Physics Highlights from the Frontiers: Examples of International and National Status and Plans

The View from Canada

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The view from Canada

• Who are the Canadian HEP community?
  • Academic community: University faculty, laboratory researchers
  • Community institutions: Institute for Particle Physics (IPP), McDonald Institute
  • Laboratories / Platforms: TRIUMF, SNOLAB, Perimeter Institute
  • Funders: NSERC, CFI, NRC, Provinces

• National plans are evergreen documents across both community and facilities
• The Canadian community has just completed it’s five-year long range plan for 2022-2026
  • https://subatomicphysics.ca/
Canadian Sub-atomic Physics (SAP) Community

- Canada funding structures support ‘sub-atomic physics’ covering HEP, NP, APP
- Coast to coast academic capability
- Canada uses a faculty driven ‘bottom-up’ approach to projects and infrastructure; grant-driven approach to research
Canadian Sub-atomic Physics (SAP) Community

- Community of about 250 principal investigators
- Some transition over the last two decades away from ‘EW and beyond’ towards neutrino and DM studies
- Reflects growth of the SNOLAB programme
Canadian Sub-atomic Physics (SAP) Community

- Substantial growth in support to SAP programme, primarily through great success in capital requests through CFI (Canada Foundation for Innovation - still uses a bottom-up approach to resource allocation)

- McDonald Institute also provided substantial input over last five years
Canadian SAP Long Range Plan

• Aim to maximize Canadian impact in a global field, given limited resources...

• The LRP report informs funding agencies of the community’s priorities for the field; however, funding agencies still hold broad peer-reviewed funding competitions.

• The report communicates to international partners (and policy makers) the Canadian plans and priorities, and resource requirements.

• An inclusive planning process that helps to strengthen and coordinate the Canadian SAP community.

06/20

LRP begins

06/21

Data gathering
Community surveys
CINP/IPP briefs (Dec 1st)

Fall 2020

02/21

Topical Townhall Meetings

04/21

LRP Townhall

06/21

Draft recommendations

09/21

Final LRP report text

CINP/IPP Briefs preparation
Science Drivers

• Three broad areas of research encompass eight science drivers of the Canadian programme

• Beyond the electroweak scale

• Matter in the weakly coupled Universe

• From quarks and gluons to nuclei
Underpinning national capabilities

- Canadian research programme is supported by several institutions and laboratories, all having national and international relevance
  - TRIUMF - Canada’s particle accelerator centre, centred on 500MeV cyclotron and ISOL targets, additional capability being installed. Supports detector development, data management and science, medical isotopes
    - Acts as conduit for investment in international commitments (eg HL-LHC)
  - SNOLAB - Canada’s deep underground research facility. 2km depth, lowest cosmic ray background in the world, broadening science programme around low background science
  - Perimeter Institute - theoretical physics institute supporting research threads across several drivers
TRIUMF’s Research

Both fundamental and applied, focus on discovery-driven research

- Expanding the boundaries of human knowledge
- Advancing the treatment of critical diseases
- Developing new technologies and innovations
- Deepening our understanding of the natural world
TRIUMF accelerator complex

Primary beam driver:
Cyclotron, 520 MeV, H-
Produces rare isotopes, neutrons and muons!

Isotope Separator and Accelerator facility - ISAC
Isotope Separator Online (ISOL) facility
ISAC-I: Normal conducting-linac, 0.15-1.8 MeV/u
ISAC-II: Superconducting-linac, 1.5-16.5 MeV/u

Advanced Rare Isotope Laboratory - ARIEL
Superconducting electron linac
30 MeV, 10 mA, cw

4 Cyclotrons for medical isotope production
TRIUMF 20-year Vision

- TRIUMF has recently completed a 20-year vision process to define longer term planning requirements (TRIUMF is funded in five year cycles)
- An 18-month process engaging a broad research and stakeholder community, leading to five core themes

1. A global leader in discovery science, delivering breakthroughs that unlock the deepest mysteries of the universe: Strengthening Canada’s leadership in groundbreaking particle and nuclear physics
2. A world-class accelerator centre driving use-inspired research – from the life sciences to quantum and green technologies: Leveraging our unique infrastructure to pursue research in Canada that will change the world
3. An inclusive multidisciplinary talent incubator, attracting and developing the best people from around the world: Producing Canada’s future science leaders and innovators
4. A leader in a flourishing national Big Science ecosystem: Catalyzing the success and growth of Canada’s network of major research facilities
5. A national innovation hub translating discovery science into health and sustainability solutions: Responding nimbly to complex societal challenges for the benefit of Canadians
TRIUMF 20-year Vision

• The final, Board-approved text of the inaugural 20-Year Vision is available now on the TRIUMF.ca website

• This advanced copy contains the final text of the Vision; however, it does not yet include visuals and other design elements that will come with the official release.

• The full release of the 20-Year Vision is expected to be available in September 2022; both print and digital versions will be available around this window.
Canadian planning and connection to US (and international) programme

• Canadian SAP programme is highly international
  • International collaborations across multiple continents and countries, including projects located within Canada
  • International connections between laboratories (US Labs, CERN, KEK)
  • Dialogue between agencies as appropriate and possible (given timescales and different processes adopted)
• National planning naturally incorporates the international and US connections and research drivers to ensure strong collaboration with US institutes and researchers
  • https://subatomicphysics.ca
Thank You!

Merci!