

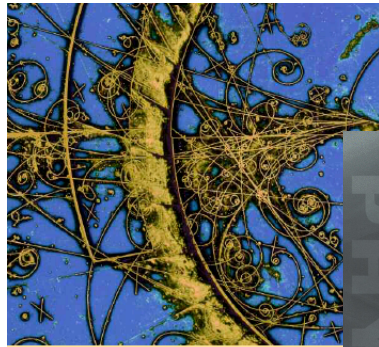
Particle Physics in the Americas

- Recent plans
- Americas' regional facilities
 - Current
 - Future
- Partnership on international projects
- National programs



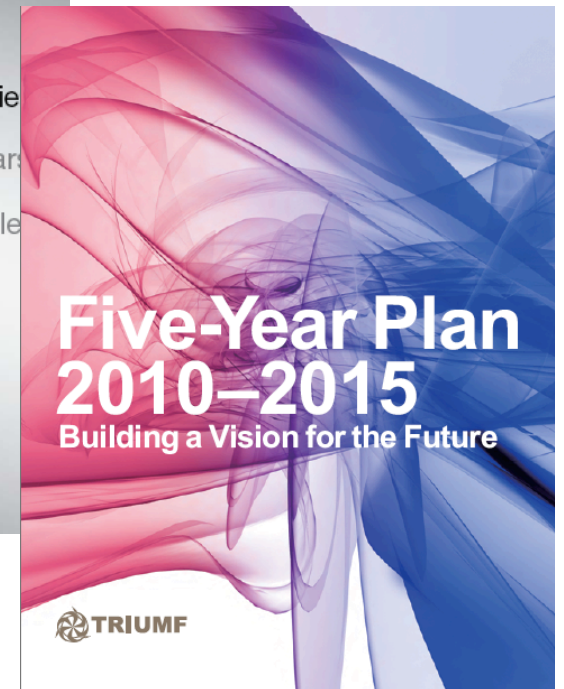
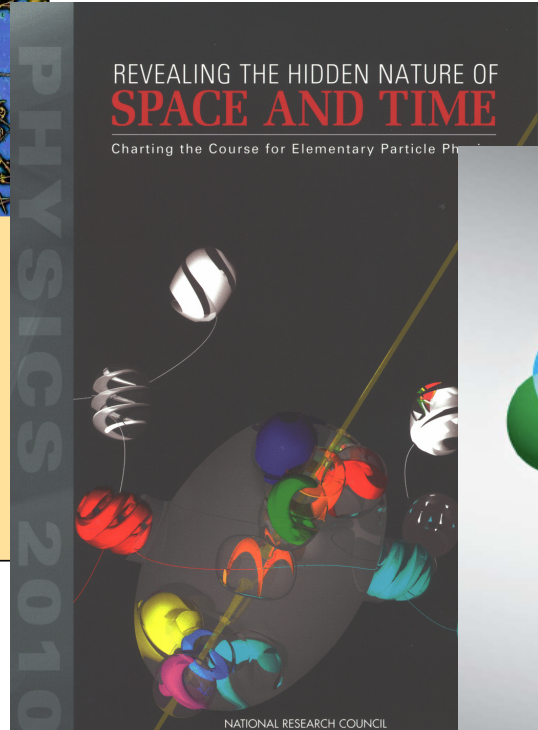
William Trischuk
University of Toronto/IPP
November 20, 2009

Vision Statements and of Strategic Plans

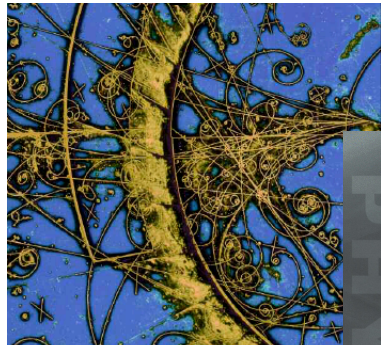


Perspectives on
Subatomic Physics
in Canada
2006-2016

REPORT OF THE NSERC
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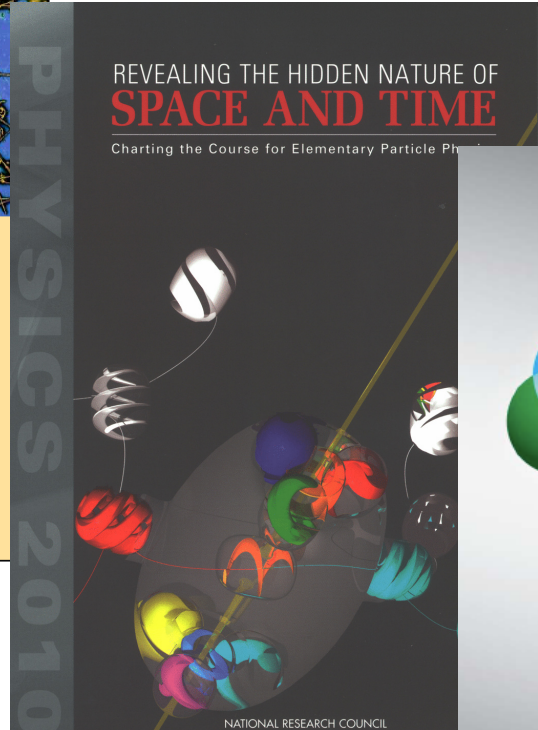


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REVEALING THE HIDDEN NATURE OF
SPACE AND TIME

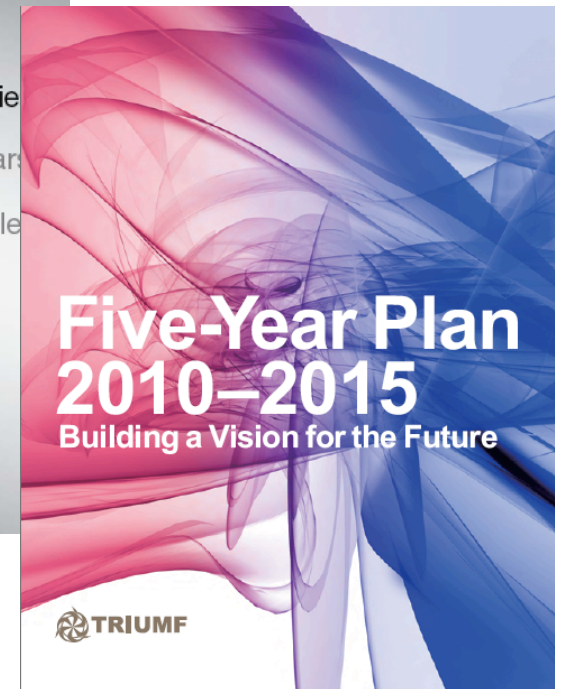
Charting the Course for Elementary Particle Physics

NATIONAL RESEARCH COUNCIL



US Particle Physics:
Scientific Opportunities
A Strategic Plan
for the Next Ten Years

Report of the Particle
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Prioritization Panel

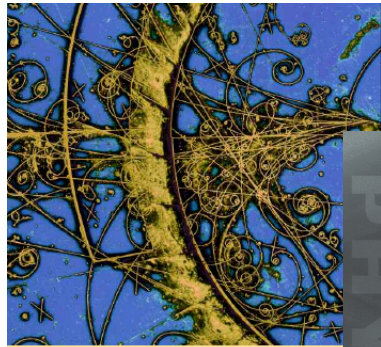


Five-Year Plan
2010-2015
Building a Vision for the Future

 **TRIUMF**

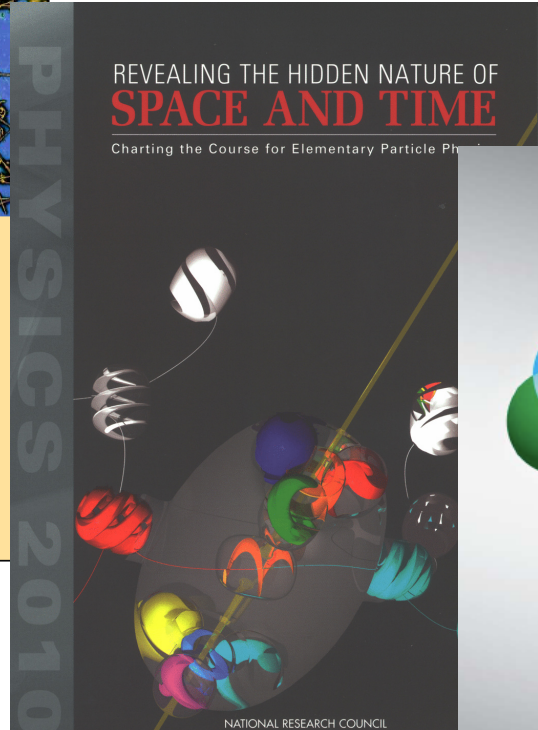
Predictions are difficult, especially for the future

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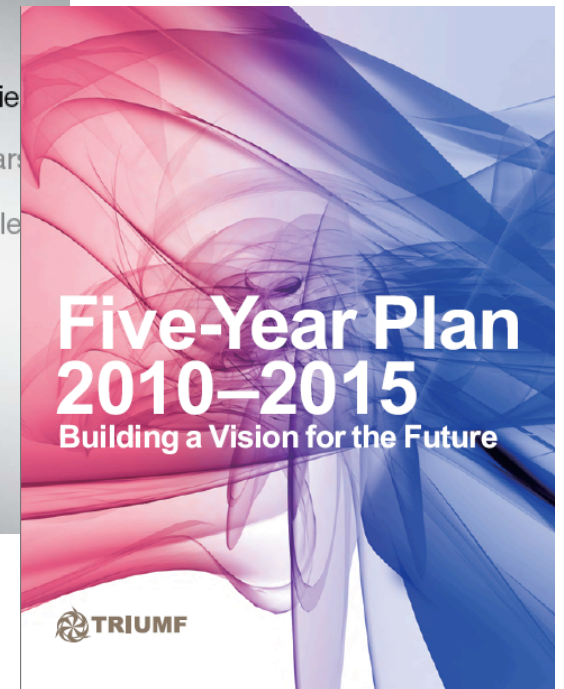
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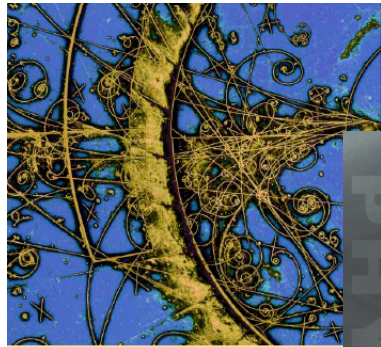
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TRIUMF

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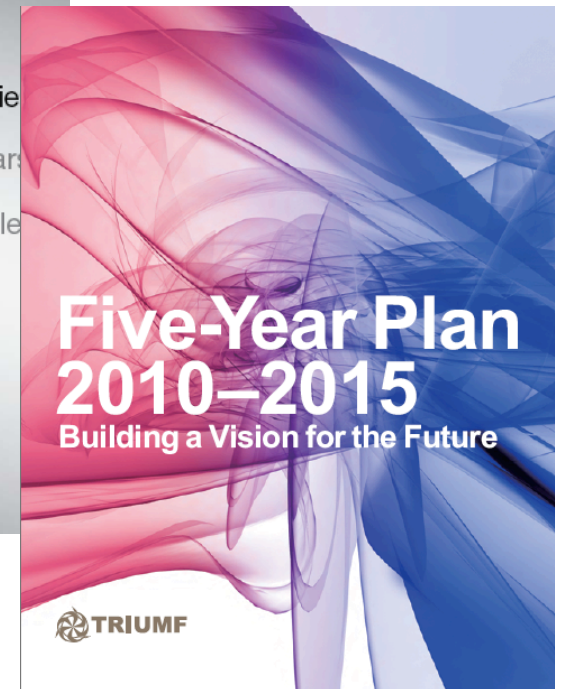
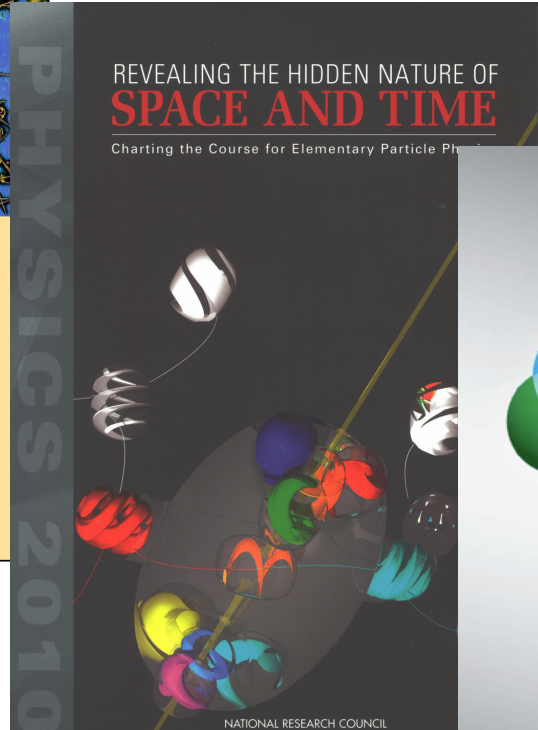
Niels Bohr, Yogi Berra

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Planning is
~~Predictions are~~ difficult, especially for the future

Niels Bohr, Yogi Berra

The Energy Frontier

Origin of Mass

Matter/Anti-matter
Asymmetry

Dark Matter

Origin of Universe

Unification of Forces

New Physics
Beyond the Standard Model

Neutrino Physics

Cosmic Particles

Dark Energy

Proton Decay

The Intensity Frontier

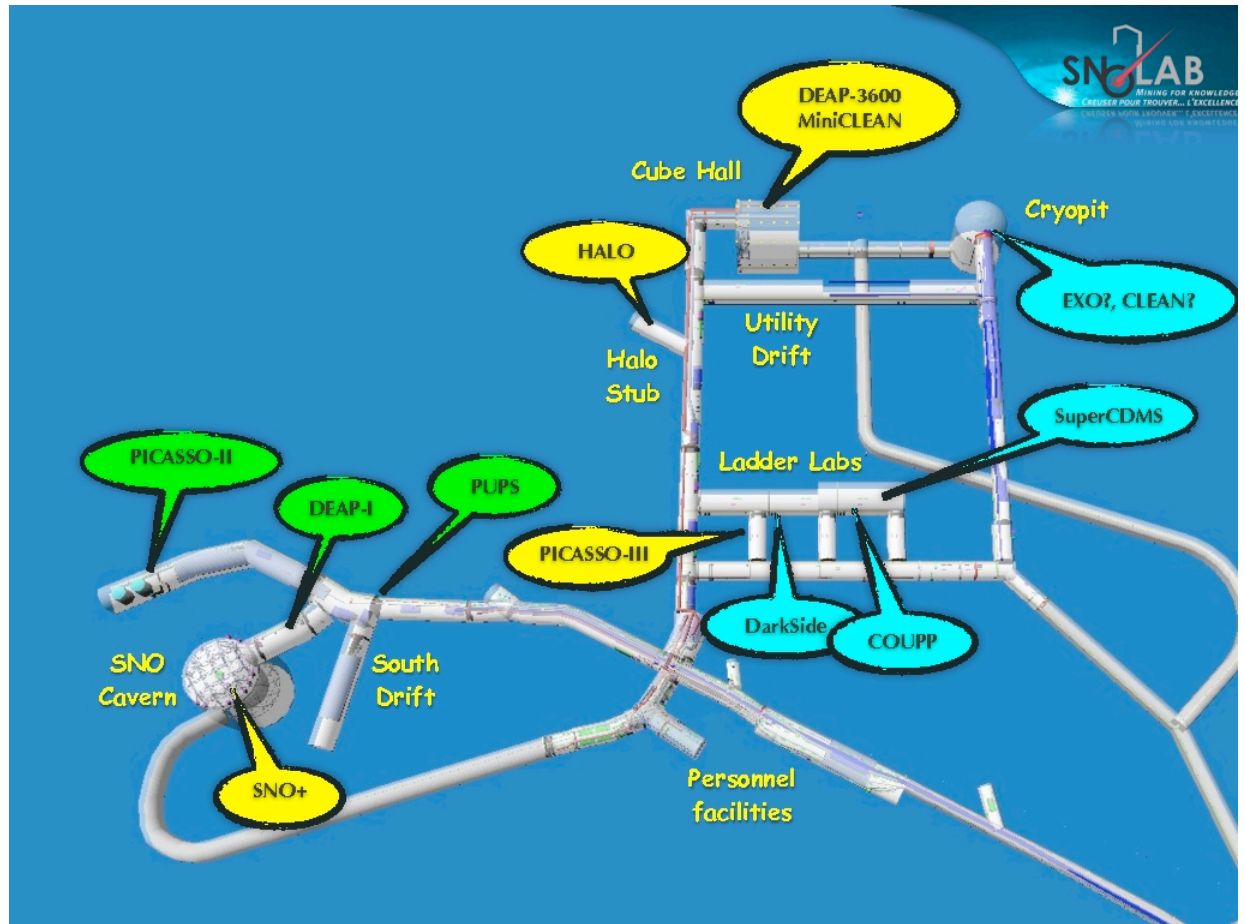
The Cosmic Frontier

Fermilab: The US National Accelerator Laboratory

- Tevatron is still the highest energy collider in the world
 - Plan to run until September 2011
 - Collect $10+ \text{fb}^{-1}$ per experiment (evidence for Higgs?)
- MINOS studying long baseline neutrinos
- NoVA now under construction (first data 2013)
- Astrophysics prominent in laboratory's future (DES, Auger, ...)
- Host LHC Remote Center and base for US-CMS (incl. Tier1)
- Growing effort in underground physics (CDMS, Coupp)
- Making major investments in SRF R&D infrastructure

SNOLAB: The world's deepest underground physics lab

- SNO experiment over
- SNOLAB open
- PICASSO, DEAP, HALO taking physics data
- Director in residence
- SNO+ and DEAP/CLEAN funded for construction



- Additional lab space available actively seeking additional collaborators

Future US Facilities

- Fermilab community building the case for an intense proton source
 - Project X: source for long baseline neutrino oscillations
 - Also supports on-site particle physics (μ to e, Kaons, ...)
 - Build up SRF competence to potentially play a major role in ILC
- Could also serve as injector to a Neutrino Factory
- Even further in the future a Muon Collider
- NSF working towards DUSEL approval in 2011 (construc'n in 2013)
 - Complementary to SNOLAB (dark matter, double beta decay)
 - Far det. for second gen. long baseline neutrinos (proton decay)

Canada/US Cooperation in Particle Physics

- Canadian chairing FALC for the next few years
- Discussing with DOE/NSF areas of North American cooperation
 - a) SRF development and ILC
 - b) Underground laboratory network (SNOLAB, DUSEL)
 - c) Next generation grid computing
 - d) Long baseline neutrino physics
 - e) Simplified access for researchers to North American facilities
 - f) Non-member state relations with CERN

American Participation in Future International Projects

1) CERN/sLHC

- Canada/US are among largest non-member state participants
- Made significant in-kind contributions to baseline LHC
- Exploring on-going relationship with CERN

2) ILC

- Making strong investments in SRF development
- Evaluate the physics case in light of LHC physics input

3) B-factories

- Researchers strongly tied to Italian Super-B proposal
- Could make important contributions if it goes ahead

The US 2008 P5 Process

- Triggered by significant financial cut-backs in December 2008
- Ten-year plan, resource driven prioritization of projects
- Four funding scenarios examined:
 - A. FY08 level (+ inflation)
 - B. FY07 level (+ inflation)
 - C. FY07 level +6.5%/annum (doubling then year \$ over 10 years)
 - D. C. + additional specific projects (blue sky)
- Built on physics case in EPP2010
- Significant international consultation despite 6-month turn-around
- Their goals were to:
 - Maintain *a* US leadership role in world-wide particle physics
 - Deliver a strong, integrated research program at the three frontiers

US Energy Frontier Plans

1) Tevatron

- Running well and could make in-roads into Higgs phase space
- Plan to run for two more years

2) LHC

- Highest priority in the US HEP program
- US should participate in accelerator and detector upgrades

3) Lepton Colliders

- Still needed to elucidate details of LHC discoveries
- 500 GeV (upgradeable to 1 TeV): ILC
- Support broad based R&D in case higher energies needed
- Eventually this might be a muon collider

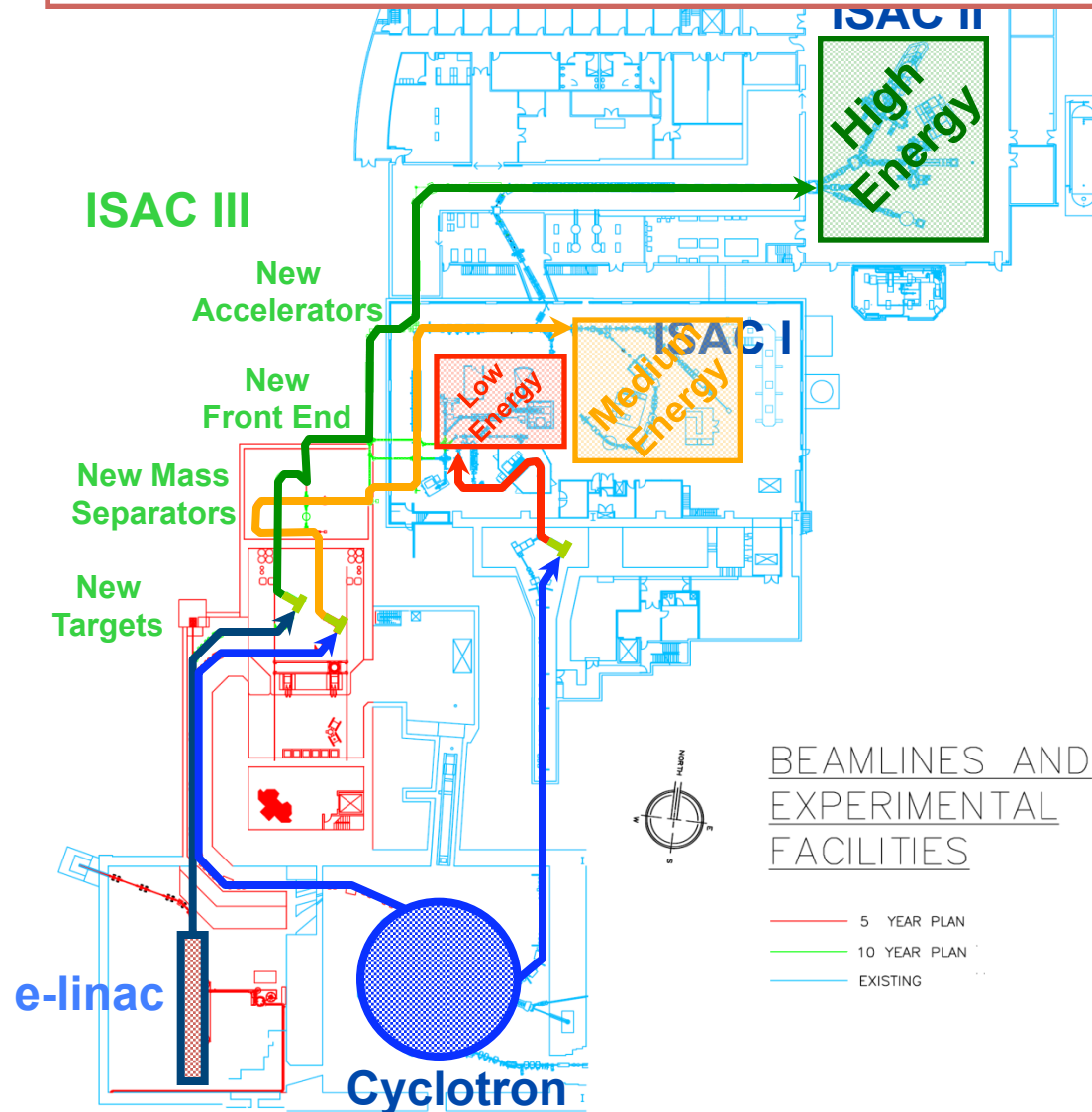
US Intensity Frontier Plans

- 1) Accelerator-based neutrino program highest priority
 - MINOS, NOvA, R&D for liquid Argon or large H₂O detector
 - Fermilab uniquely positioned to provide beams necessary
 - DUSEL baseline appears ideal for next generation ν expt.
- 2) Non-accelerator neutrino experiments
 - Daya-Bay, Double-Chooz may get to Θ_{13} first
 - Neutrinoless double-beta decay can access absolute ν mass
- 3) Other high intensity physics programs
 - μ conversion experiment using Fermilab source recommended
 - In favorable funding scenarios it may be possible to make
 - An offshore contribution to SuperB
 - Rare K experiments at Fermilab

US Cosmic Frontier Plans

- Apparently 95% of the universe is not in the Standard Model
- Recent (October 2009) Particle Astrophysics Assessment
 - Reaffirmed the importance of the cosmic frontier
 - Refined some of the P5 recommendations
- Search for dark matter (SNOLAB/DUSEL and LHC) in all scenarios
- Understanding dark energy is equally important
 - Large experiments can be very expensive
 - More substantial role for HEP-scientists in higher funding scenarios
 - Optimize ground/space program to maximize science within budget
- High energy cosmic rays (Auger-North) only possible with growing funds
- AGIS possible as part joint AGIS/CTA project with Europe even in B

TRIUMF Canada's National Lab for Particle ... Physics



- Radioactive beam studies are focus of on-site program
- New director emphasising accelerator development
- Hosting Tier 1 Centre
- Partially funded to build e-LINAC based on 1.3 GHz SRF
- Expanding nuclear medicine capabilities
- Exploring off-shore accelerator opportunities

Canadian Particle Physics

- One third of the Canadian particle physics community on ATLAS
- One third working at SNOLAB
- One quarter working on T2K
- Small groups still on CDF, ZEUS , ILC R&D (detector & accelerator)
- Small efforts in non-SNOLAB particle astrophysics

Project	Researchers	Students
ATLAS	43	70
T2K	19	12
DEAP	12	8
Picasso	10	11
SNO+	13	9
EXO	8	7
BaBar	10	8
Other	17	10

Latin American Particle Physics

- Mexican physicists working at Fermilab since early 1980s (now CDF/D0)
 - Proposing to host HAWC (joint US/Mexican cosmic observatory)
- Brazilian participation in LEP (DELPHI) and at D0 since late 1980s
- Argentina is hosting for Auger cosmic ray observatory
- Statistics (from Fermilab publications circa 2007):

Country	Exp Papers	PhD Thesis
Argentina	201	5
Brazil	370	19
Canada	502	31
France	313	31
Italy	649	57
Japan	483	52
Mexico	339	11
United Kingdom	403	38

Latin America and the LHC

CMS

ALICE

ATLAS

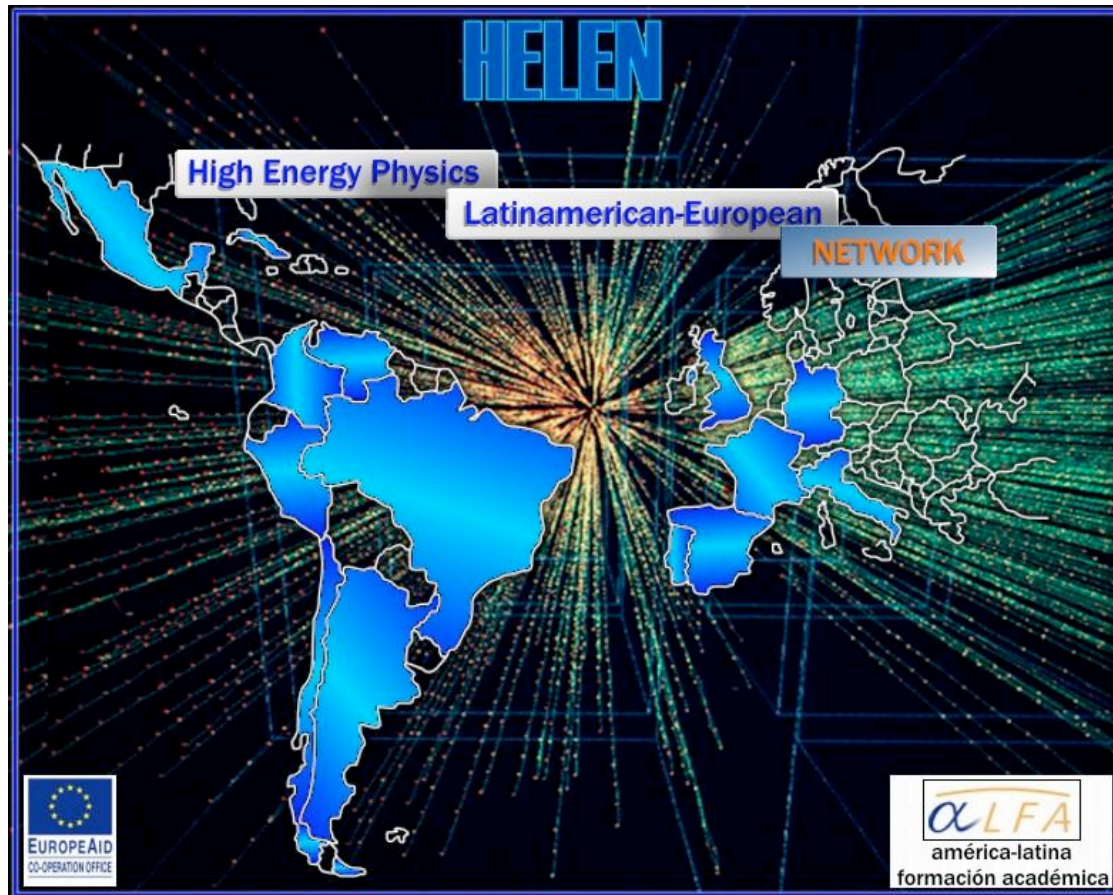
LHCb

8 L.A. countries participating in LHC experiments.

About 230 L.A. people involved (Physicists, Engineers, Grad. Students).



HELEN: A successful cooperation project in HEP between Europe and Latin America, 2006-2009.



**General Coordinator
of the HELEN
program:**

Prof. Luciano Maiani



HELEN

22 Latin American Institutions

17 European Institutions

Countries participating:

From Europe:

France, Germany, Italy,
Portugal, Spain, United
Kingdom

From Latin America:

Argentina, Brazil, Chile,
Colombia, Cuba, Mexico,
Peru, Venezuela.

~70% of fellowships for
mobility to CERN

Summary

- America is still at the energy frontier
 - Will continue to produce particle physics for several years
- Next facilities will be at intensity and cosmic frontiers
- Continue to be sought after partners for international projects
 - North American community committed to making LHC a success
 - Looking to the future with sLHC, ILC, lepton collider, ...
 - Maintaining a healthy domestic program is a high priority
- Latin American particle physics is growing fast
- Remains to be seen how *our* science will emerge from current financial pressures that exist worldwide

Hadron Collider Physics Symposium

August 23-27, 2010

University of Toronto,
Toronto, Canada



International Organizing Committee

Grigorio Bernardi	(Paris VI/VII)
Dmitri Denisov	(Fermilab)
Ludwik Dobrzynski	(Ecole Polytechnique)
Keith Ellis	(Fermilab)
Fabiola Gianotti	(CERN)
Andrey Golubvin	(Imperial College)
Jacobo Koenigsberg	(Florida)
Zoltan Kunszt	(ETH Zurich)
Tom LeCompte	(Argonne)
Michelangelo Mangano	(CERN)
Joachim Mnich	(DESY)
Kevin Pitts	(Illinois)
Gigi Rolandi	(CERN)
Karel Safarik	(CERN)
Heidi Schellman	(Northwestern)
Katsuo Tokushuku	(KEK)
Guido Tonelli	(INFN Pisa)

Local Organizing Committee

William Trischuk	Chair
Robert S. Orr	Chair
Mike Luke	
Peter Krieger	
Pierre Savard	
Pekka Sinervo	
Richard Teuscher	

<http://hcp2010.physics.utoronto.ca/>

The Hadron Collider Physics Symposium 2010 will be hosted by the University of Toronto, in Toronto, Canada. The 21st conference in this series, this meeting will showcase the first results from the LHC, and the latest results from the Tevatron, RHIC and HERA.



For Further Information:
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TRIUMF



INSTITUTE OF
PARTICLE
PHYSICS

Looking forward to
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late summer next year

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