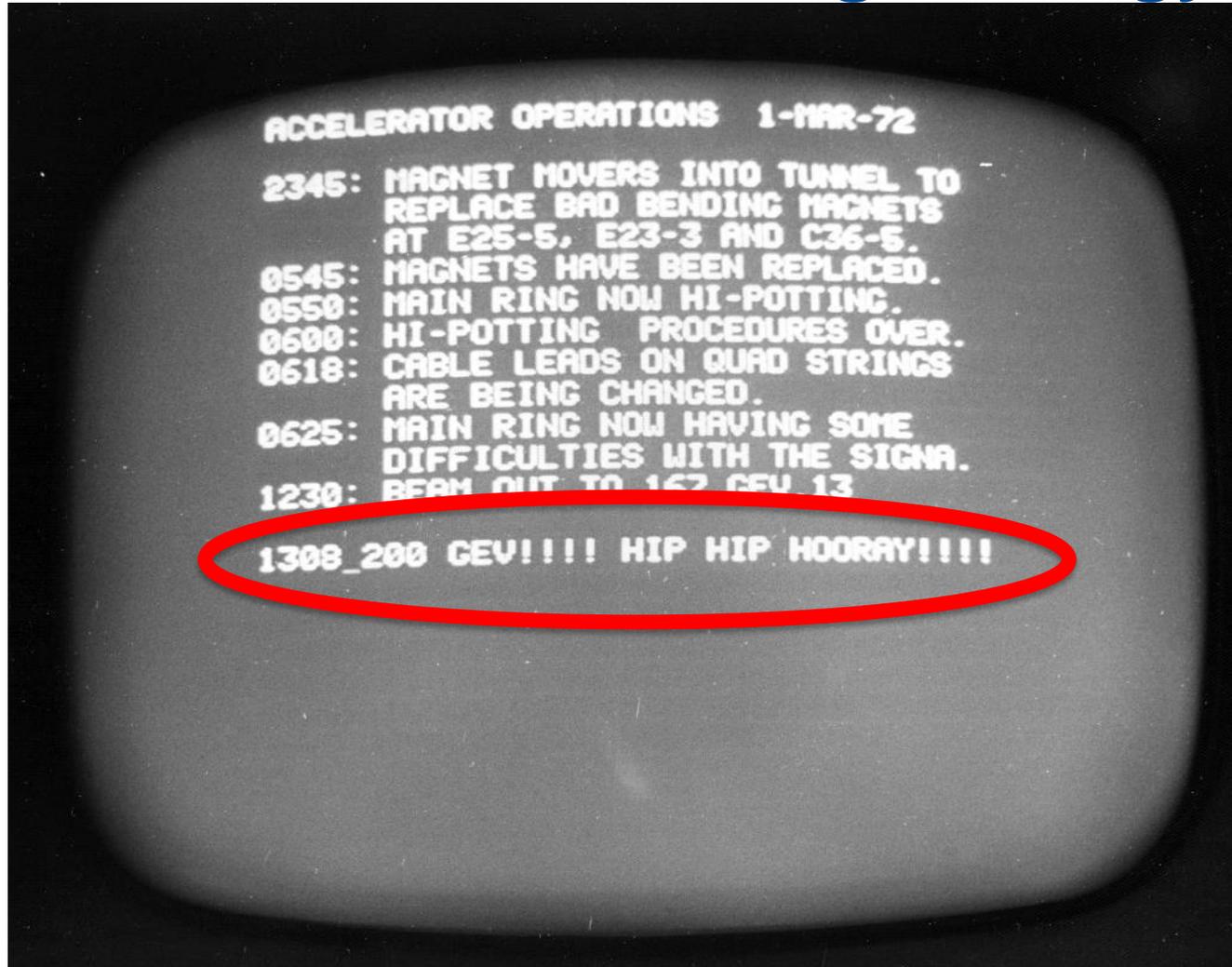


# Accelerator Reaches Design Energy



**March 1, 1972: The accelerator reaches design energy of 200 GeV**

# Accelerator Reaches Design Energy



**March 1, 1972: The accelerator reaches design energy of 200 GeV**

# Experimental Program Begins



Lab's first experiment, E-36, began taking data on February 12, 1972



# Experimental Areas



**Proton Pagoda**



**Meson Lab**

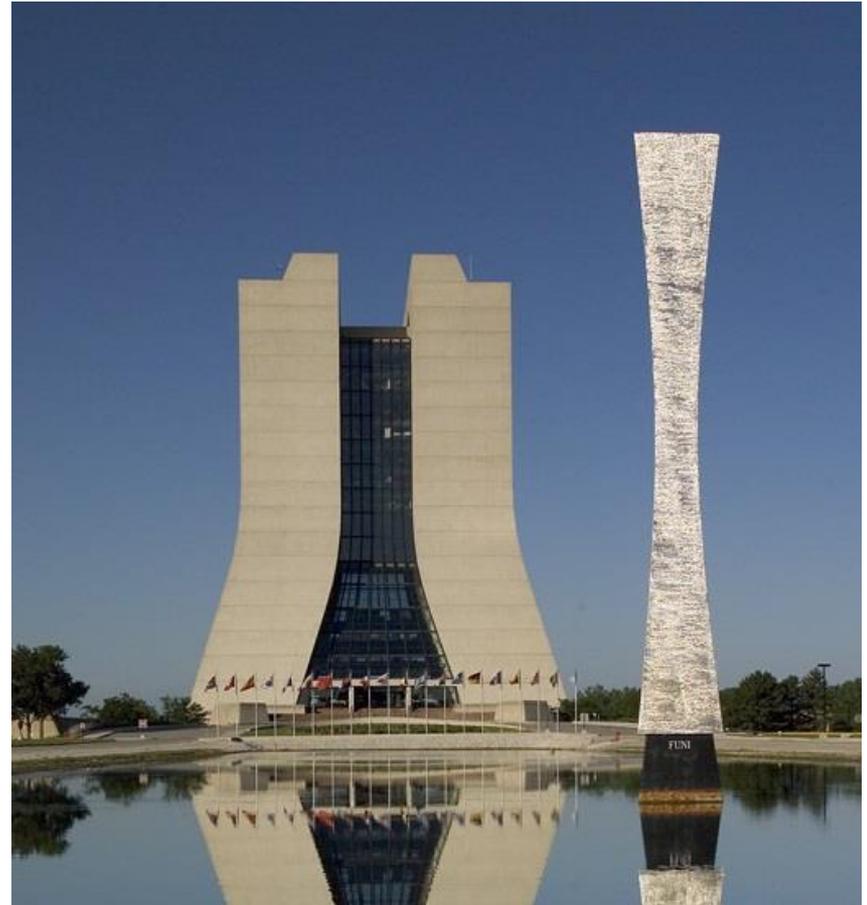


**Neutrino Geodesic Dome**

# Making an Art of Science



**Möbius Strip**



**Acqua Alle Funi**

**Sculptures by Robert R. Wilson**

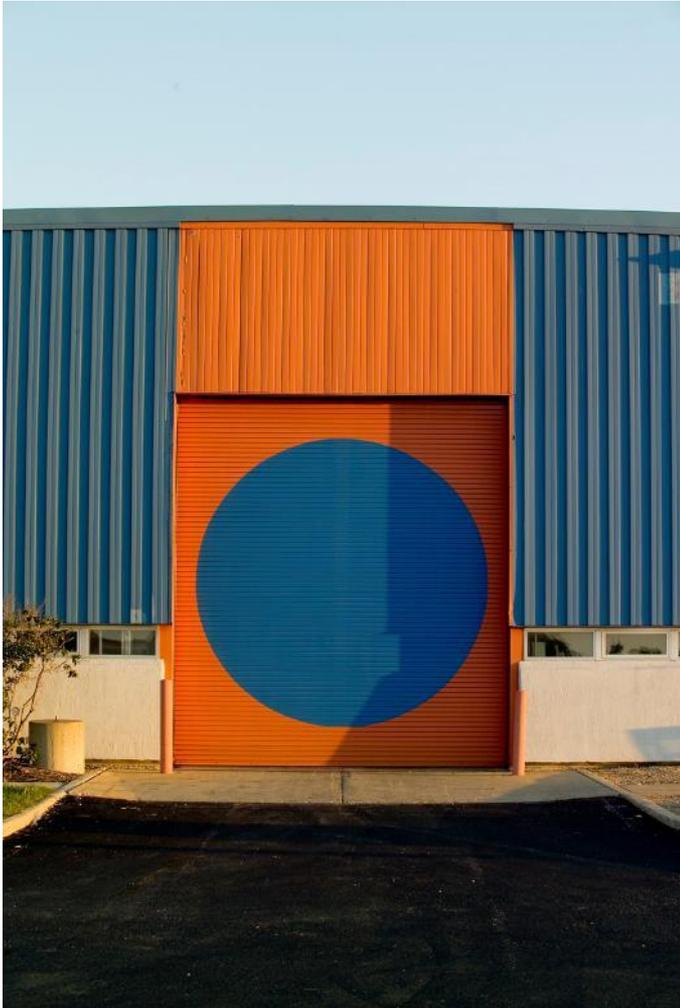
# Making an Art of Science



## Broken Symmetry

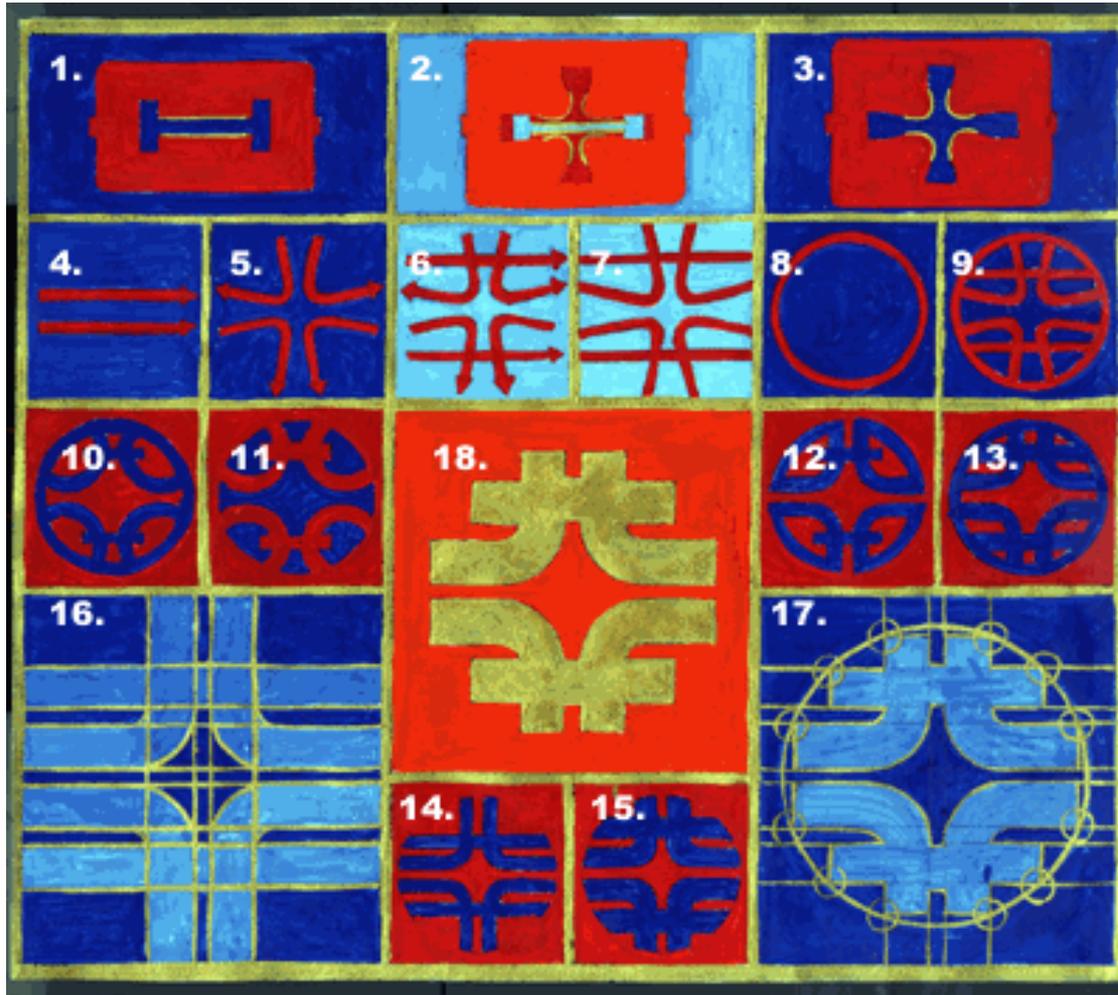
Sculptures by Robert R. Wilson

# Making an Art of Science



**Angela Gonzales developed the lab color scheme: Blues, oranges, and reds.**

# Making an Art of Science



Angela Gonzales designed the lab logo

# Science and Nature



**Fermilab**  
Fermilab Research Association Inc.  
for the Atomic Energy Commission

June, 1969

## NAL Appeal: Save Our Trees, Cut Vandalism

**Dr. Wilson's Appeal . . .**

Contrary to what many of us thought when we first came to these corn fields, there is a real potential for beauty here. We need to conserve and use every tree, every bush, every patch of grass, and every body of water that we have.

I feel strongly about this and, believe me, anyone who thoughtlessly damages any of the natural attributes of our site is going to have a hard time with me.

If we do preserve what we have, and add to it, and create with imagination, then the site can become a joy to behold—a source of pride for all of us. I would like to hear more suggestions about how we can beautify our land.

Robert Rathbun Wilson

May 2, 1969: First Arbor Day at the lab; June 1969: Article urging preservation of trees

# Science and Nature



**First bison arrive in late 1969**

# Science and Nature



## Bison in 2016

# Prairie Restoration



**The prairie restoration began in 1974.**

# Construction of Wilson Hall



**Construction of Wilson Hall was completed in 1974**

# Dedication of Fermilab



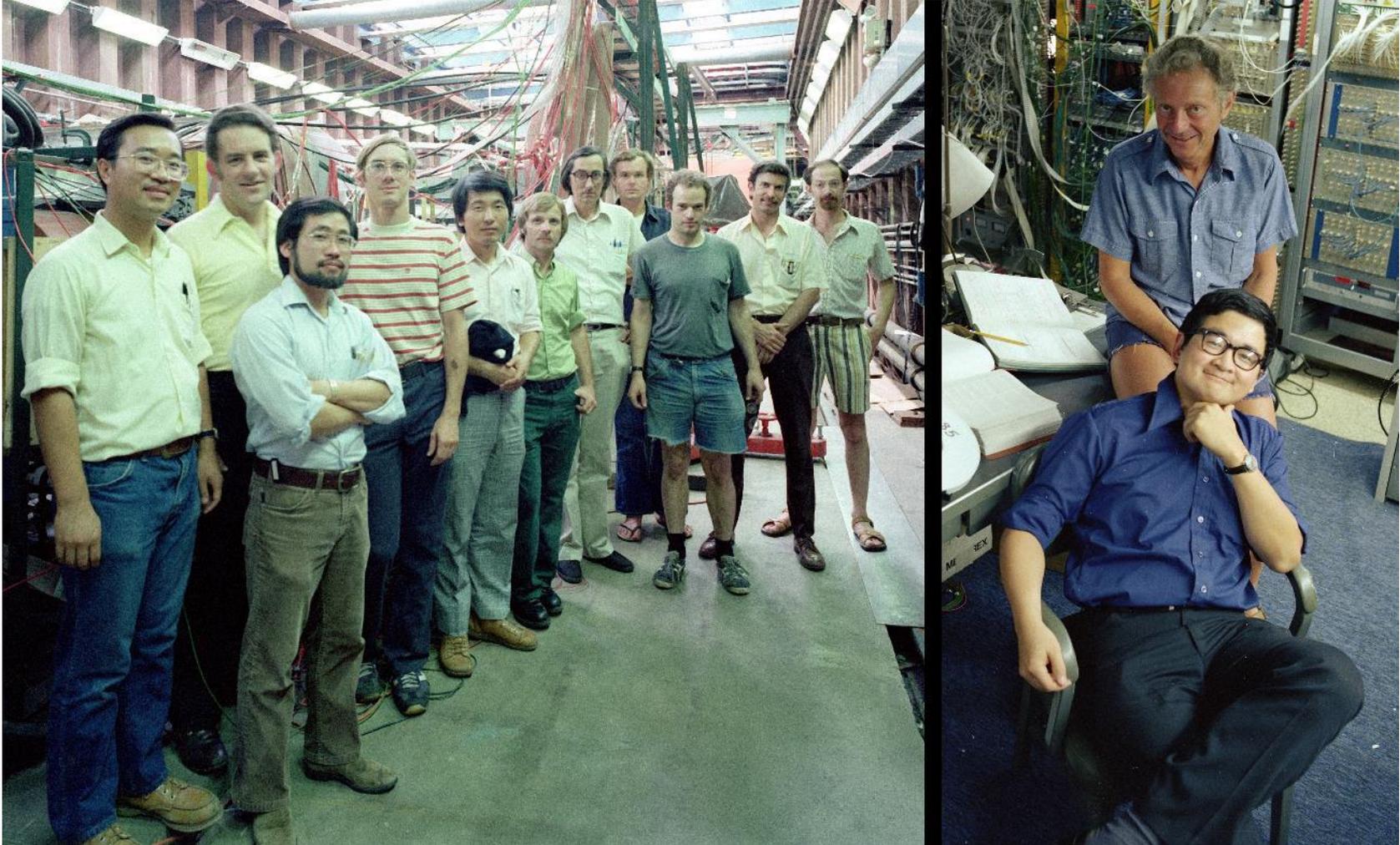
**NAL was dedicated as Fermi National Accelerator Laboratory on May 11, 1974**

# Dedication of Fermilab



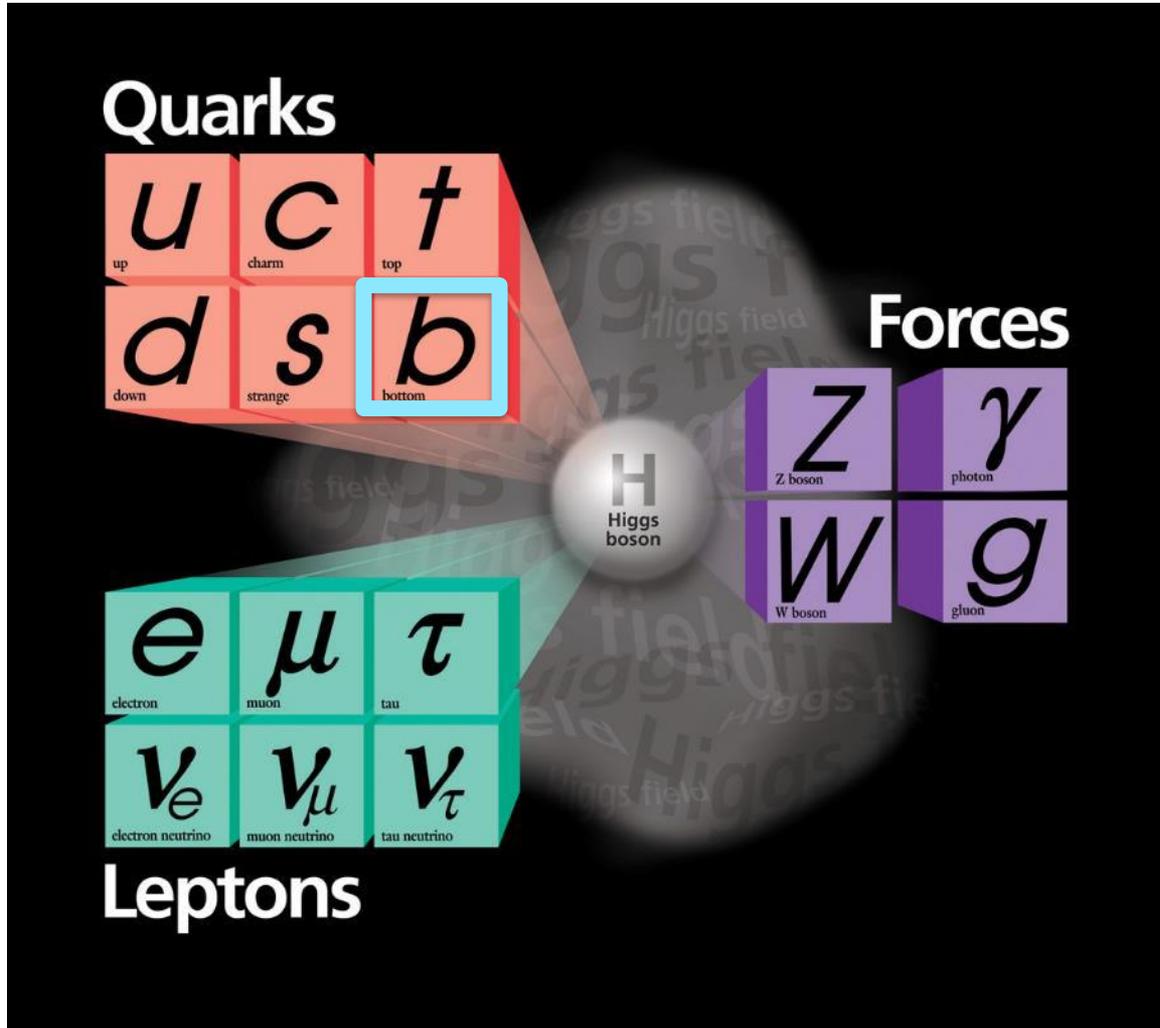
**NAL was dedicated as Fermi National Accelerator Laboratory on May 11, 1974**

# Discovery of the Bottom Quark



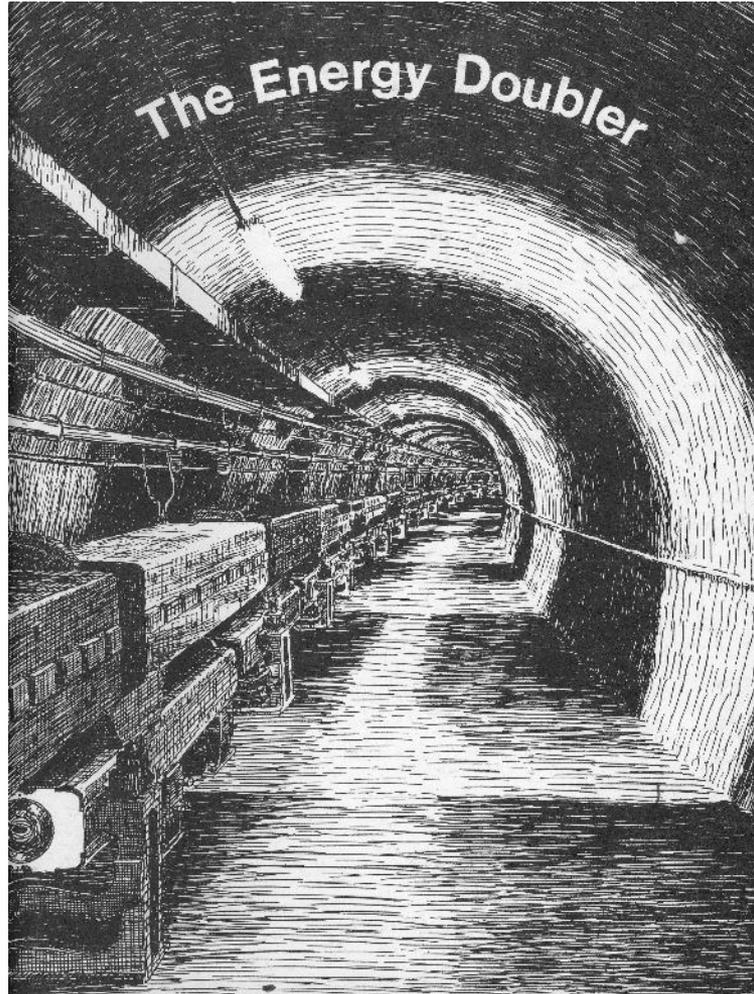
Paper announcing E-288's discovery received by publishers on July 1, 1977

# Discovery of the Bottom Quark



Paper announcing E-288's discovery received by publishers on July 1, 1977

# The Energy Doubler



Artwork by Angela Gonzales

# Robert Wilson Resigns

## The Village Crier



fermi national accelerator laboratory

Operated by Universities Research Association Inc.  
Under Contract with the U.S. Department of Energy

Vol. 10, No. 7

February 16, 1978

### WILSON SUBMITS RESIGNATION

Robert R. Wilson resigned Feb. 9 as Director of the Fermi National Accelerator Laboratory.

The announcement was made by Norman F. Ramsey, president of Universities Research Association. A consortium comprising 53 universities, URA operates Fermilab under contract with the Department of Energy. Ramsey said the problem of inadequate funding led Wilson to resign and indicated the loss of Wilson as director would be a severe blow.

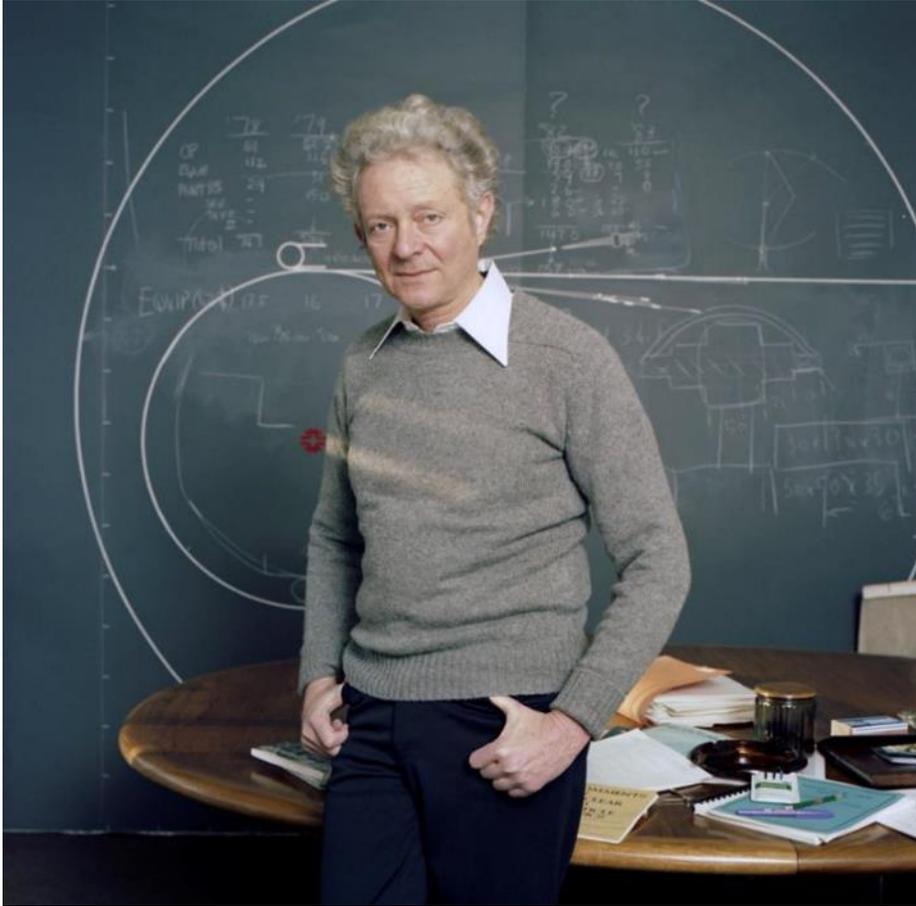
In his resignation letter Dr. Wilson wrote:

*"In this letter I regretfully tender my resignation. In a previous communication I expressed my concern that the future viability of Fermilab is threatened because the funding has been below that necessary to operate the existing facilities responsibly; presently we are operating at about half of our capacity to do studies essential*



Fermilab newsletter announces the director's resignation

# Leon Lederman Becomes Director



Lederman would serve as director from 1979 to 1989

# Saturday Morning Physics



Lederman speaks to a Saturday Morning Physics class in 1980

# Lederman Science Education Center



**Dedicated in 1992**

# Tevatron



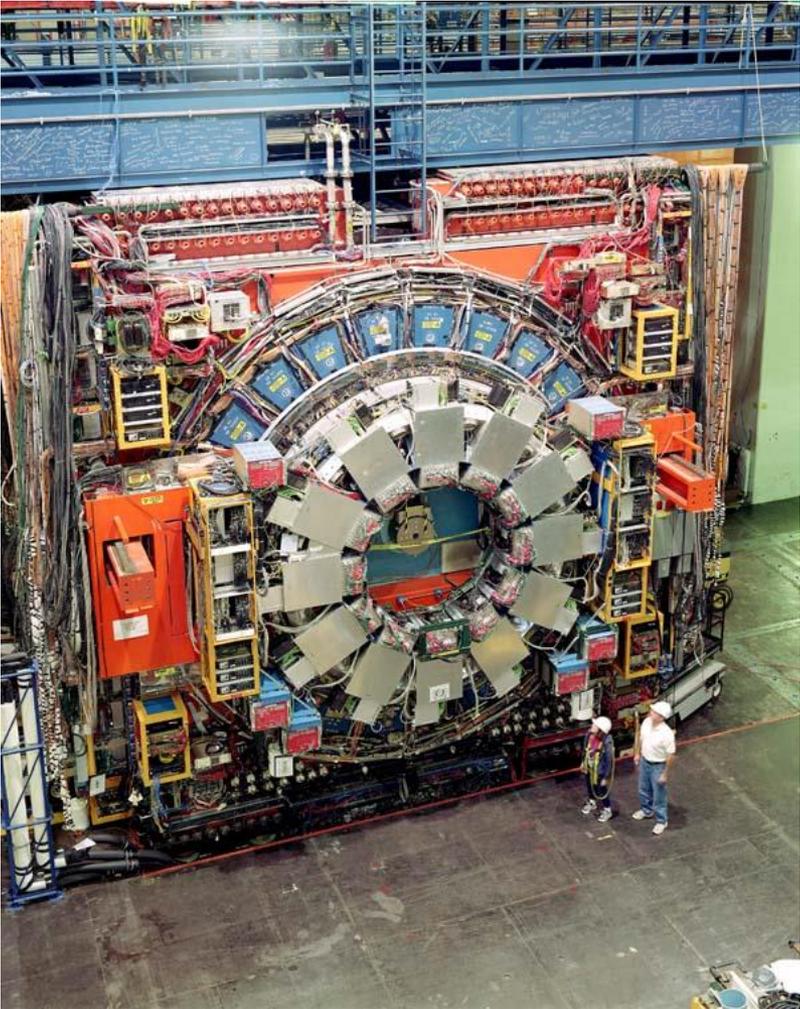
The Tevatron collider was dedicated on October 11, 1985

# Tevatron



**Rich Orr, Dick Lundy, Helen Edwards, and Alvin Tollestrup receive the 1989 National Medal of Technology for their work on the Tevatron**

# CDF and DZero



CDF



DZero

# CDF and DZero



# CDF and DZero



CDF



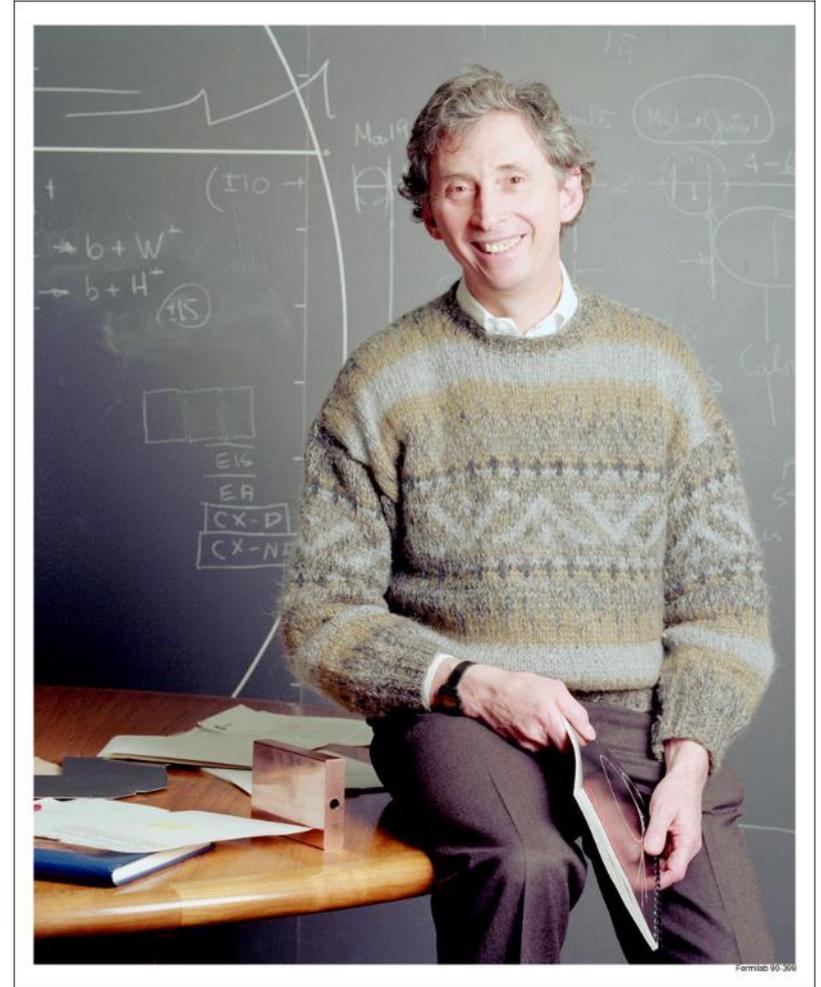
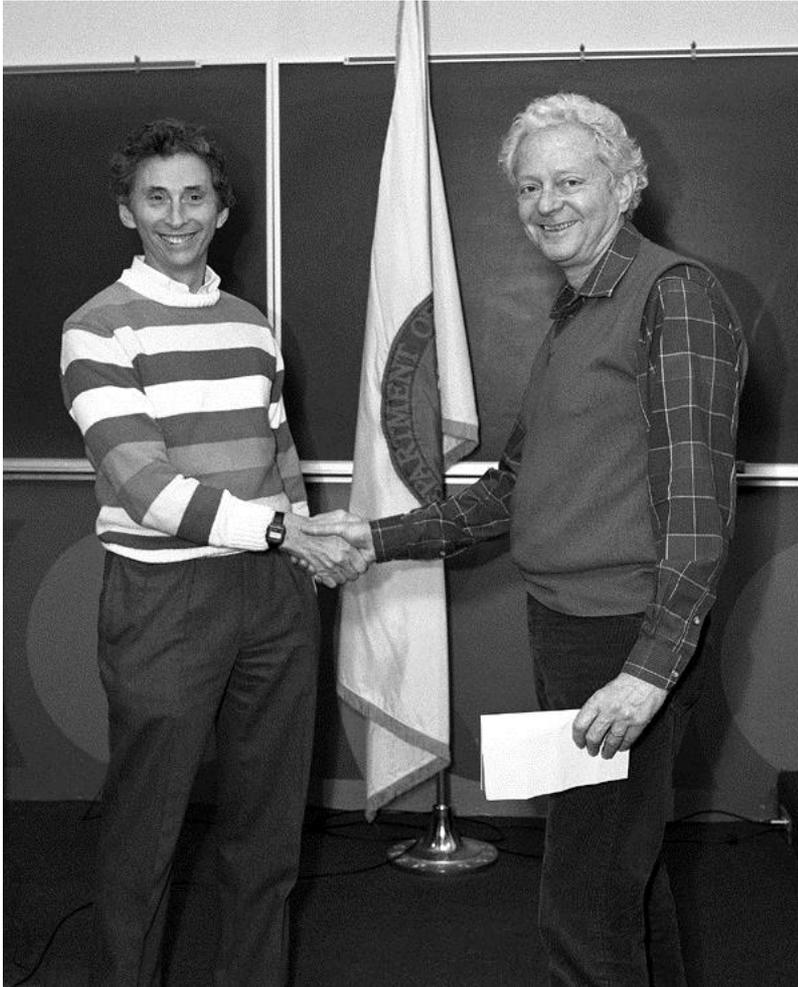
DZero

# Leon Lederman Wins Nobel Prize, 1988



Leon Lederman receiving the Nobel Prize in 1988

# John Peoples Becomes Director



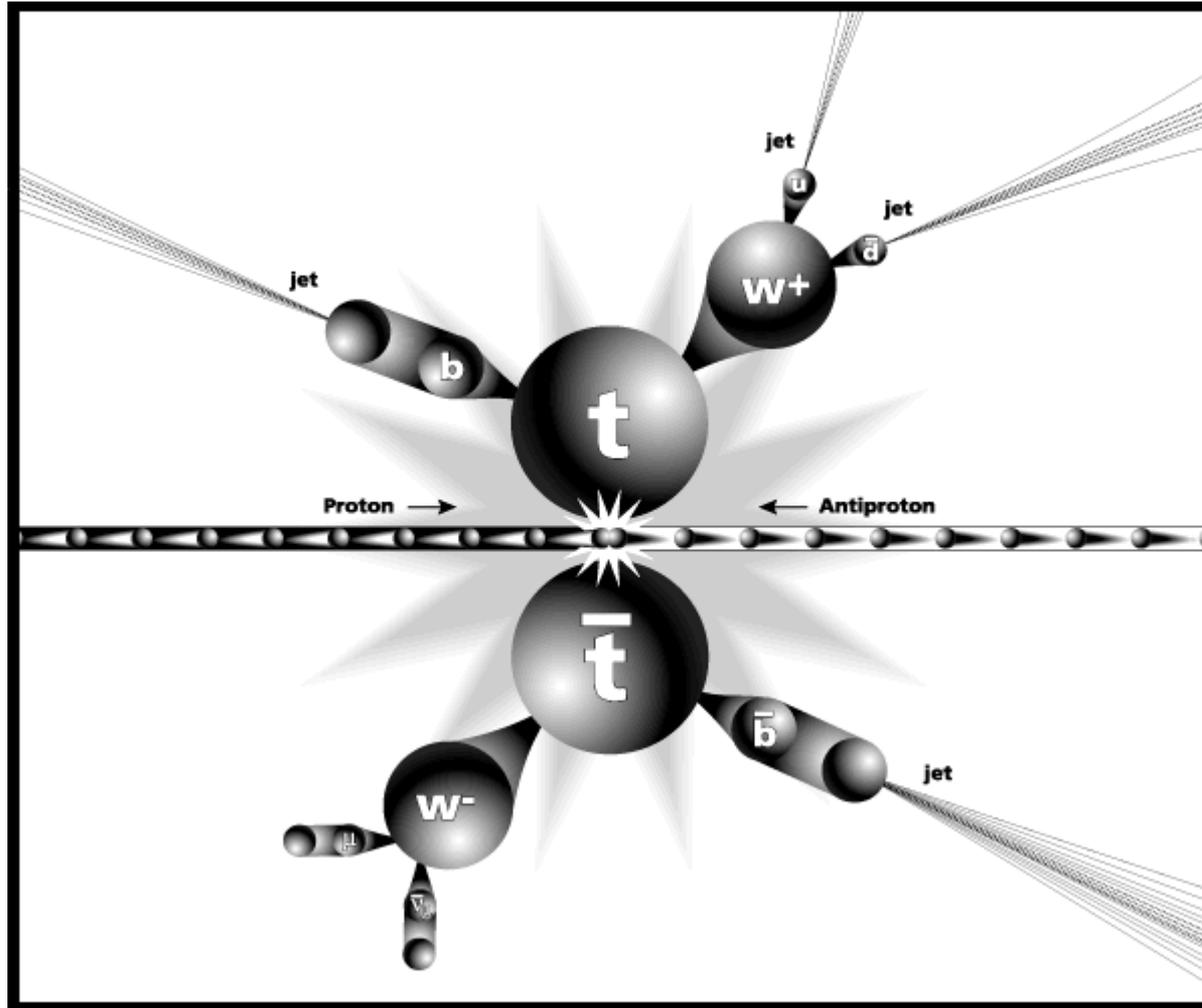
John Peoples became director in 1989 and served until 1999

# Top Quark Discovery, 1995



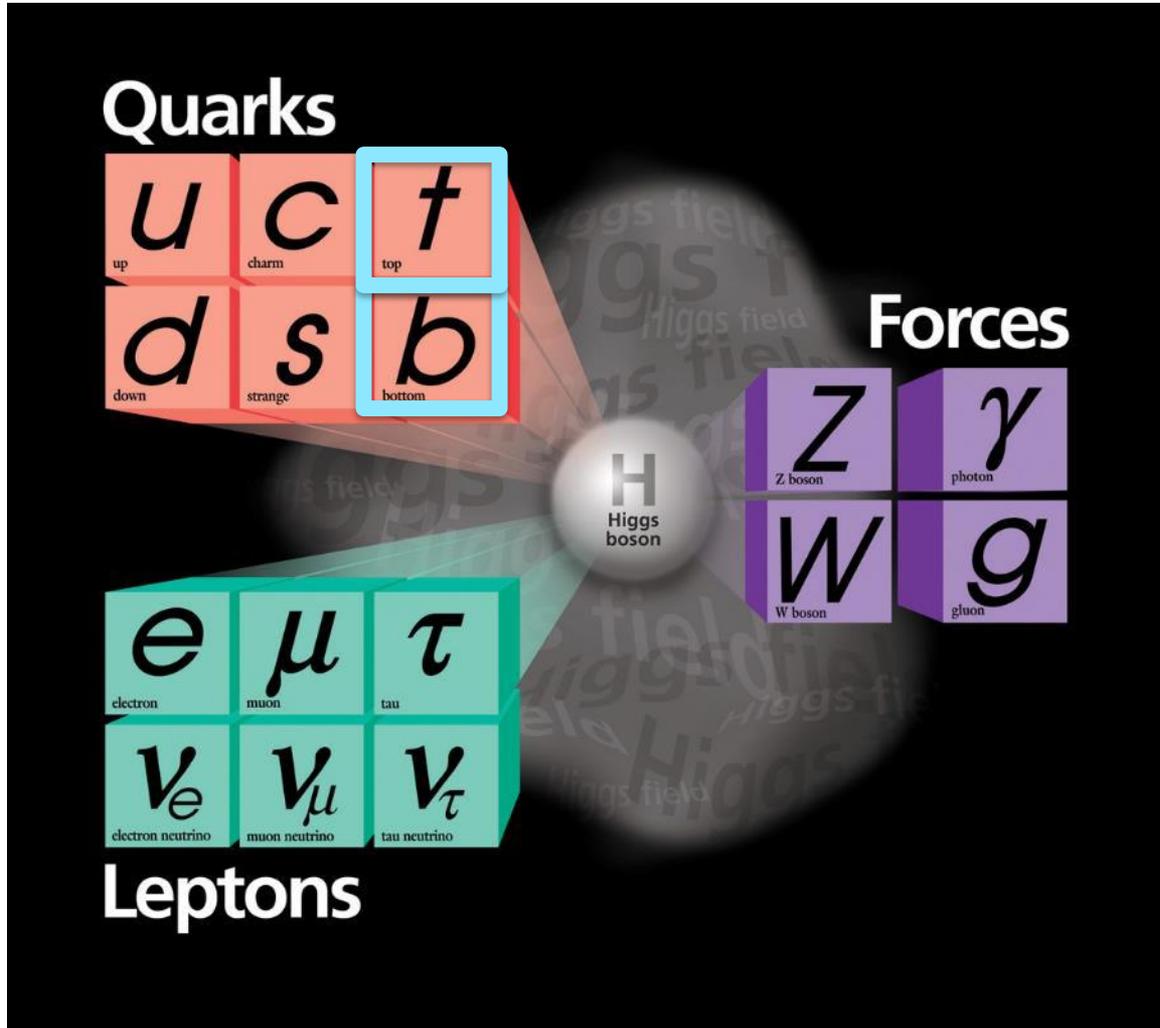
**March 2, 1995: Top Quark Discovery Announcement Seminar and Press Conference**

# Top Quark Discovery, 1995



Proton-antiproton collision producing the top quark

# Discovery of the Top Quark



# Main Injector



**Main Injector groundbreaking on March 22, 1993**

# Main Injector



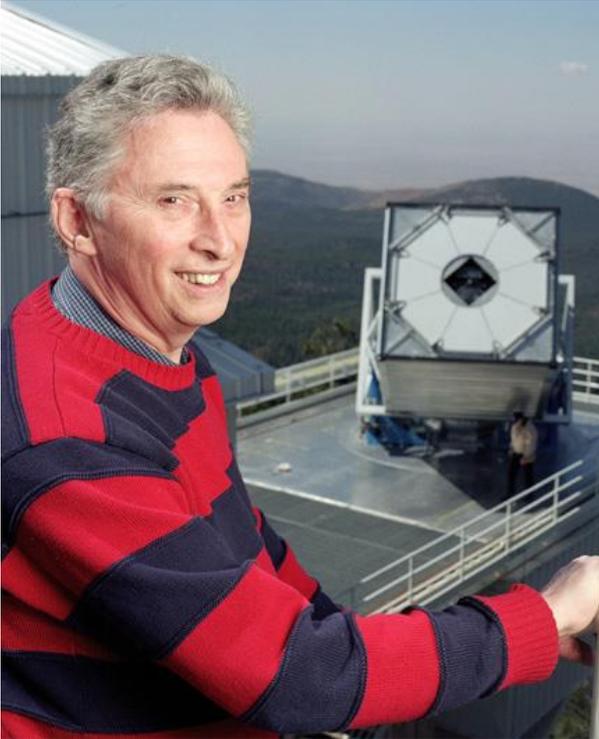
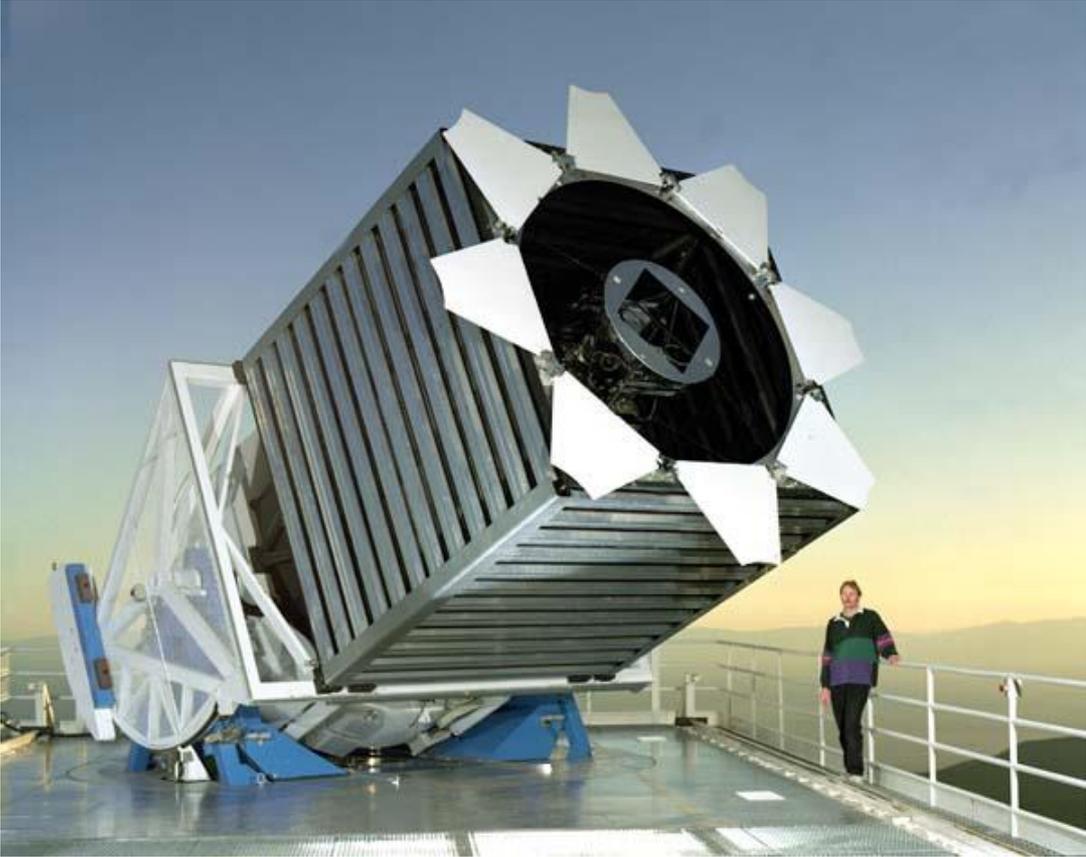
Main Injector completed in 1999

# Sloan Digital Sky Survey



Sloan Digital Sky Survey Collaboration in 1993

# Sloan Digital Sky Survey



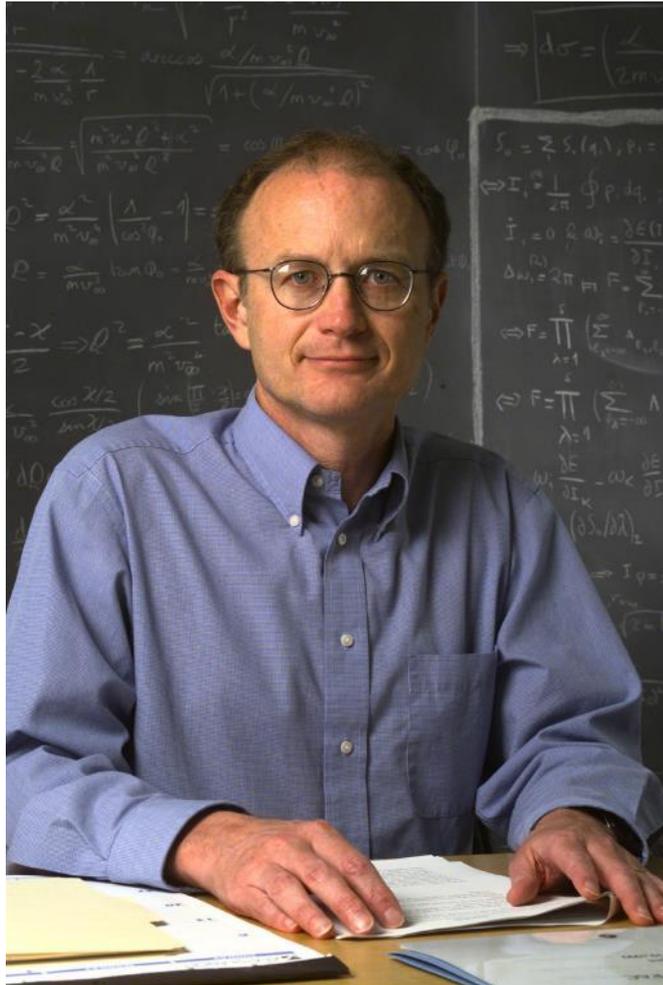
Sloan Digital Sky Survey 2.5 m telescope in 2000

# Fermilab and the Web

FERMILAB COMPUTING DIVISION	
Computing[1]	Documentation: General[2], Offline Products[3], Online (DOCOB) [4]
INFO[5]	Access to Fermilab and Computing Division announcements.
H E P[6]	World Wide Web services provided by other High Energy Physics Laboratories, CERN[7], SLAC[8]
Spires[9]	Access to Spires preprint database.
Help[10]	Fermilab Help Page for WWW
WWW[11].	Information on the World-Wide Web project.

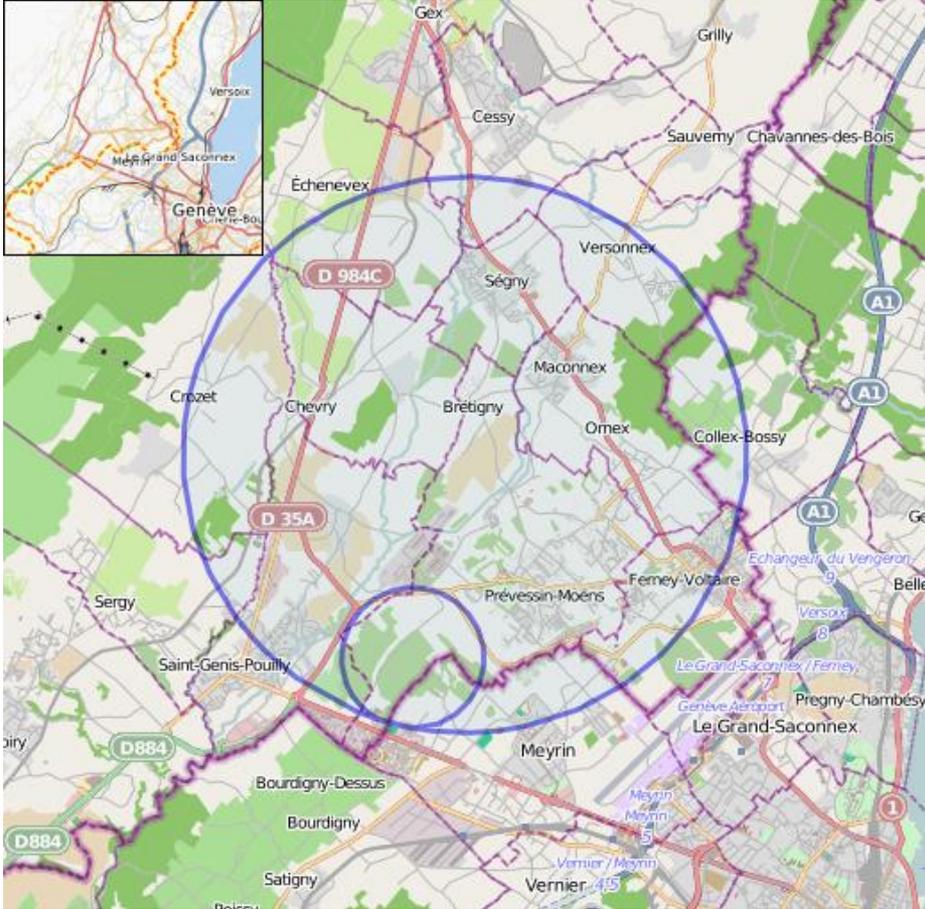
## Fermilab's first webpage from late 1992

# Mike Witherell Becomes Director



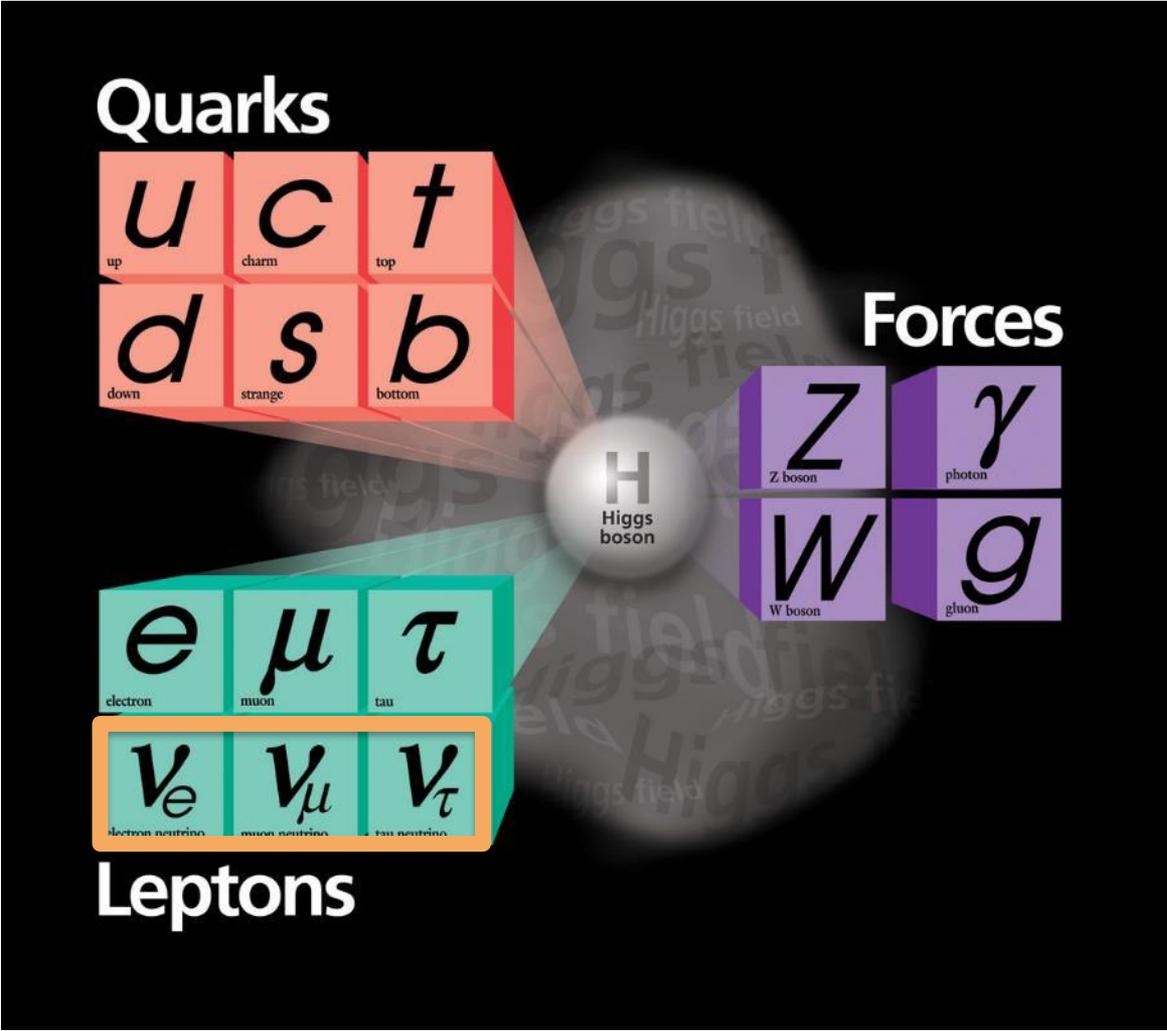
He served as director from 1999 to 2005

# On the Horizon: Large Hadron Collider

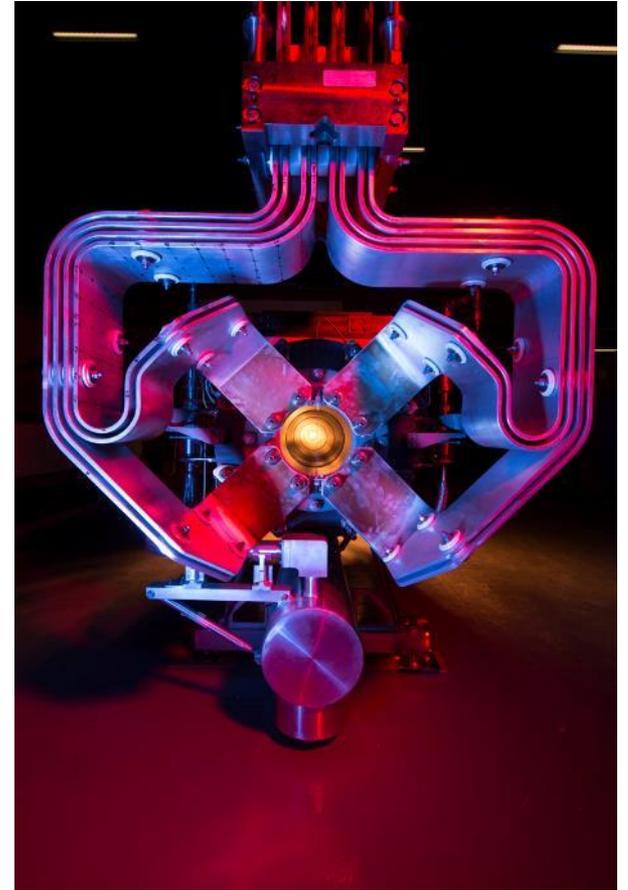


Construction on the LHC started in 1998. Image via:  
[https://en.wikipedia.org/wiki/File:Location\\_Large\\_Hadron\\_Collider.PNG](https://en.wikipedia.org/wiki/File:Location_Large_Hadron_Collider.PNG)

# Neutrinos

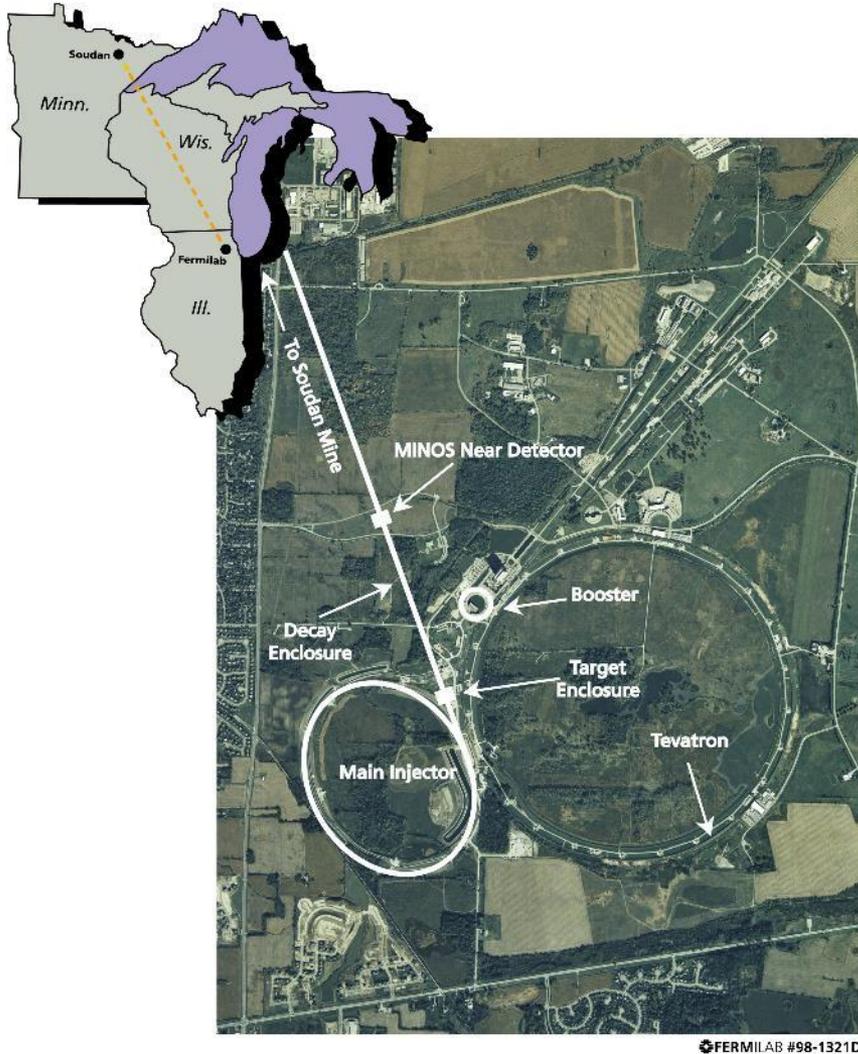


# NuMI



The NuMI beam was completed in 2005, setting the stage for neutrino experiments

# MINOS



**Groundbreaking for MINOS Detector Hall in the Soudan Mine, Minnesota in 1999**

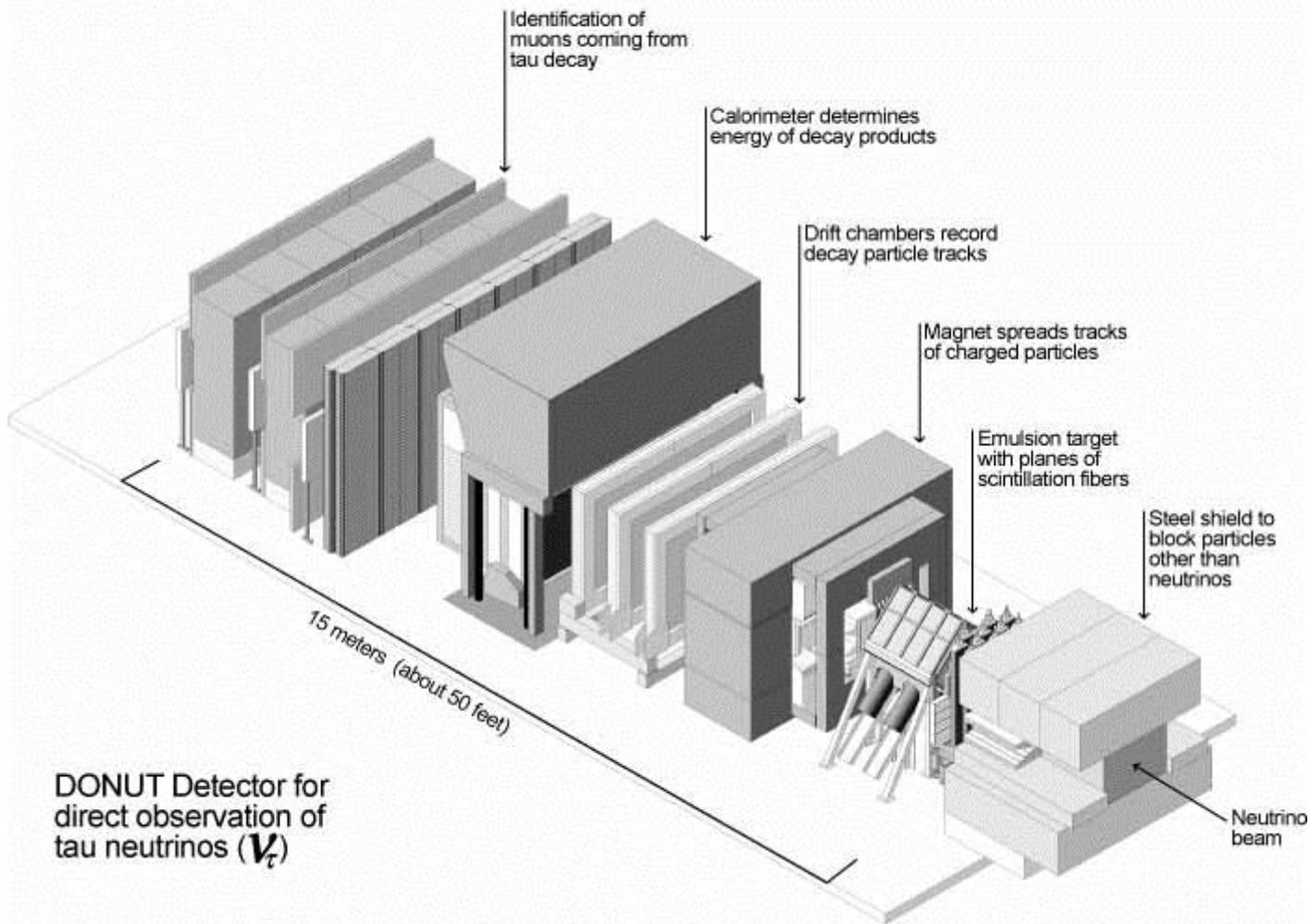
# MINOS



**MINOS starts on March 4, 2005**

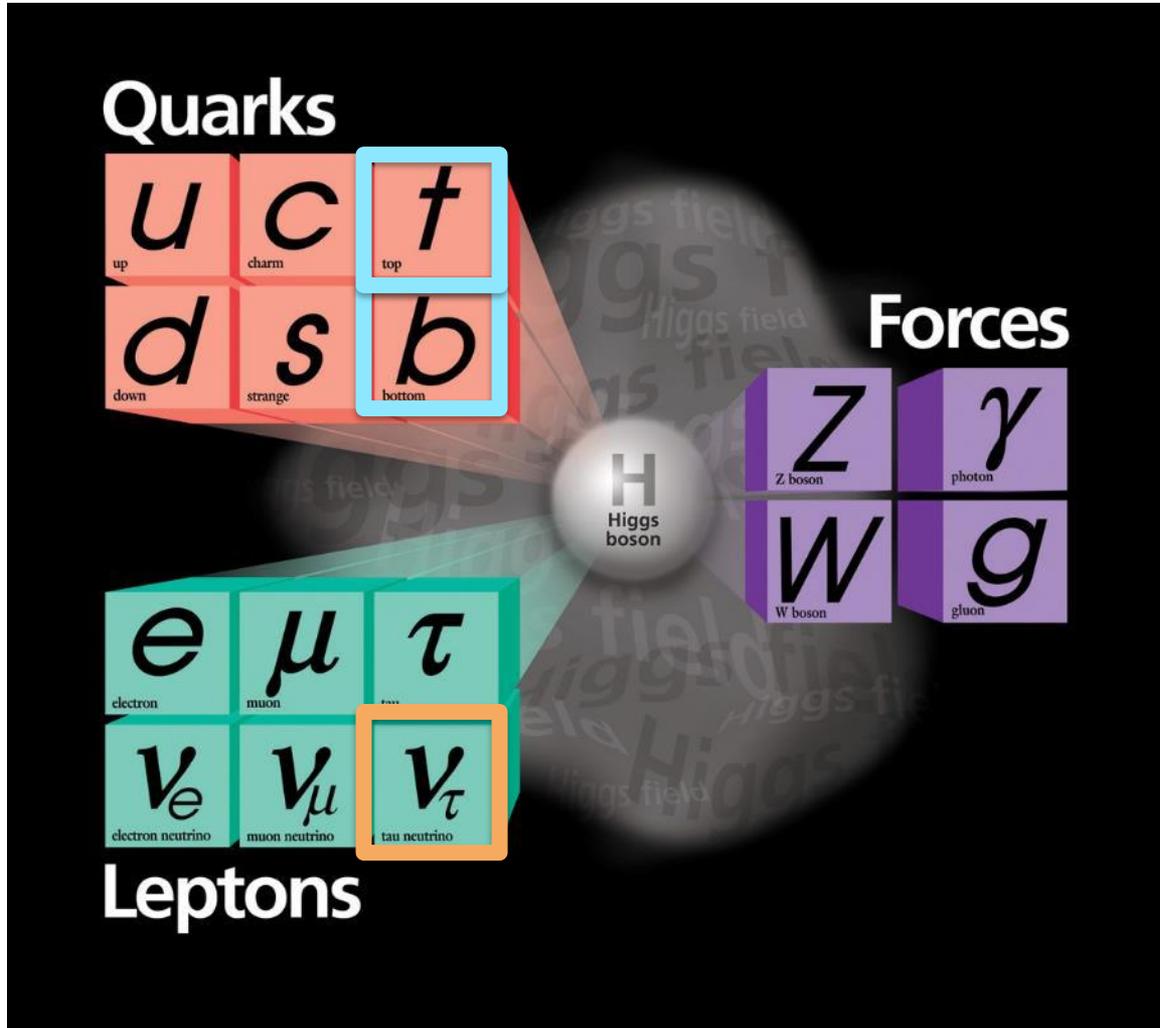
# DONUT Observes the Tau Neutrino

## DONUT Detector



Announced July 21, 2000

# DONUT Observes the Tau Neutrino

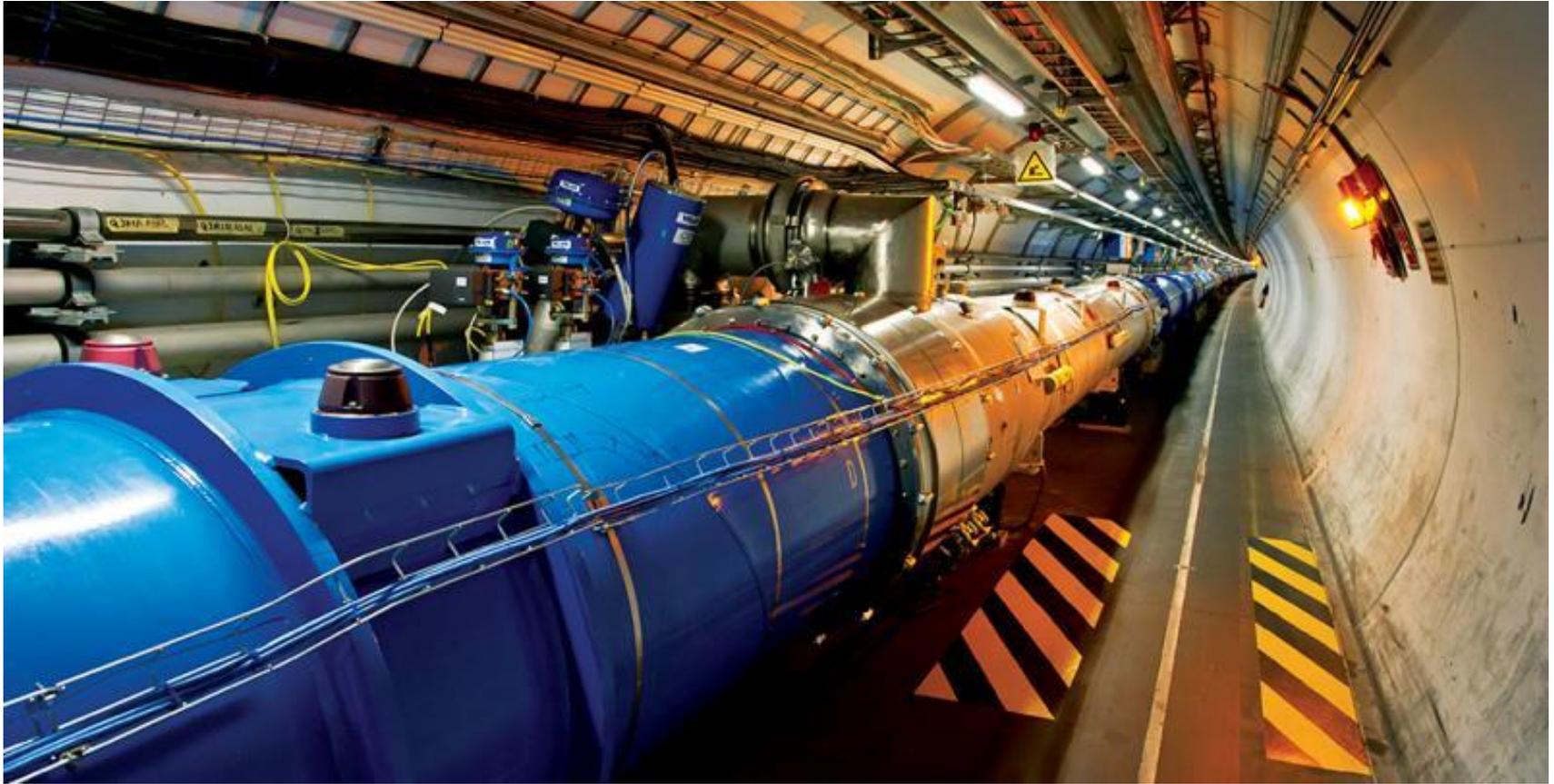


# Pier Oddone Becomes Director



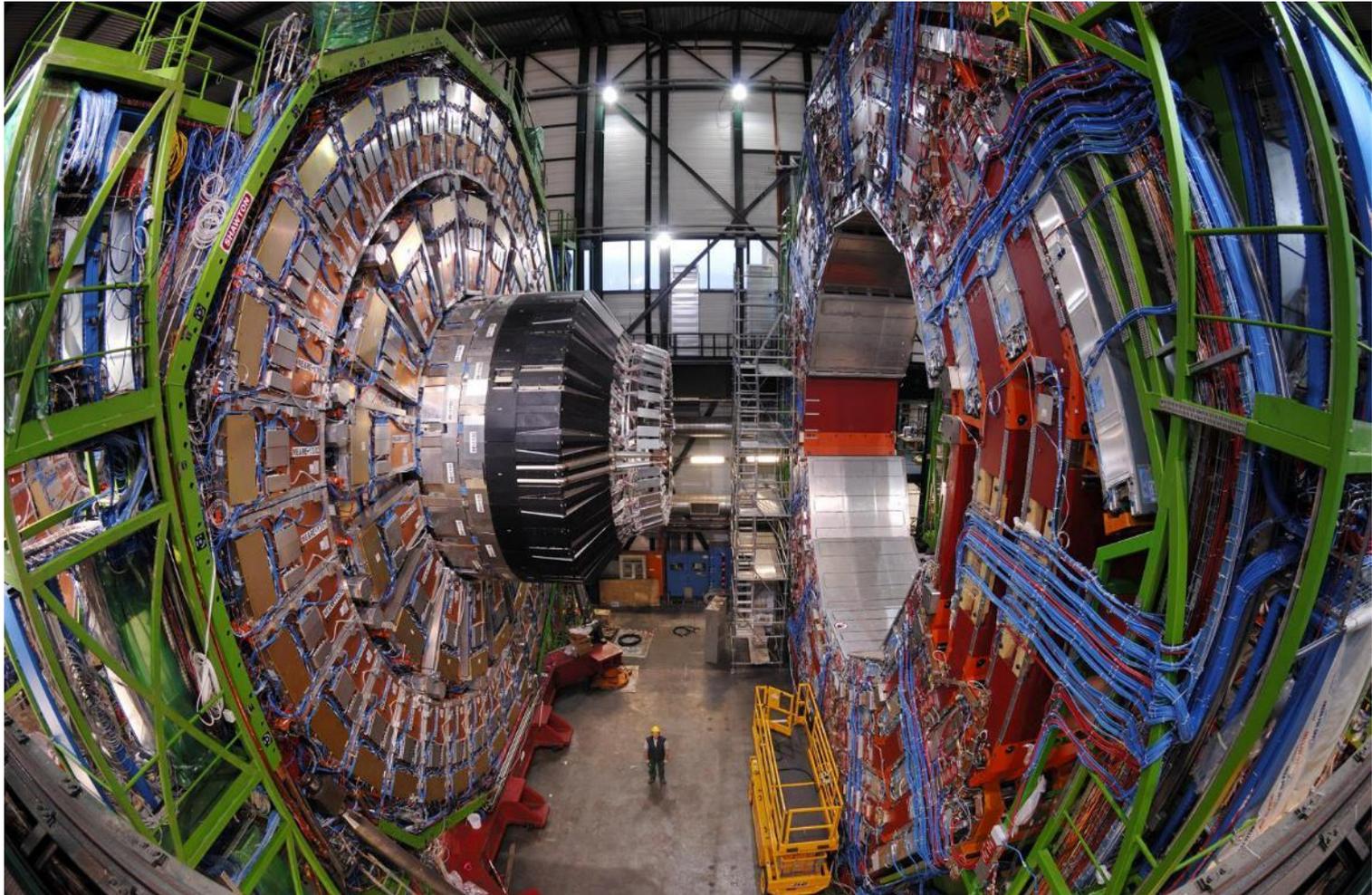
**He served as director from 2005 to 2013**

# LHC (Large Hadron Collider) at CERN



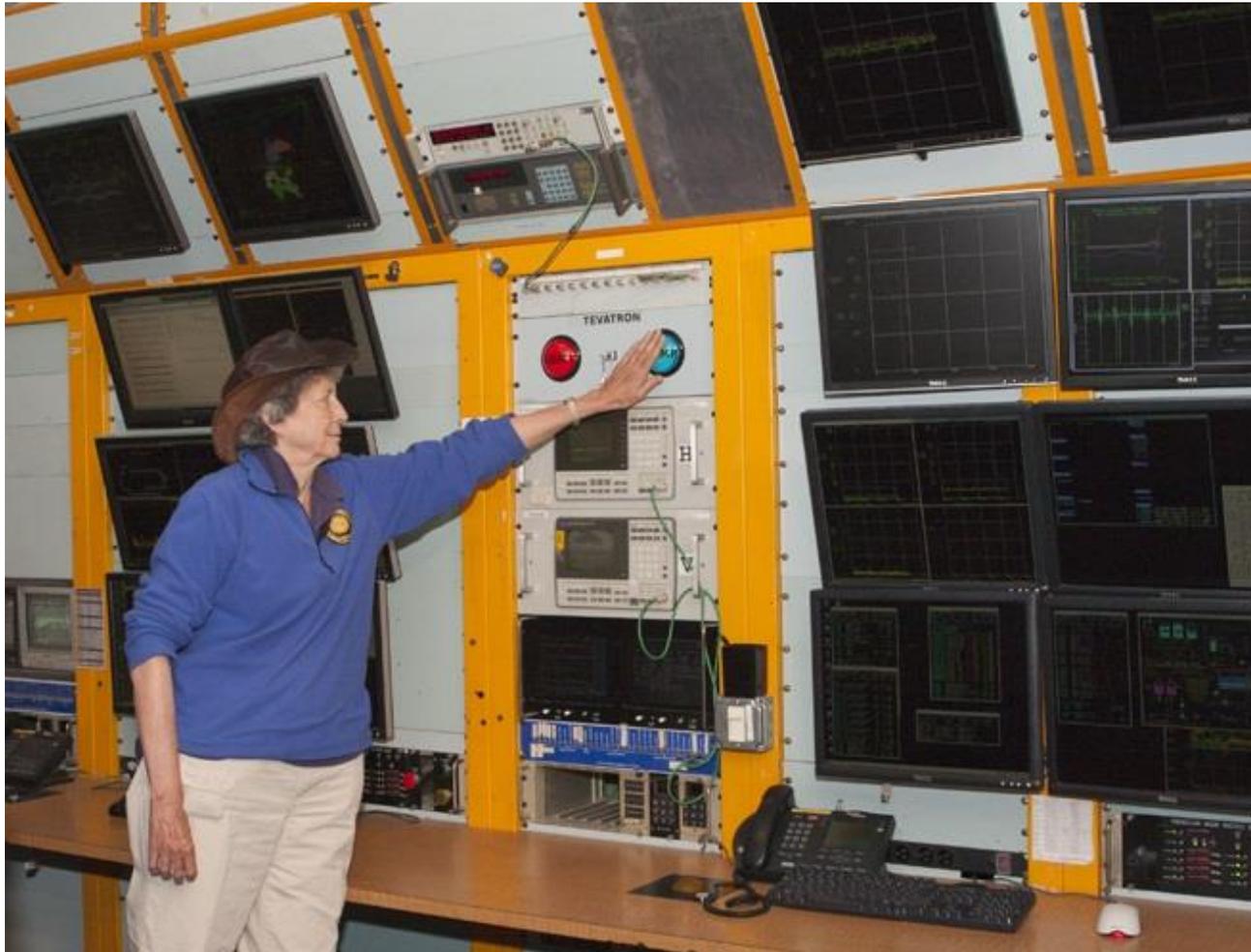
The LHC was completed in 2008, becoming the world's most powerful accelerator (image via <http://home.cern/topics/large-hadron-collider>)

# CMS Detector Completed at CERN



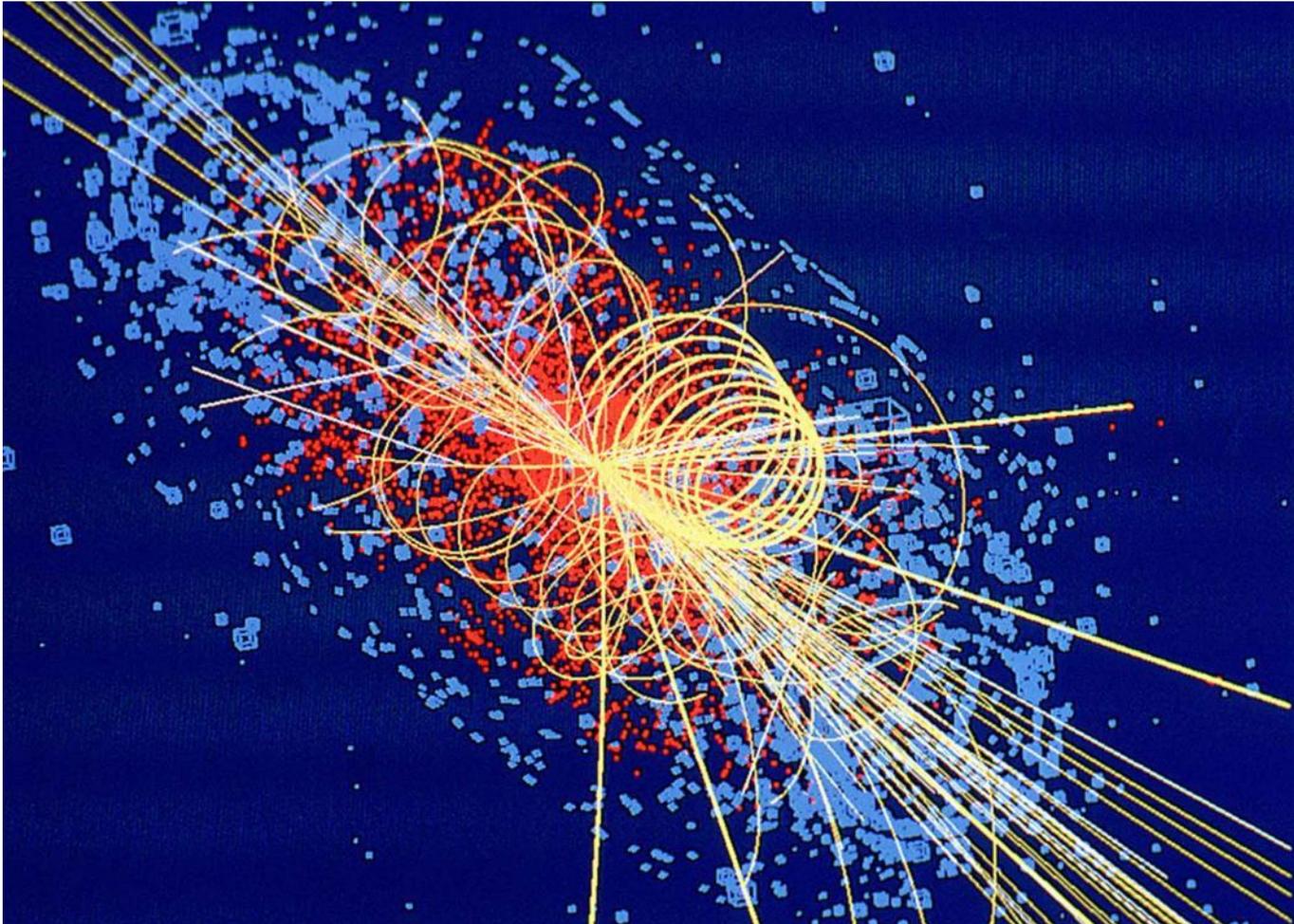
January 22, 2008 (image via <http://cms.web.cern.ch/news/what-cms>)

# Tevatron Shutdown



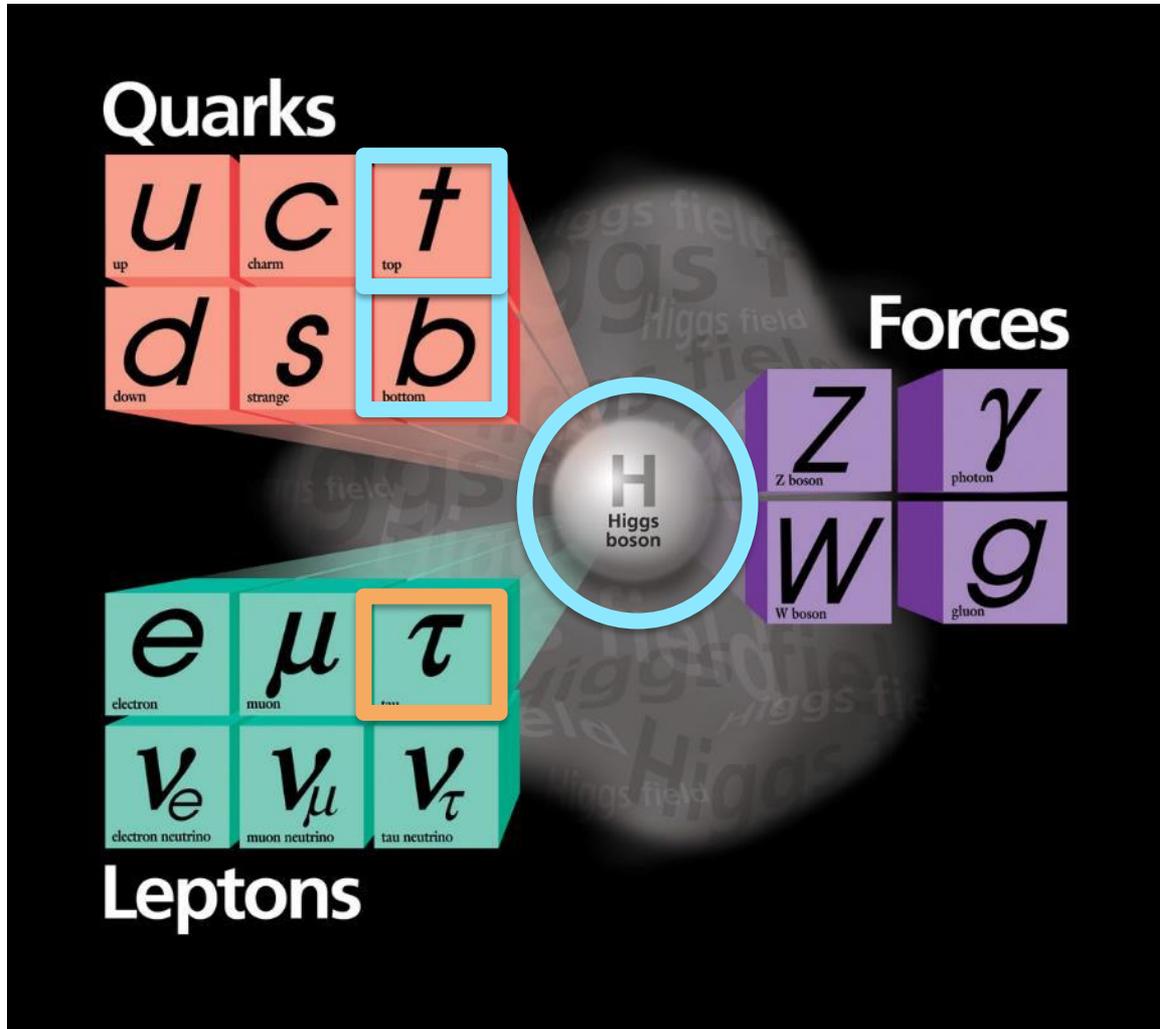
The Tevatron was shut down on September 30, 2011

# Higgs Boson Discovery



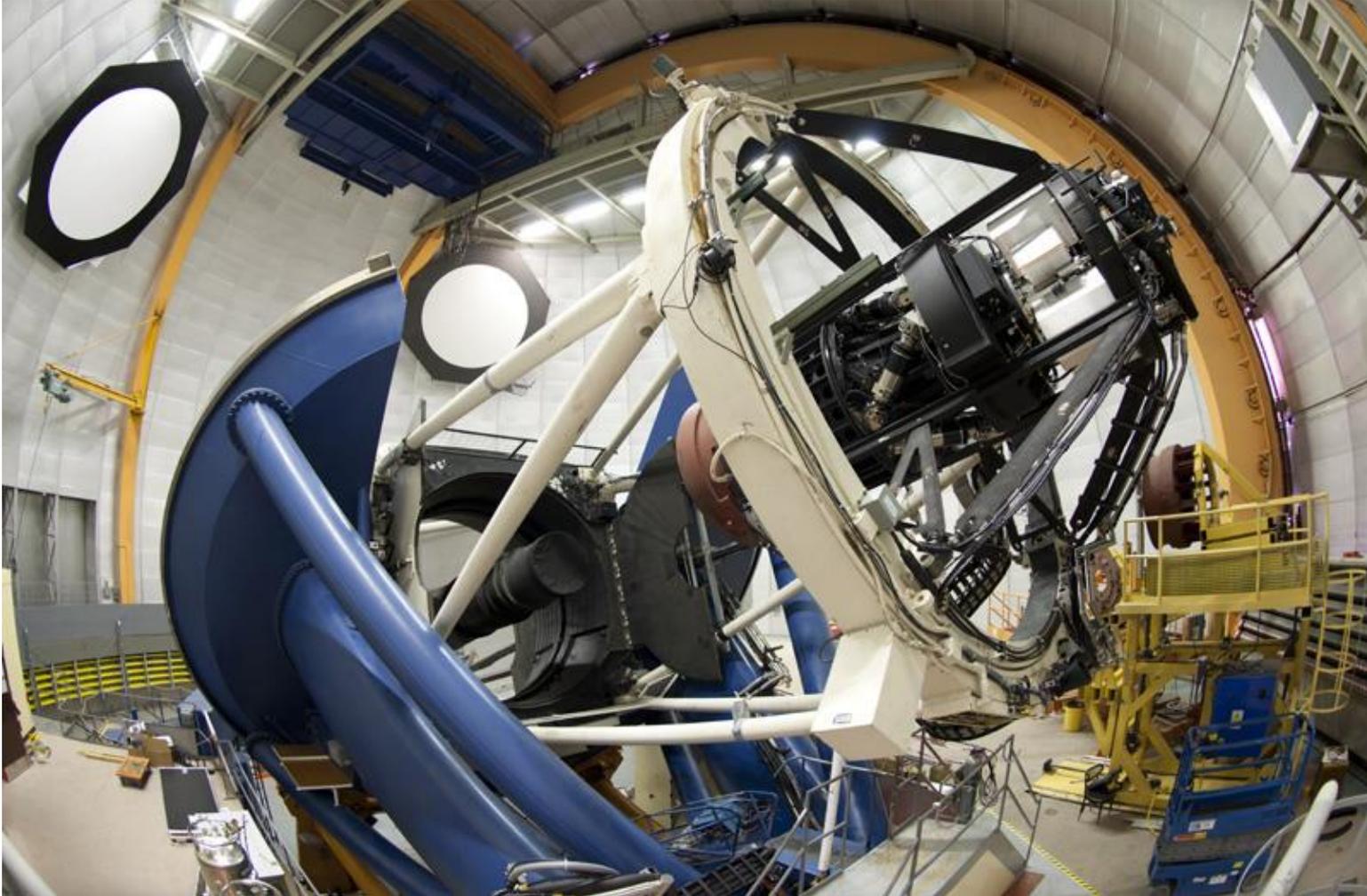
Announced July 4, 2012

# Higgs Boson Discovery



Announced July 4, 2012

# Dark Energy Survey



First pictures in 2012

# Dark Energy Survey



First pictures in 2012

# Nigel Lockyer Becomes Director



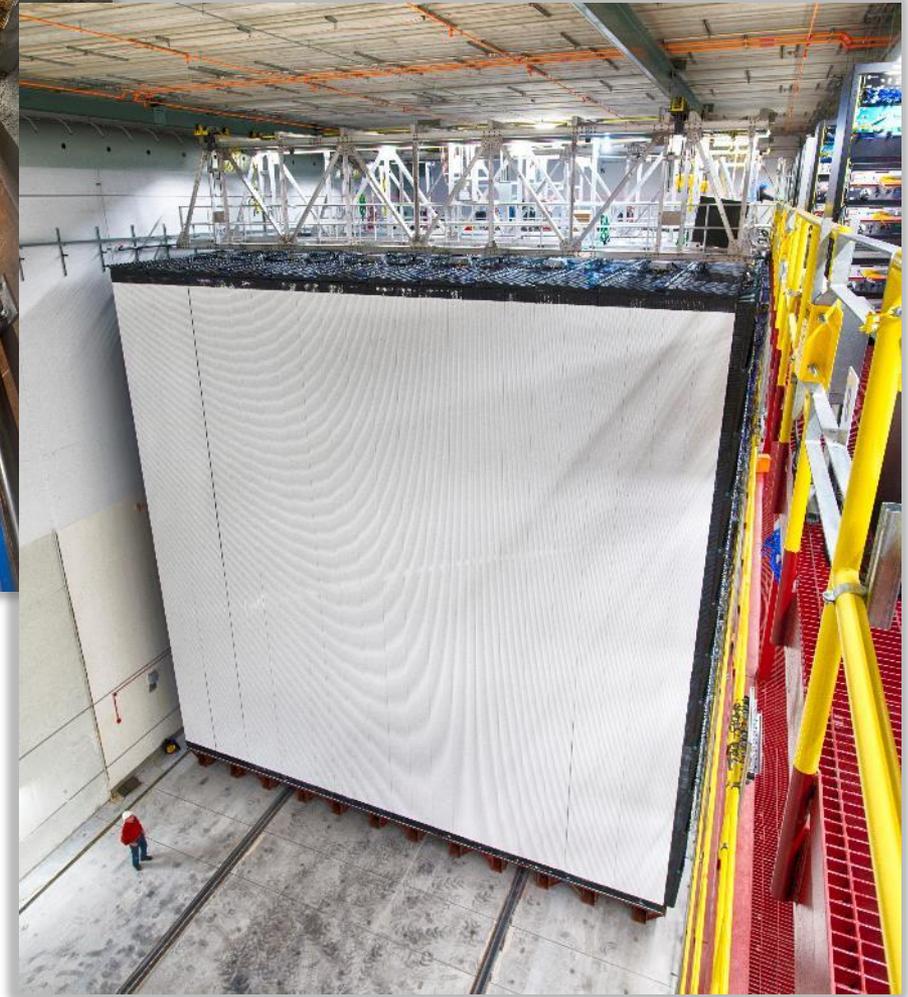
**He has served as director since 2013**

# NOvA



**Near Detector**

**Far Detector**

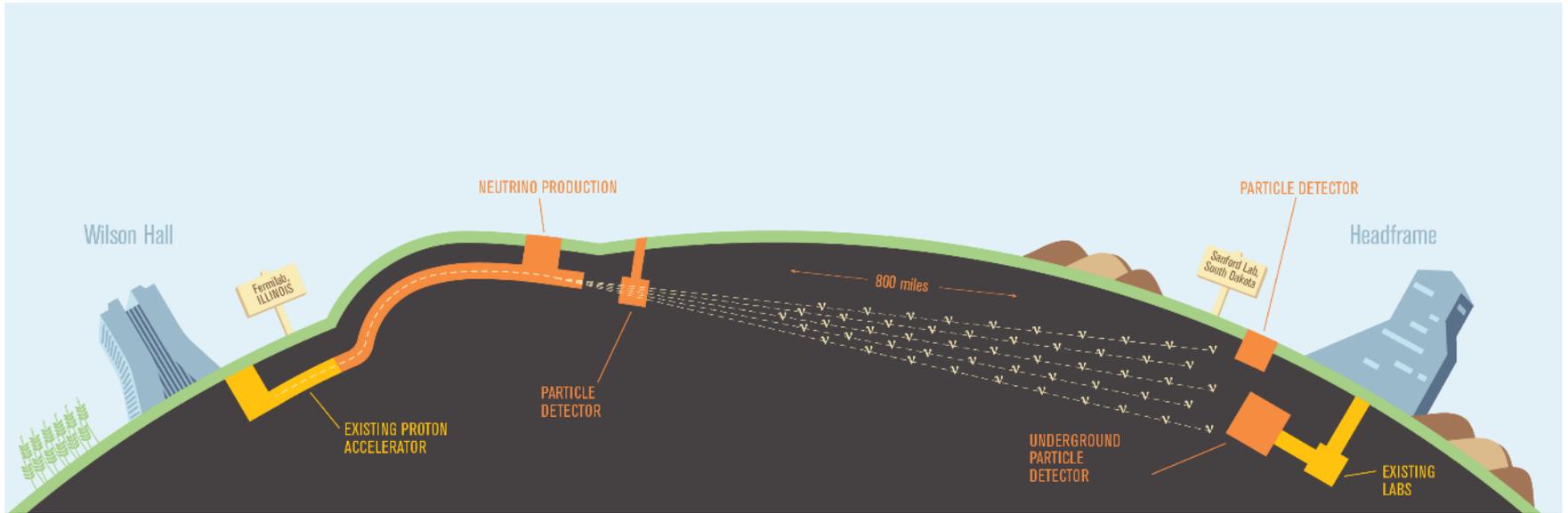


**Completed in 2014**

# LBNF/DUNE



# LBNF/DUNE



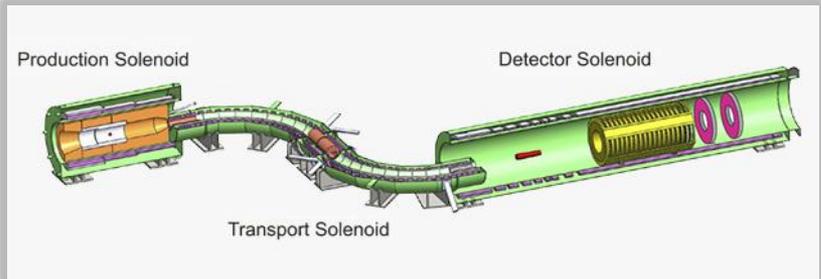
# Other Experiments



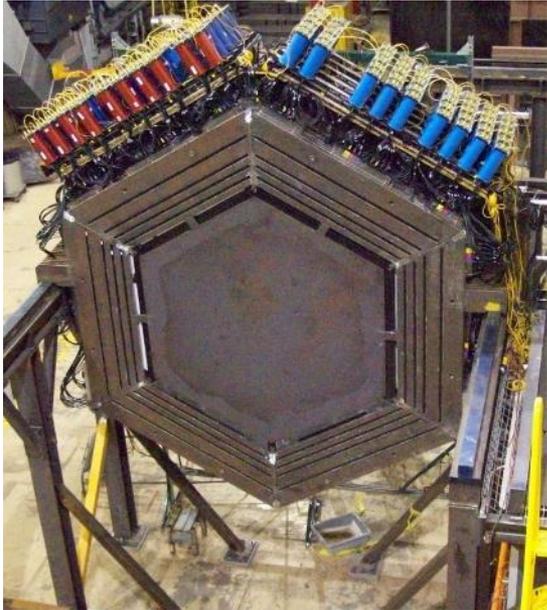
**Muon g-2**

*...And Many More!*

**MINERvA**



**Mu2e**



**2017: Fermilab's 50<sup>th</sup> Anniversary**

**What will the next  
50 years bring?**

***Stay tuned!***

