

Canadian Subatomic Physics Long Range Plan 2022 - 26

LRP Committee Co-chairs

Brigitte Vachon (McGill) & Adam Ritz (Victoria)

<https://subatomicphysics.ca/>



Canadian Subatomic Physics Long Range Planning

LRP2022-26 is the latest in a series of 5-yearly *community-driven* planning exercises for Canadian nuclear and particle physics.



Purpose and Value

- Help strengthen and coordinate the Canadian SAP community through an *inclusive* planning process.
- Clarify current and future project needs for funding agencies.
- Communicate priorities to international partners (and policy makers).

Broader Context

- Increasing internationalization.
- Priority for world-class domestic research programs and infrastructure.
- Established expertise and strengths of the Canadian community.
- Recognition that the Canadian community cannot be involved in all endeavours.

Canadian process independent of other planning exercises (e.g. SNOWMASS/P5, EPPSU, NSAC, etc), but research field is globally interconnected.

Commissioning Bodies

- Canadian Institute for Nuclear Physics (CINP)
- Institute for Particle Physics (IPP)
- Natural Sciences and Engineering Research Council (NSERC)



Mandate

Based on broad consultation with the Canadian community:

- *Identify subatomic physics scientific ventures and priorities that should be pursued on a 5 year time horizon (with a 15 year outlook).*
 - *LRP scope is 2022 - 2036; plan active from 2022 - 2026*
- *Provide budgetary estimates for capital and operations, and address other infrastructure and support needs.*
- *Address Equity, Diversity and Inclusion, and support for early career researchers.*

LRP Committee

Appointed by commissioning bodies.

Name	Institution
Adam Ritz (Co-chair)	Victoria
Brigitte Vachon (Co-chair)	McGill
Eckhard Elsen (INTL)	CERN
Chris Jillings	SNOLAB
Rituparna Kanungo	St Mary's
Bob Laxdal	TRIUMF
Augusto Macchiavelli (INTL)	LBNL
Juliette Mammei	Manitoba
Jeff Martin	Winnipeg
Niki Saoulidou (INTL)	Athens
Kate Scholberg (INTL)	Duke
Alex Wright	IPP/Queen's

LRP Committee : Non-voting members*/Observerst

Provide expert input to LRPC members, but not engaged in the formulation of the LRP recommendations and writing of the report.

Position	Name
CINP Executive Director *	Garth Huber
IPP Director *	J. Michael Roney
NSERC Team Leader *	Emily Diepenveen (→Kevin Lapointe)
CFI Manager, JELF *	Olivier Gagnon
SAPES Co-chairs *	Thomas Gregoire/Alison Lister
McDonald Institute Scientific Director *	Tony Noble
TRIUMF ALD Physical Sciences †	Jens Dilling
SNOLAB Director †	Nigel Smith (→Jeter Hall (delegate))
Perimeter Institute Director †	Cliff Burgess (delegate)

Process Overview

LRP begins

Environmental Data Gathering

- Community surveys
- Analysis of different funding sources
- Community position papers (CINP/IPP)

06/20

Fall 2020

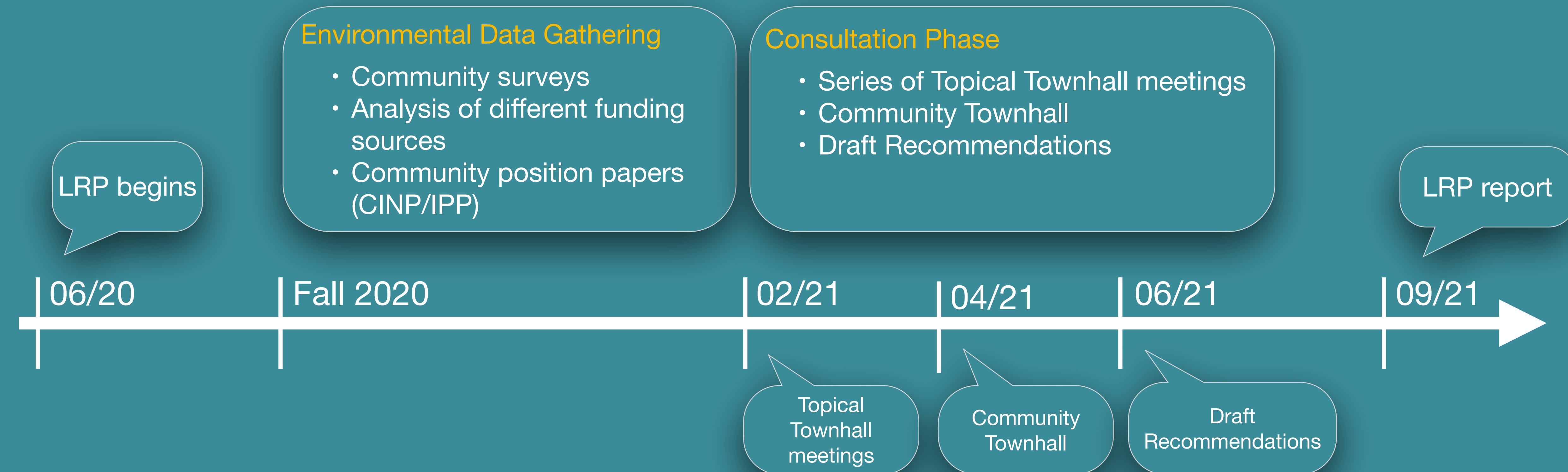
02/21

04/21

06/21

09/21

Process Overview



Community engagement strategy was reconfigured, and moved fully online, due to COVID19.

Canadian Subatomic Physics Community

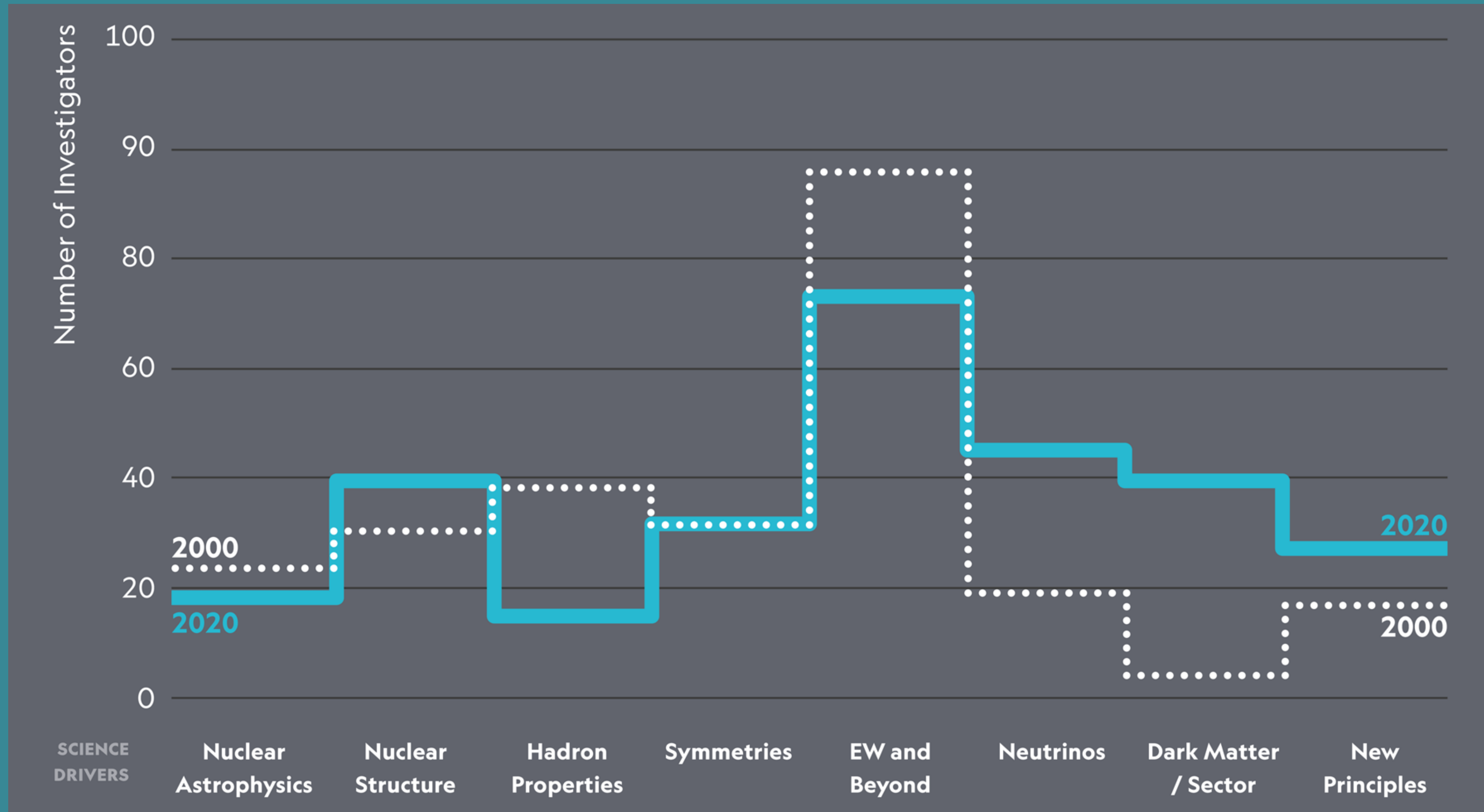


Canadian Subatomic Physics Community

REGION	2011	2015	2021
British Columbia (BC)	86	88	88
Prairies (AB, SK, NB)	38	38	40
Ontario (ON)	60	66	81
Quebec (QC)	35	31	32
Atlantic (NL, NB, NS, PE)	6	8	8
TOTAL	225	231	251

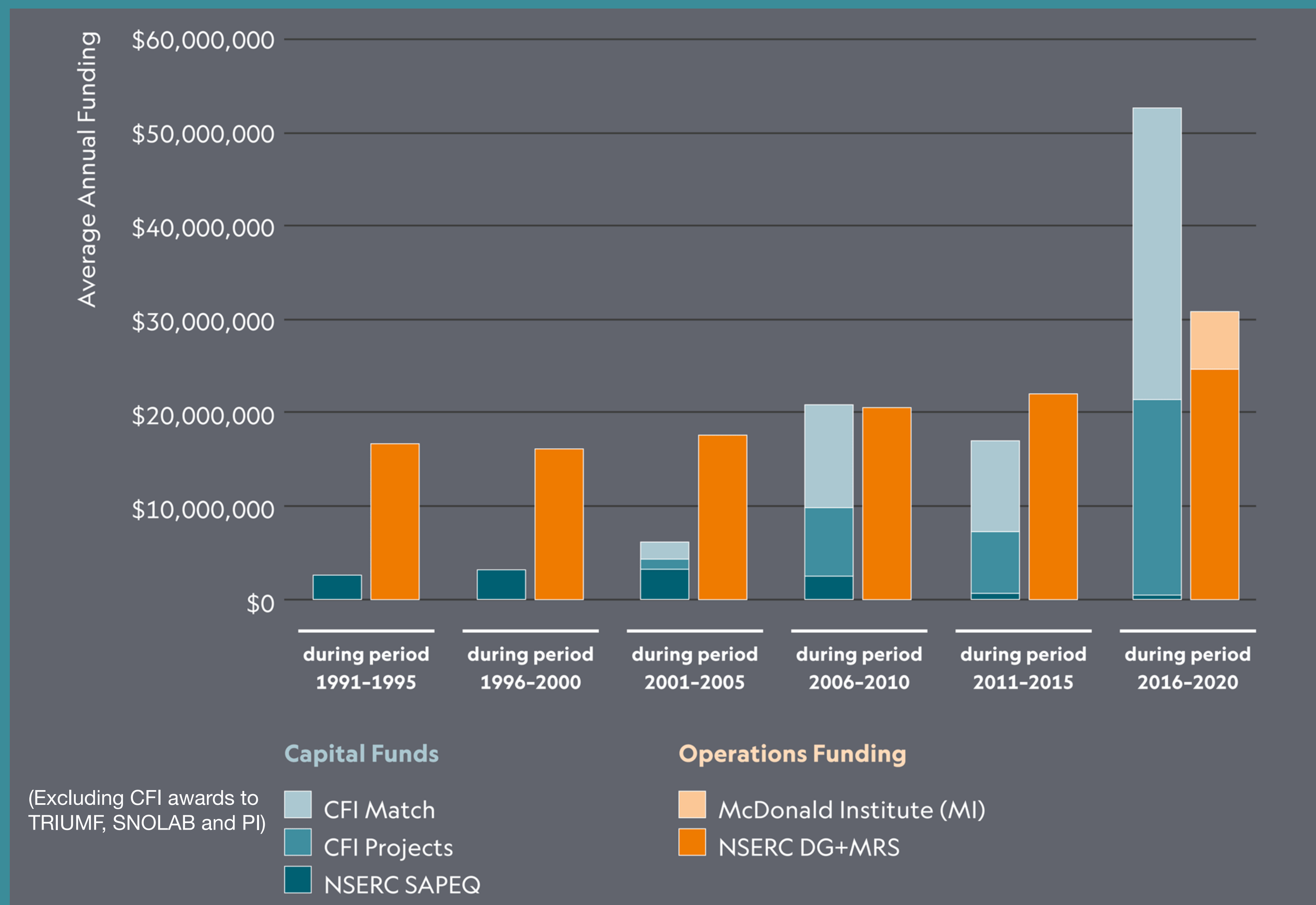
15% women

Canadian Subatomic Physics Community

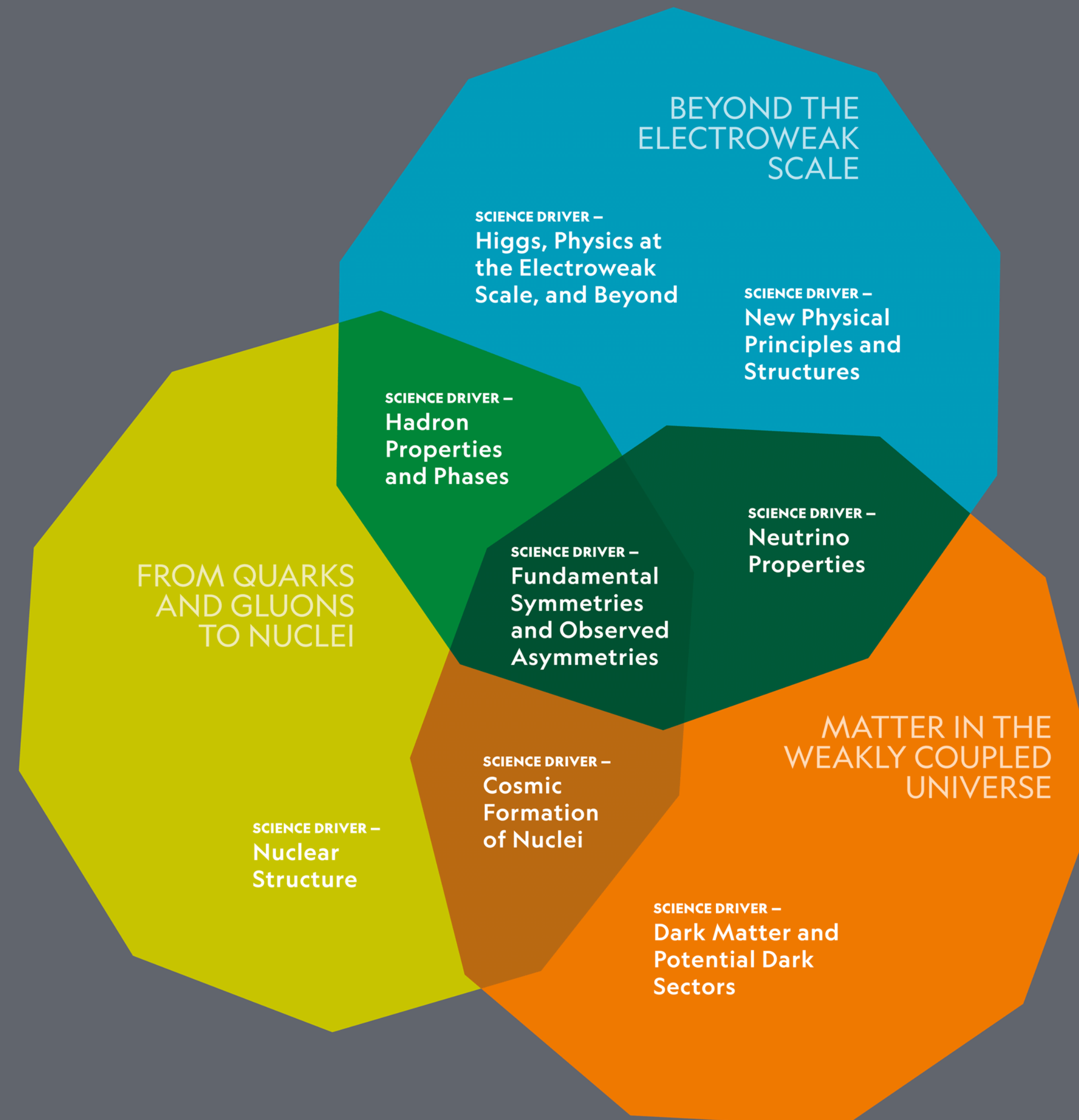


Funding landscape

CFI capital funding for SAP projects has totalled \$372M since 2002, 52% of which was in direct support of the major Canadian SAP facilities (TRIUMF, SNOLAB, Perimeter Institute).



Science Drivers



Research Plan Portfolio

FROM QUARKS AND GLUONS TO NUCLEI



SCIENCE DRIVERS:

- Nuclear Structure
- Cosmic Nuclei
- Hadron Properties
- Dark Matter/Sectors
- Neutrinos Properties
- EW and beyond
- Symmetries
- New Principles

BEYOND THE ELECTROWEAK SCALE



SCIENCE DRIVERS:

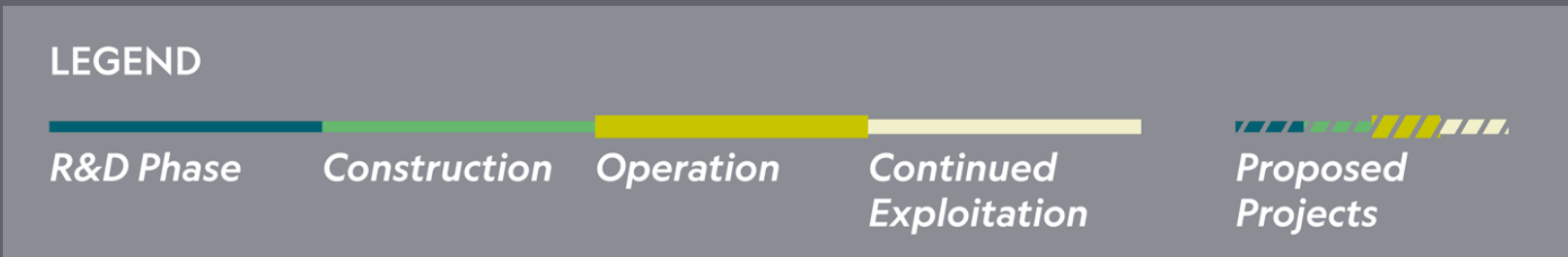
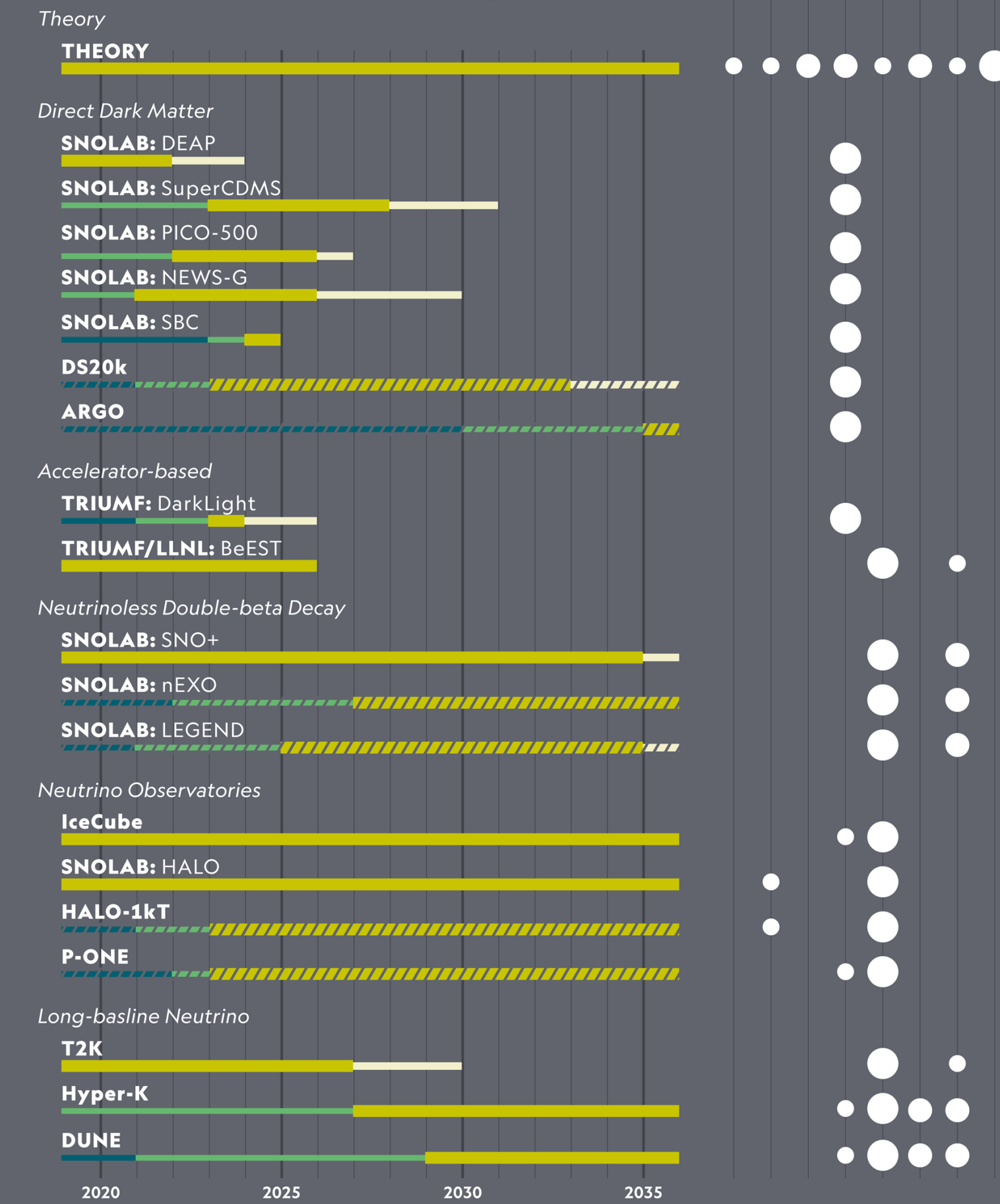
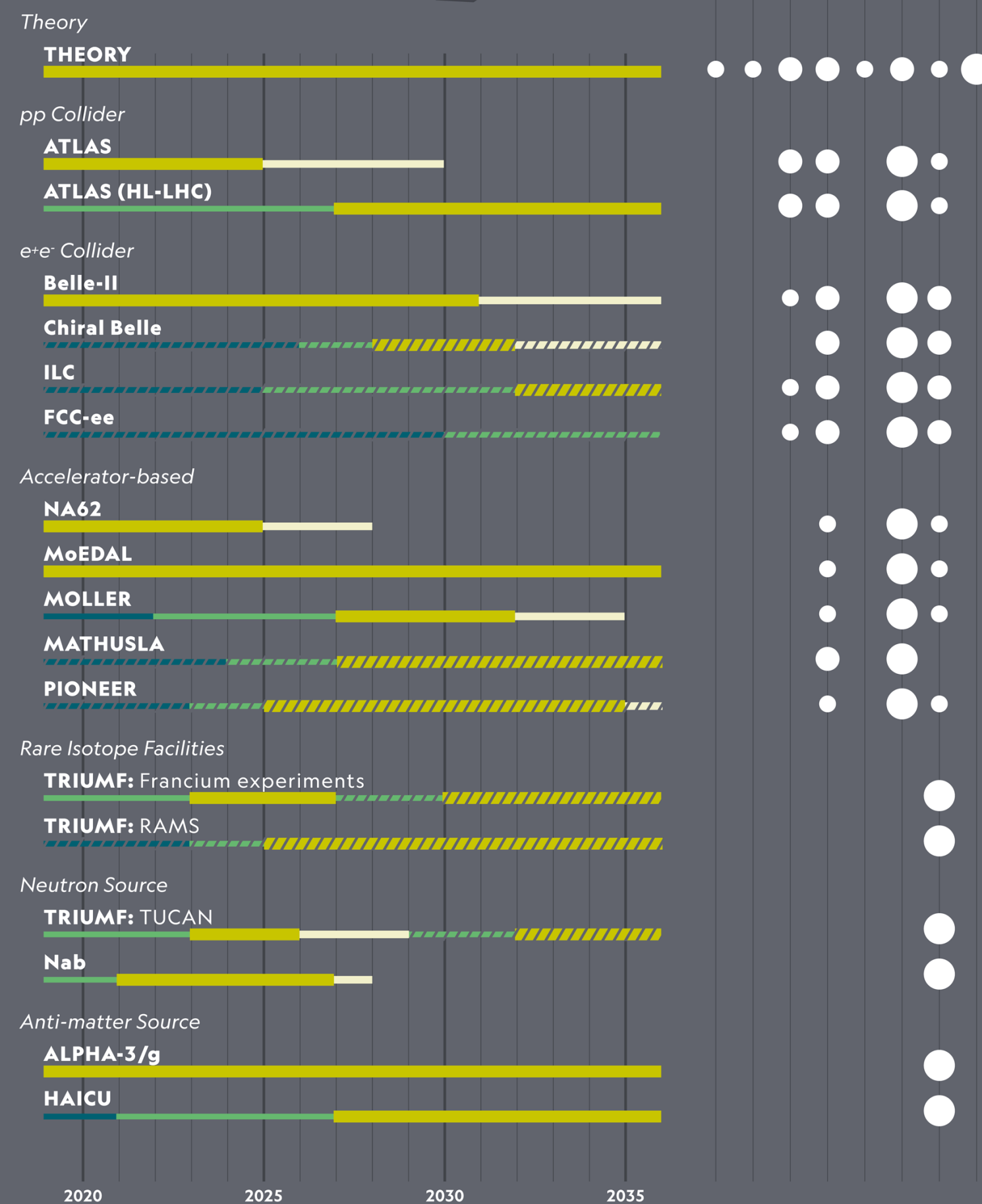
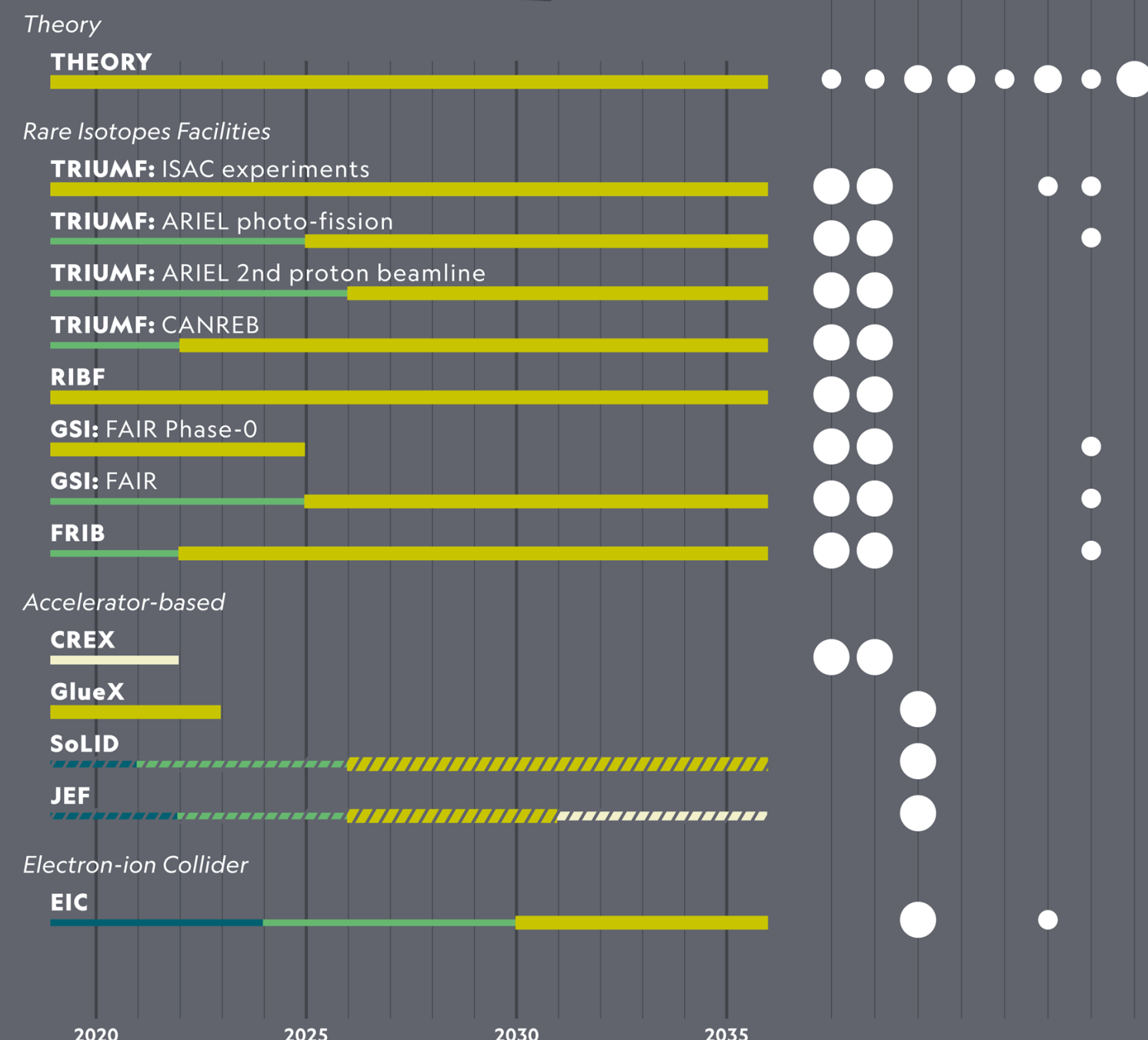
- Nuclear Structure
- Cosmic Nuclei
- Hadron Properties
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- New Principles

MATTER IN THE WEAKLY COUPLED UNIVERSE



SCIENCE DRIVERS:

- Nuclear Structure
- Cosmic Nuclei
- Hadron Properties
- Dark Matter/Sectors
- Neutrinos Properties
- EW and beyond
- Symmetries
- New Principles



Recommendations

Recommendations are divided into four categories

Science

Funding

Policy

Community

For a complete list of recommendations, see report at subatomicphysics.ca

Recommendations

Science

- Canadian infrastructure
- Theory
- Experiment
- R&D activities

Recommendations

Science

- Canadian infrastructure
- Theory
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We recommend fully capitalizing upon the unique science opportunities provided by the SNOLAB and TRIUMF infrastructure, and by the Perimeter Institute, in pursuit of the science drivers.

Recommendations

Science

- Canadian infrastructure
- Theory
- **Experimental program**
- R&D activities

- ▶ **MATTER IN THE WEAKLY COUPLED UNIVERSE** — *The future program should incorporate the search for dark matter using complementary direct and indirect techniques, including via multi-ton scale direct detection. The future program should include the further exploration of neutrino properties via neutrinoless double-beta decay experiments, long baseline experiments and neutrino observatories.*

(Excerpt)

Recommendations

Science

- Canadian infrastructure
- Theory
- **Experimental program**
- R&D activities

	<i>Flagship projects with broad physics outcomes</i>	<i>Flagship projects with strategic physics outcomes</i>
MATTER IN THE WEAKLY COUPLED UNIVERSE	T2K/HK, IceCube, SNO+	DEAP, PICO-500, SuperCDMS

We recommend the support of these projects and also those initiatives within the scientific program, with the potential for high impact, that are under development or may be developed in the coming years.

(Excerpt)

Recommendations

Science

Funding

Policy

Community

Recommendations

- CFI programs
- NSERC SAP envelope
 - *Increase of \$6.2M over 5 years*
- World-leading Centres
 - *SNOLAB, TRIUMF, Perimeter*
- IPP Research Scientist Program
- McDonald Institute
- Digital Research Infrastructure
- Funding for R&D

Funding

Recommendations

Science

Funding

Policy

Community

Recommendations

- Coordination of large-scale (\$50M+) Science endeavours
 - *Canada's Fundamental Science Review 2017: Investing in Canada's Future*, <http://sciencereview.ca> (Recommendation 4.7)
- Canadian office for international research engagement

Policy

Report of the Advisory Panel on the Federal Research Support System (March 2023)
<https://ised-isde.canada.ca/site/panel-federal-research-support/>

Recommendations

Science

Funding

Policy

Community

Recommendations

- Equity, Diversity & Inclusion
 - *Dimensions charter, leadership roles, decolonization*
- Training and career development
- Communication & engagement with agencies & government

Community

Acknowledgements

The LRP Committee wishes to thank IPP, CINP and NSERC for their support



INSTITUTE OF
**PARTICLE
PHYSICS**
1971 - 2021



**Canadian Institute of
Nuclear Physics**

**Institut canadien de
physique nucléaire**



and the Canadian SAP community at large for its engagement throughout this planning process.

Canadian Subatomic Physics Long Range: 2022-2026

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