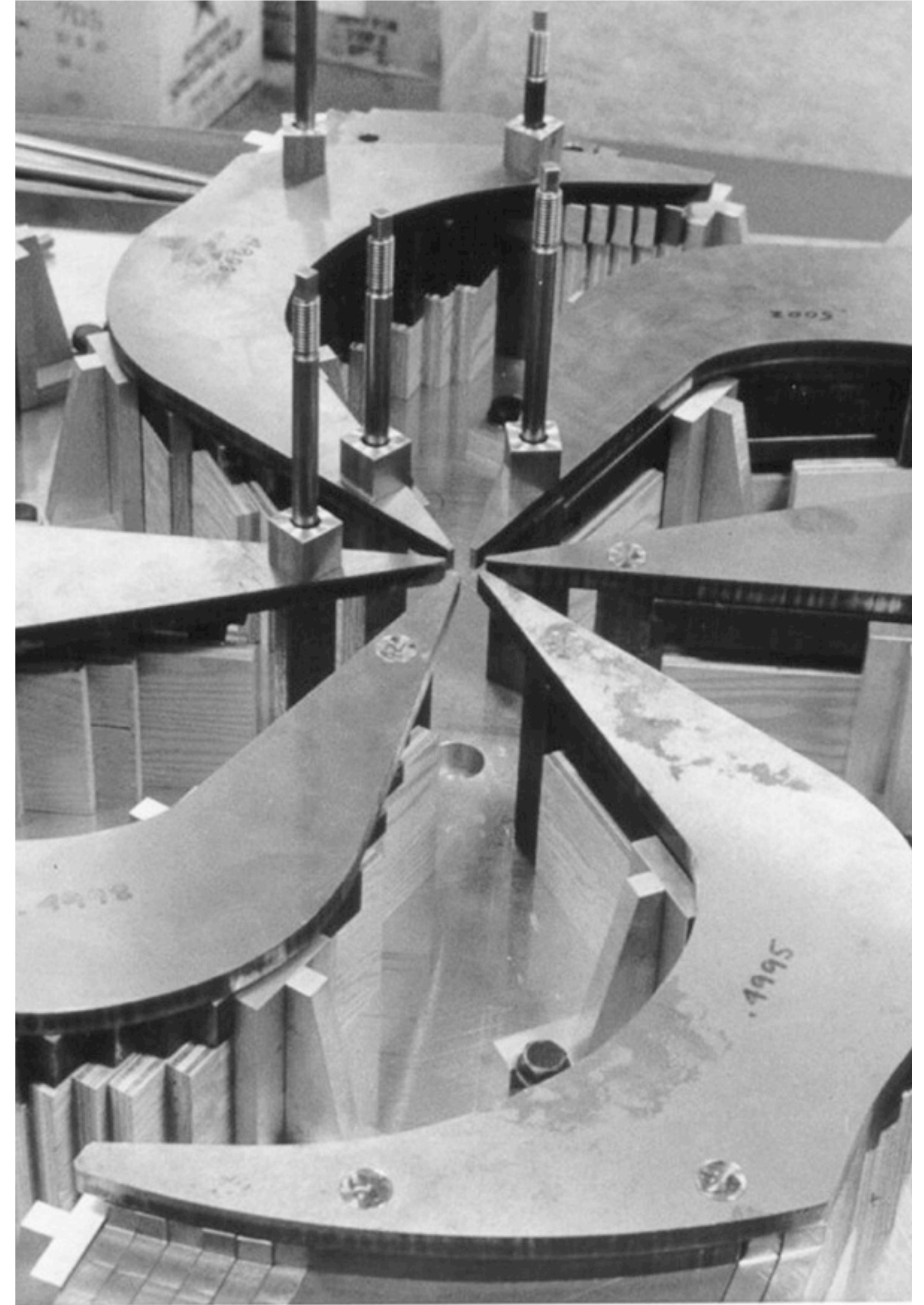


# Physics Highlights from the Frontiers: Examples of International and National Status and Plans

## The View from Canada

Nigel Smith  
TRIUMF Executive Director

July 25<sup>th</sup>, 2022



# The view from Canada

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- 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/>



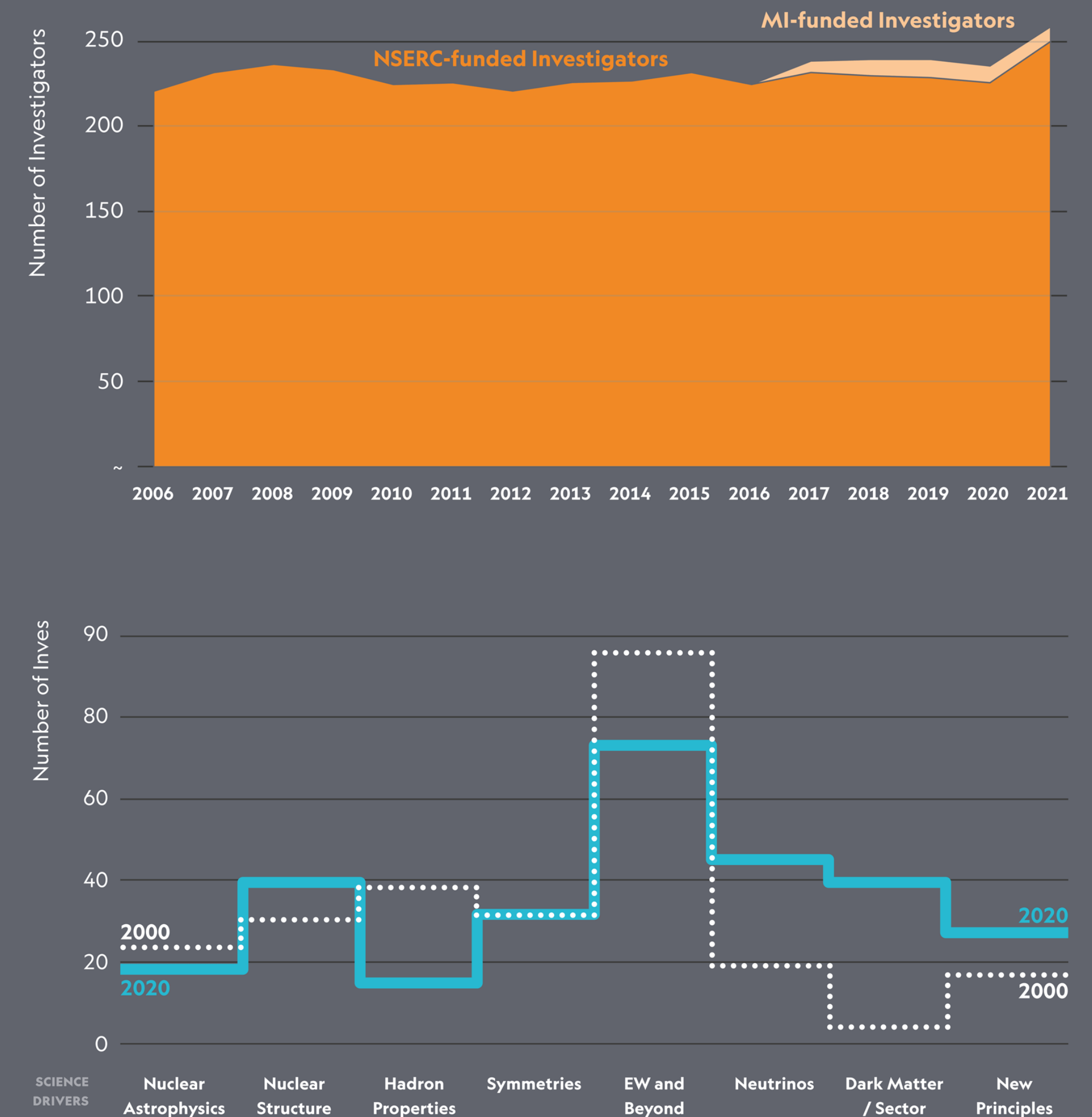
# Canadian Sub-atomic Physics (SAP) Community

- 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

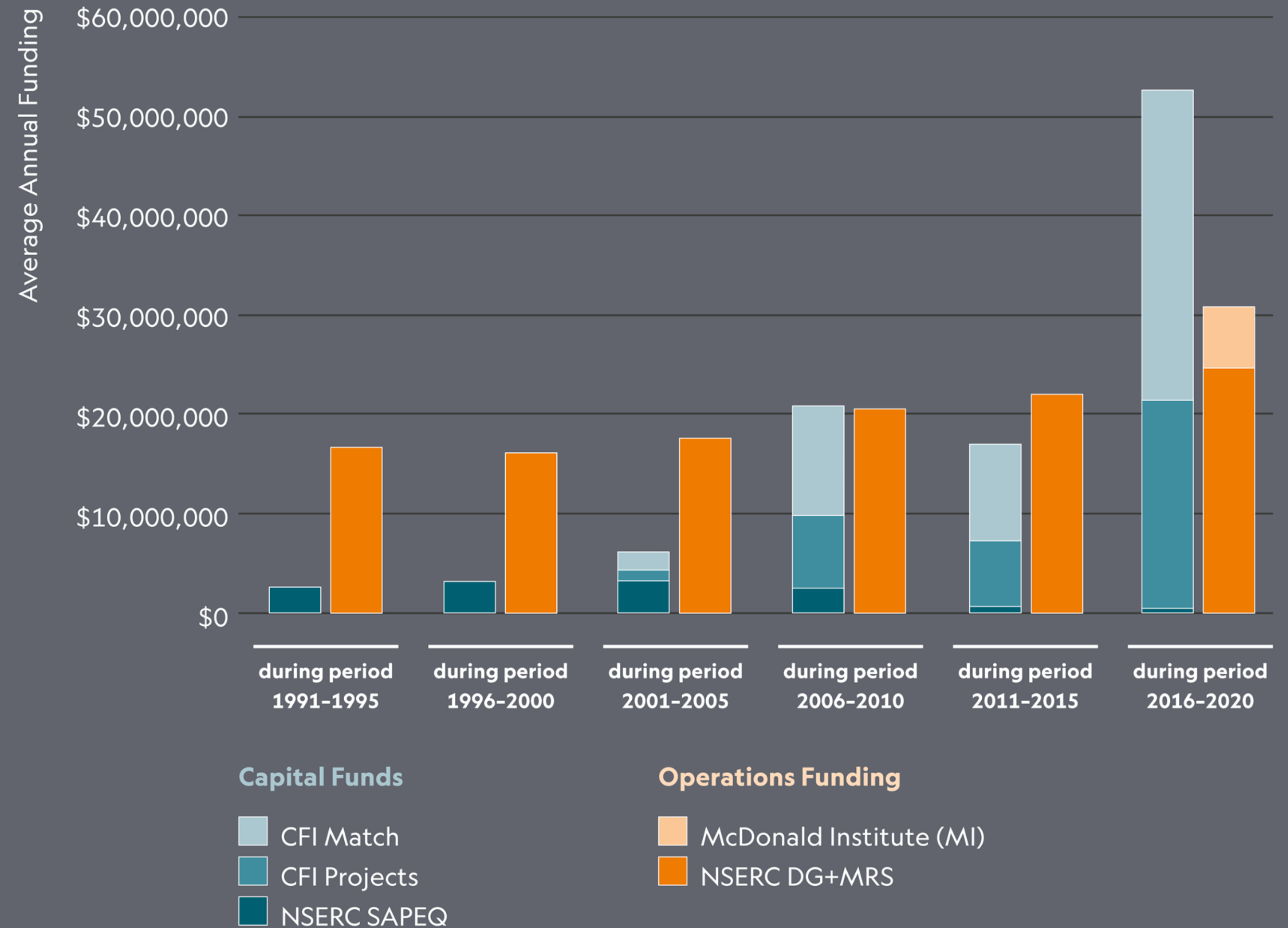
- Community of about 250 principal investigators
- Some transition over the last two decades away from 'EW and beyond' towards neutrino and DM studies
- Reflects growth of the SNOLAB programme





# Canadian Sub-atomic Physics (SAP) Community

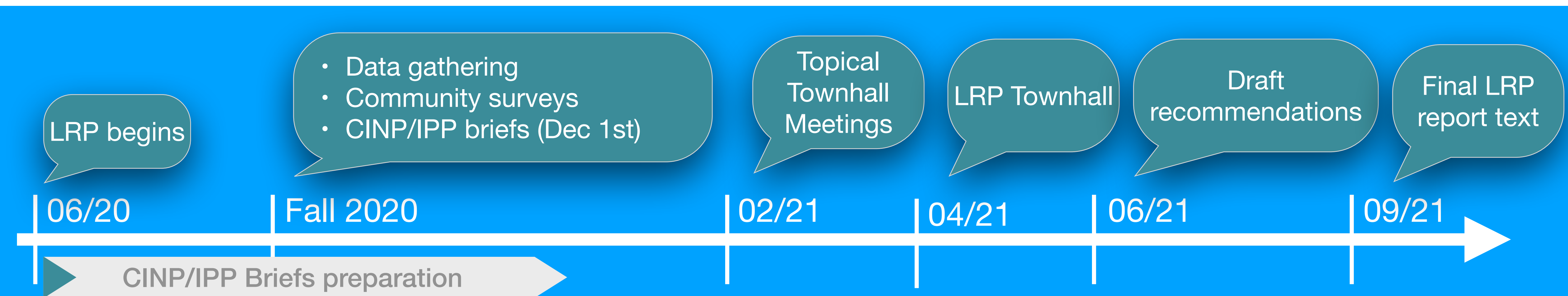
- Substantial growth in support to SAP programme, primarily through great success in capital requests through CFI (Canada Foundation for Innovation - still uses a bottom-up approach to resource allocation)
- McDonald Institute also provided substantial input over last five years



# 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.

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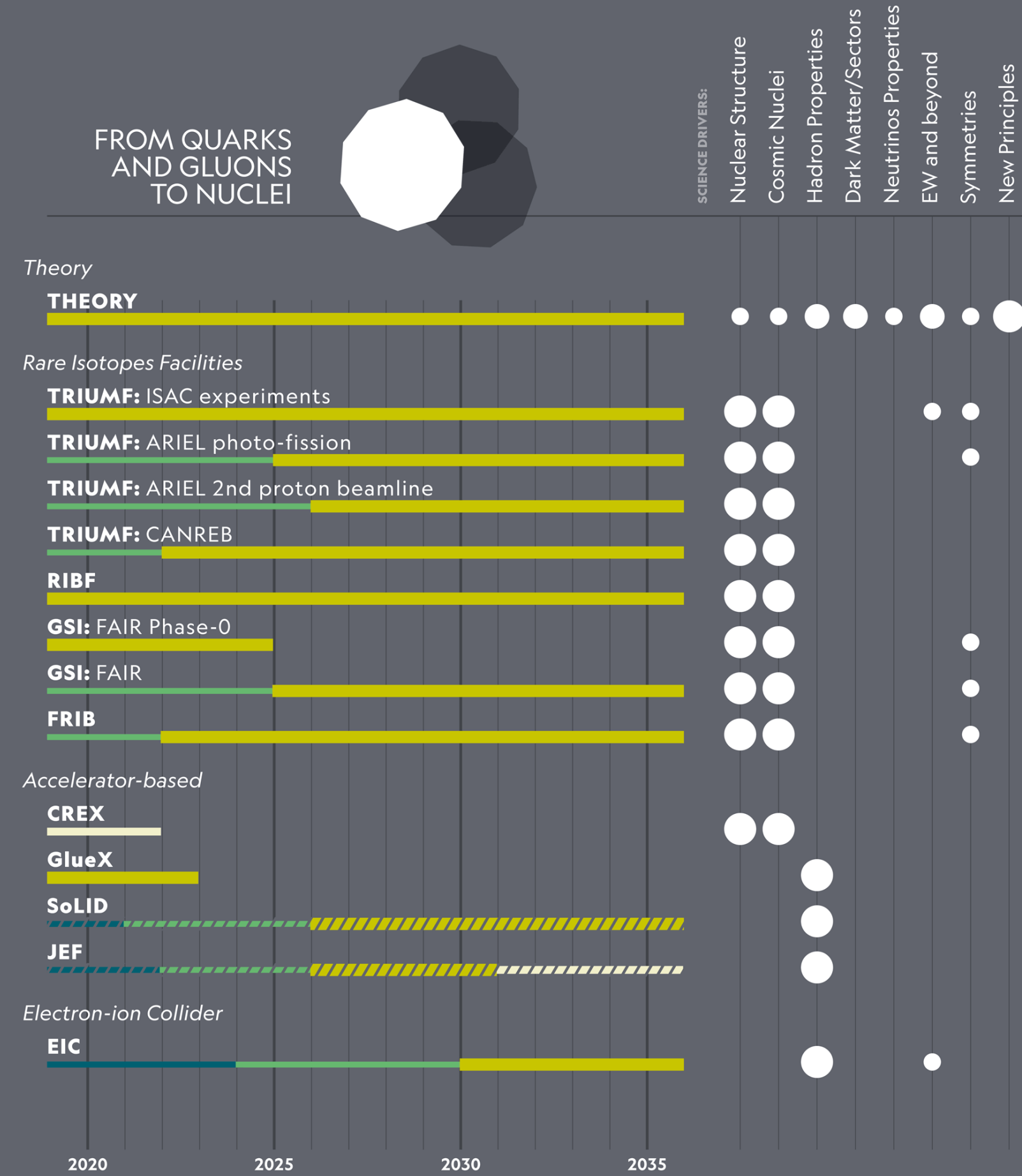
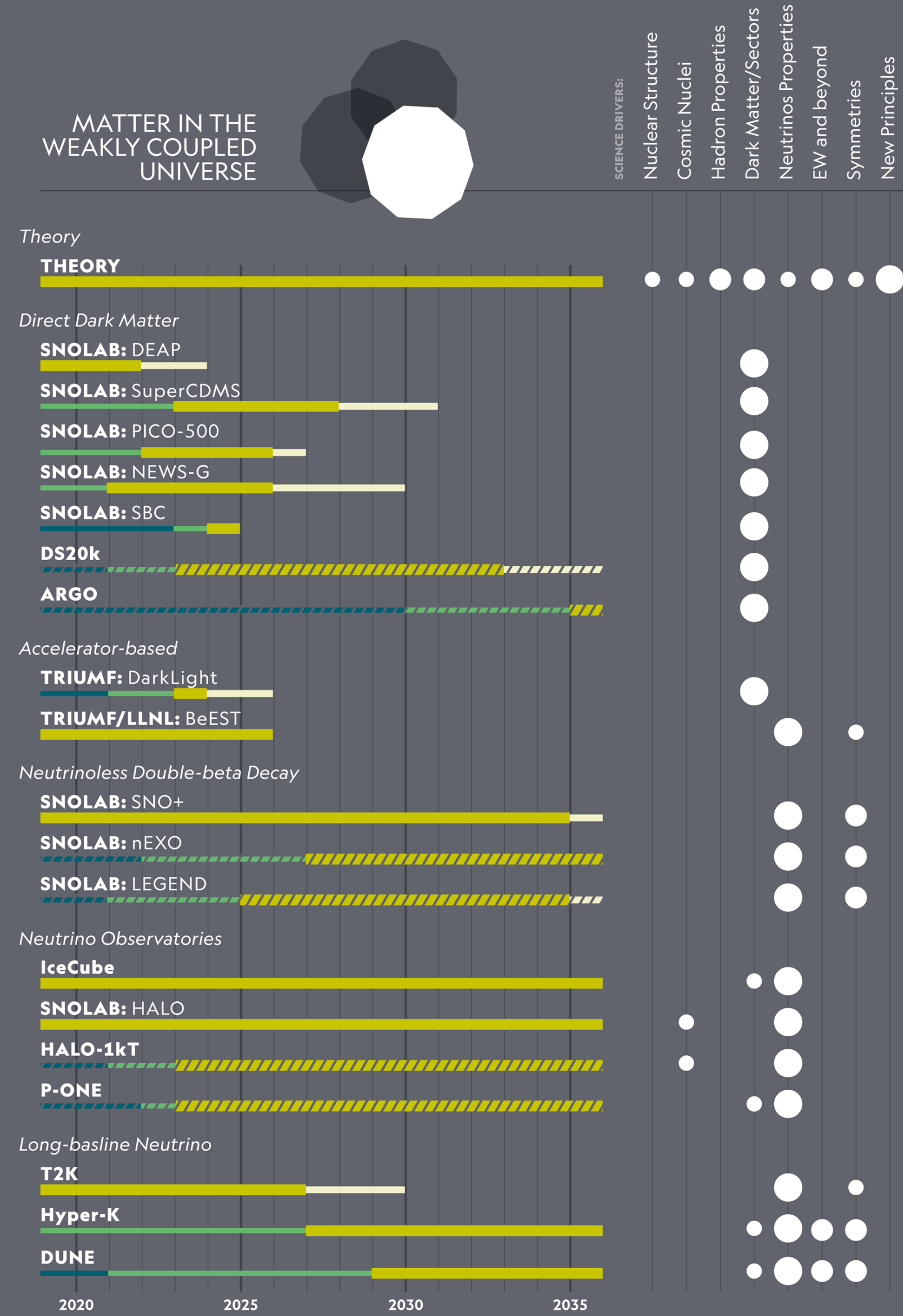
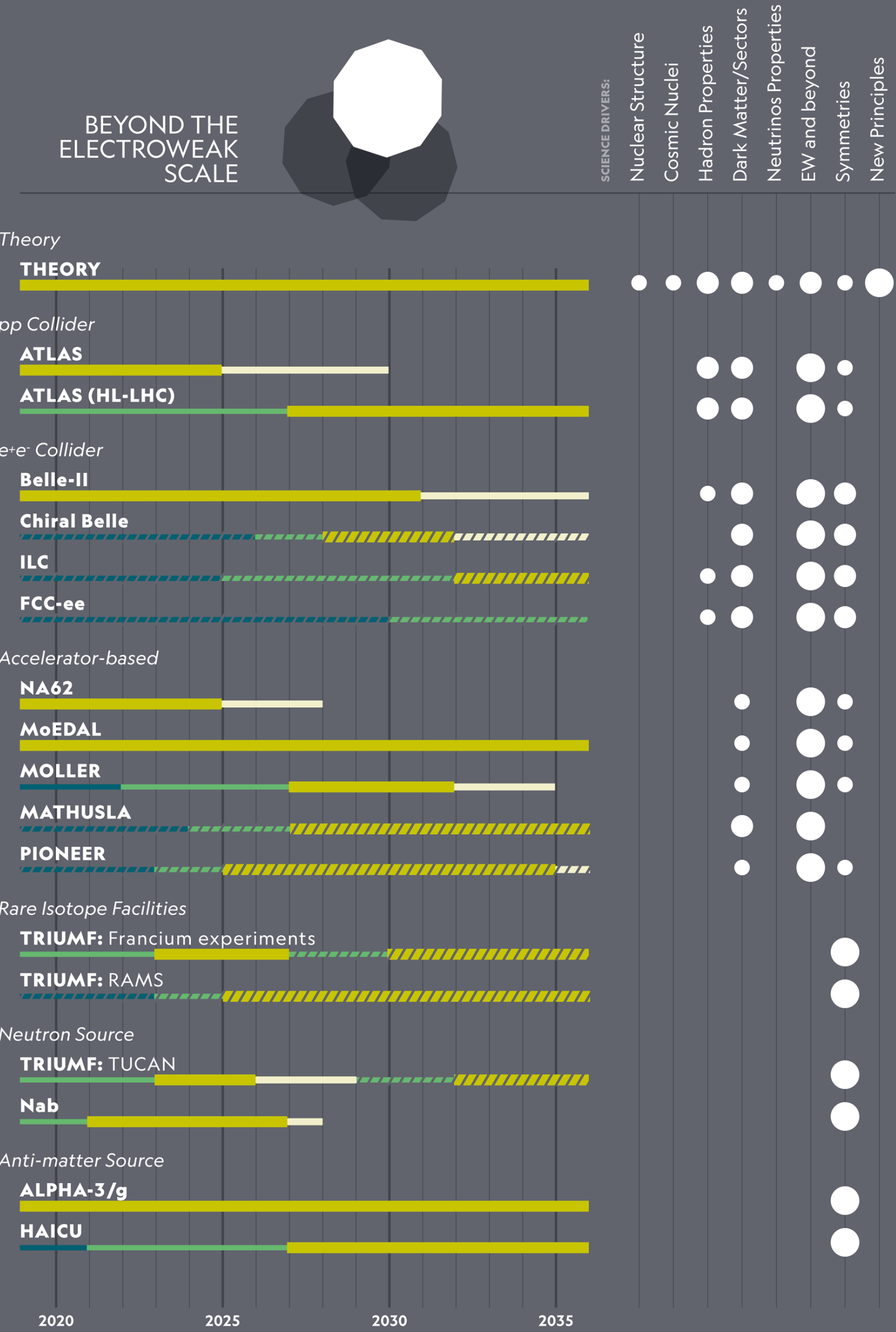


# Science Drivers

- 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





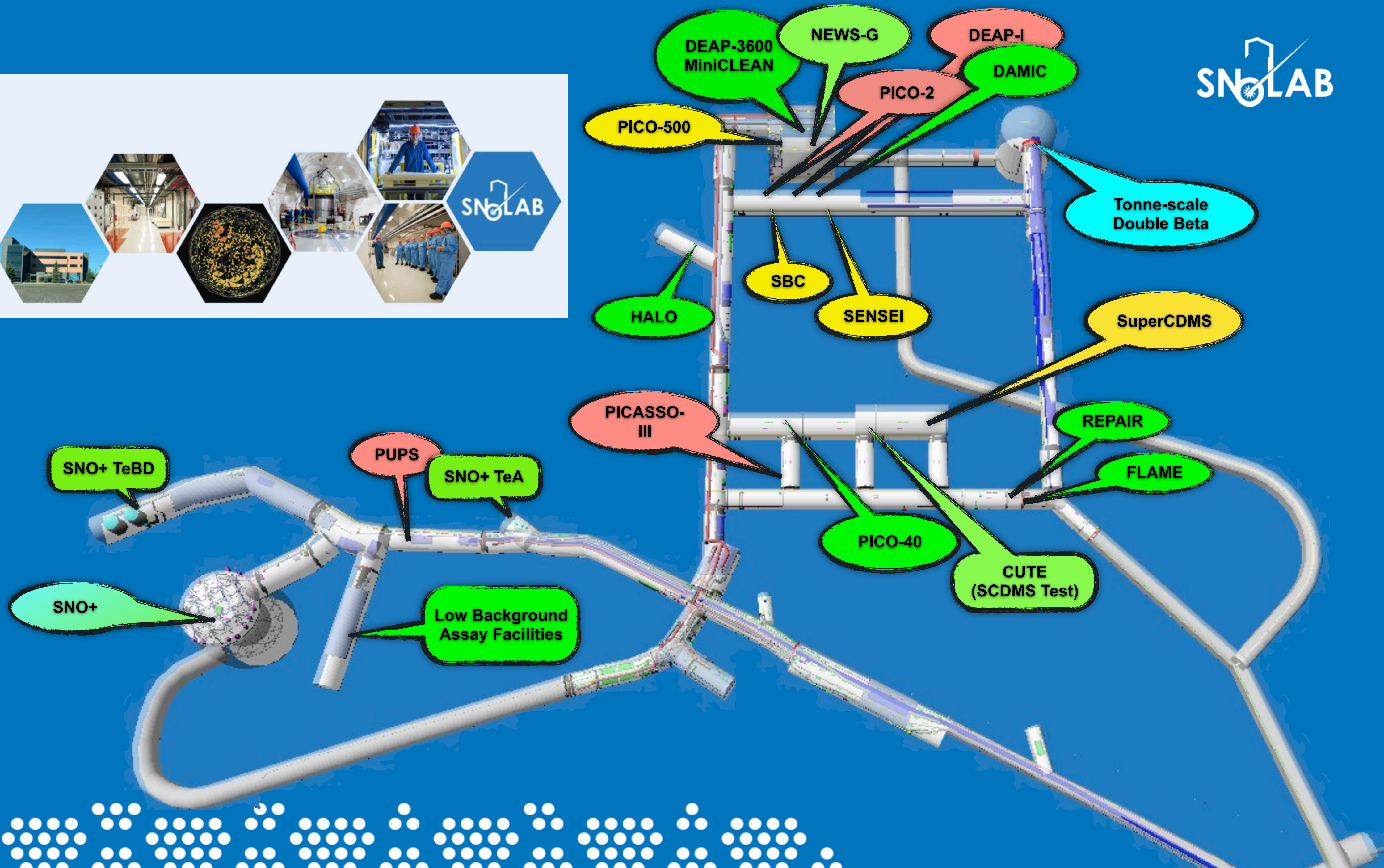


# Underpinning national capabilities

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- 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



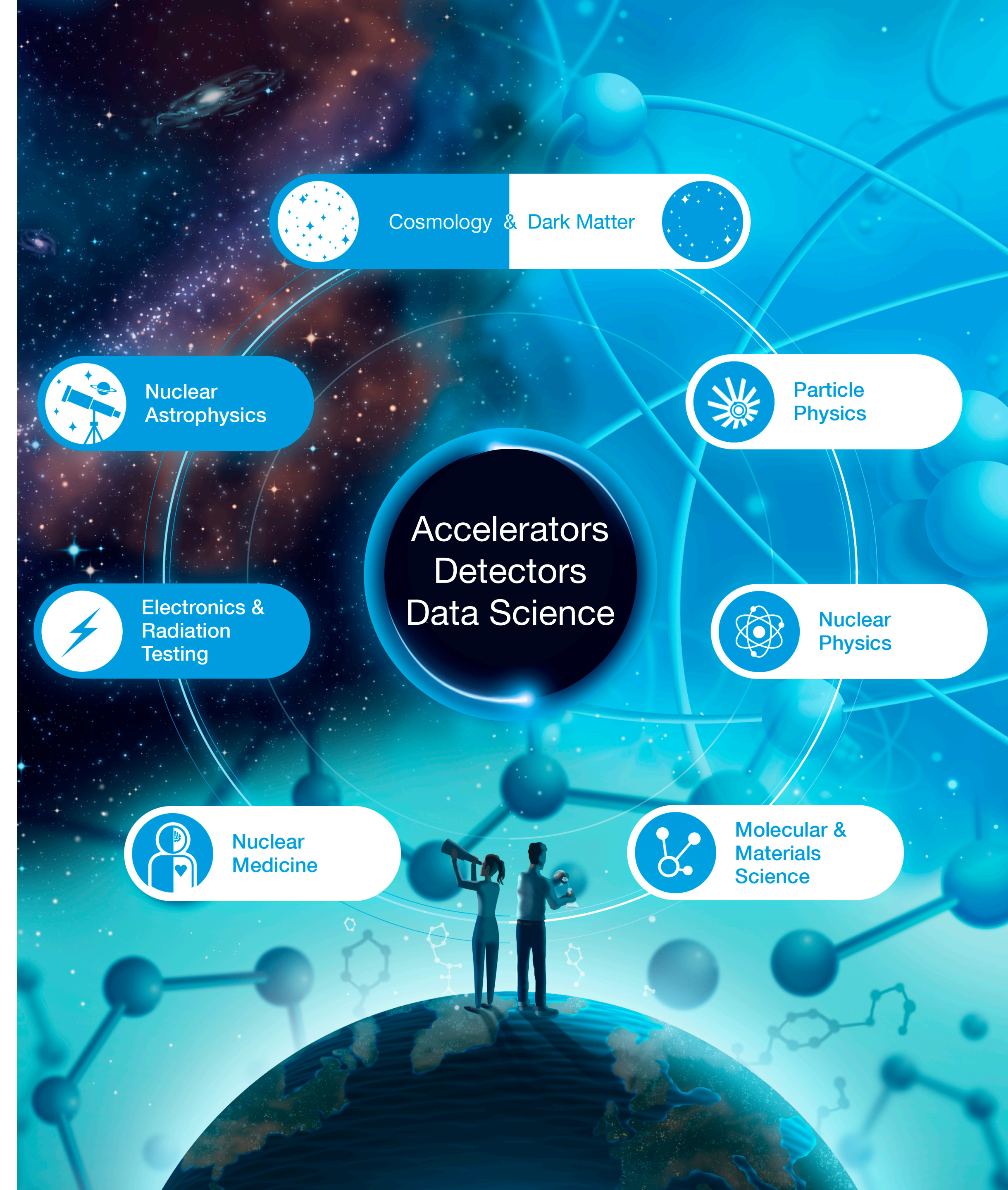
Advancing the treatment of critical diseases



Developing new technologies and innovations



Deepening our understanding of the natural world





# TRIUMF accelerator complex

**Primary beam driver:**

Cyclotron, 520 MeV, H<sup>-</sup>

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**

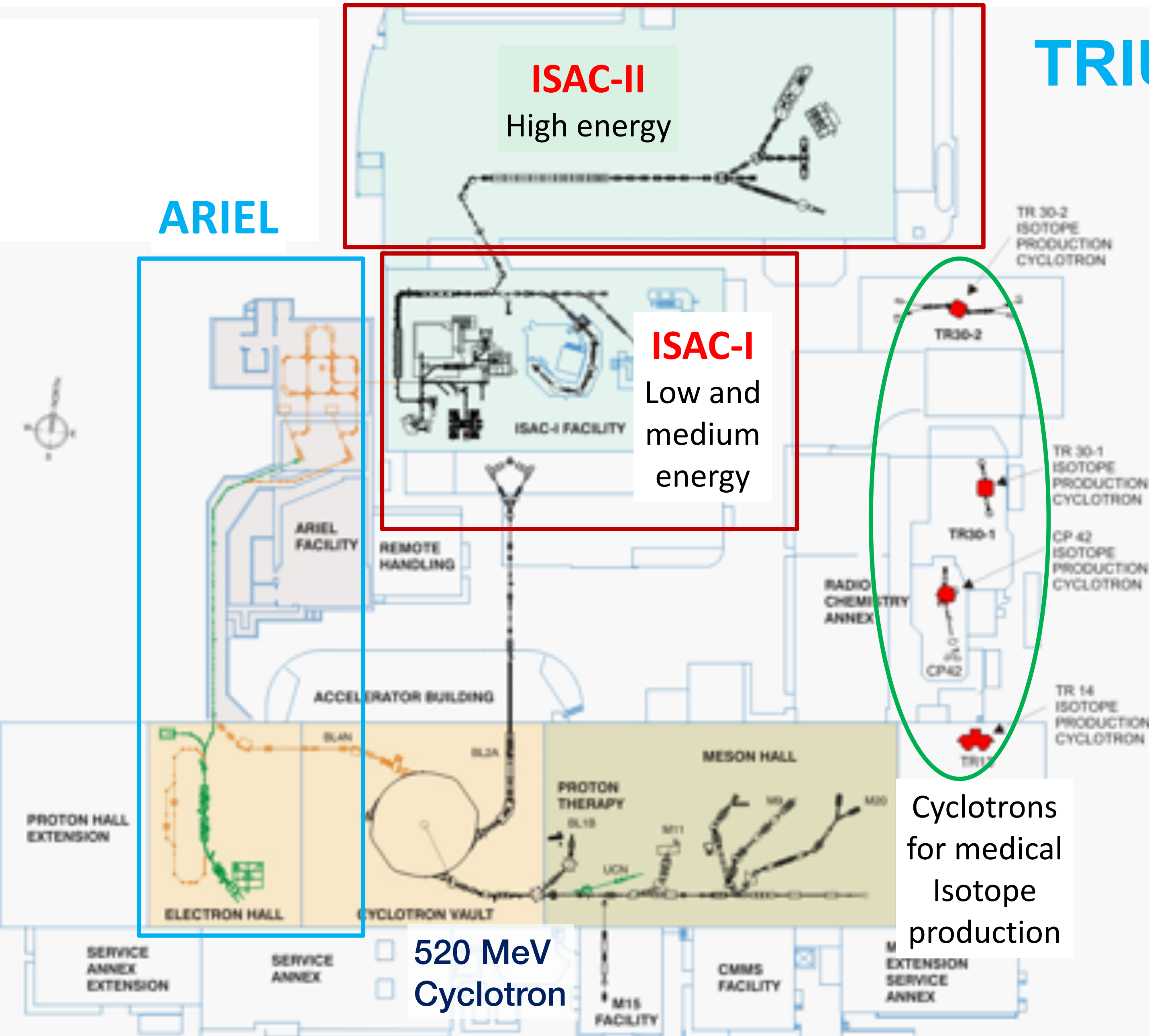
Superconducting electron linac

30 MeV, 10 mA, cw

**4 Cyclotrons for medical isotope production**

Cyclotrons  
for medical  
Isotope  
production

520 MeV  
Cyclotron





# TRIUMF 20-year Vision

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- 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

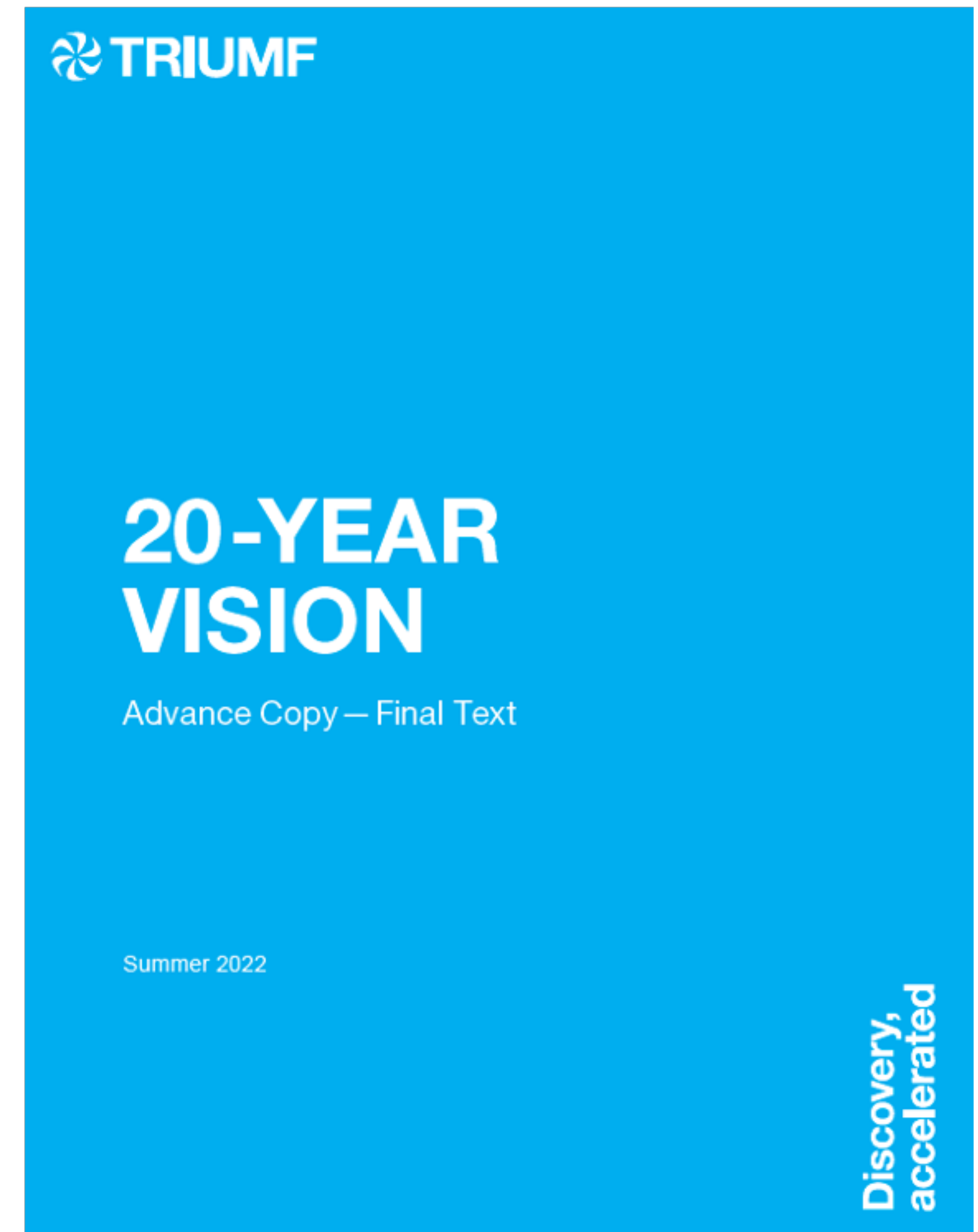
4. **A leader in a flourishing national Big Science ecosystem:**  
Catalyzing the success and growth of Canada's network of major research facilities

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

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- 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!**