



Update from the McDonald Institute

Joint IPP/CINP Meeting
CAP Congress
June 26th / 2026

Arthur B. McDonald
Canadian Astroparticle Physics Research Institute



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The McDonald Institute is **Canada's network for astroparticle physics research**, uniting scientists, engineers, and technical experts within one Pan Canadian Partnership

We strive to be:

A globally recognized centre for research and learning, coalescing Canadian and international expertise in underground astroparticle physics.



Now a partnership of 11 Universities and 6 institutes>



University of Victoria



SIMON FRASER UNIVERSITY



Université de Sherbrooke



CITA | ICAT

Canadian Institute for Theoretical Astrophysics / L'Institut Canadien d'astrophysique théorique



New



Funding Situation

- **CFREF completed:** All spending complete. Accounts closed. Final annual reports due to CFREF Sept 2026
- **NSERC-MRS In progress:**
 - First two years (18.2 M\$) received. Nominally April 2024 – March 2026 but with extra year spend down at NSERC we are budgeting this April 2024 – March 2027
 - Final three years (27.3 M\$) has also been reviewed, approved and received. Budgetted ~ April 2027 – March 2030 including the one year spend down.

	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
First 2 years	0	9.1	9.1			
Final 3 years				9.1	9.1	9.1

Scope: The Institute is providing support for the initial research & development of projects and for the ongoing science delivery, primarily at the Universities where the initial R&D is occurring.

Focus: The Institute was initially created with a focus on ensuring Canadian scientists were leading in the science that benefits from having the premier underground facility, SNOLAB, in their backyard.

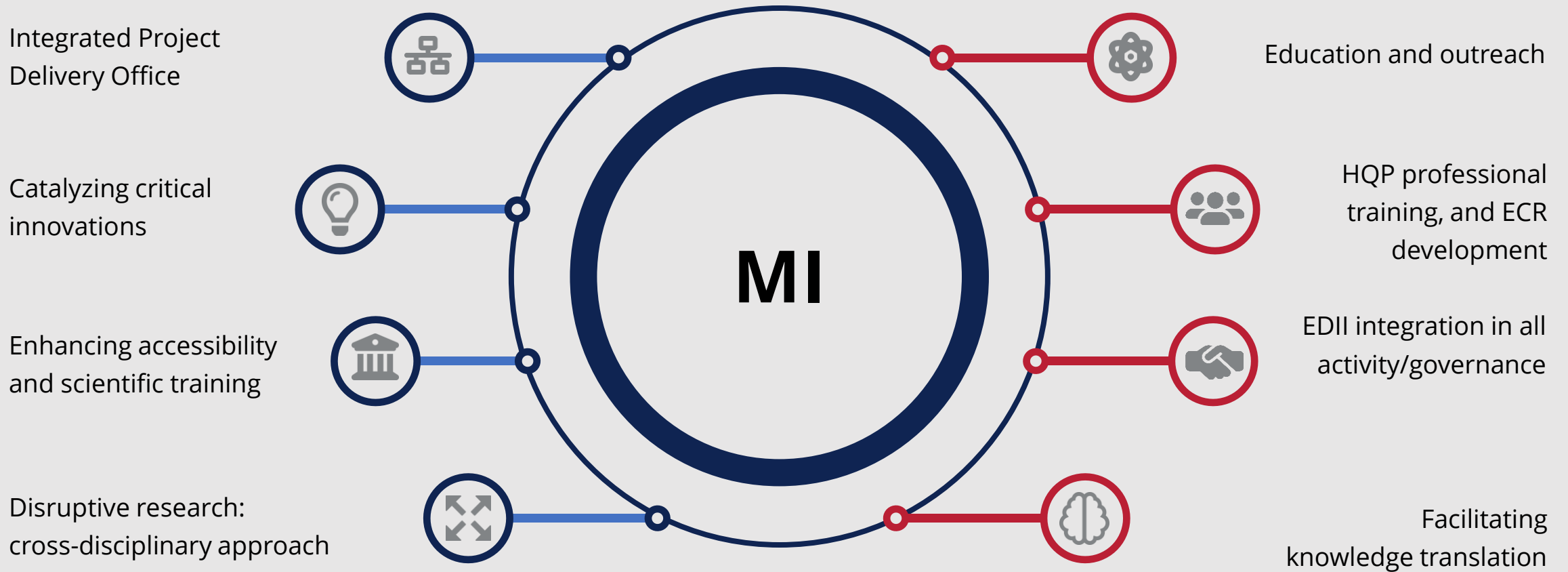
Physics objective focus on:

- Dark Matter
- Fundamental Properties of neutrinos
- Neutrinoless double beta decay
- Multi-messenger Physics

In addition to SNOLAB we also now benefit from the underwater facilities at Ocean Networks Canada.



Delivering the Science: McDonald Institute



Integrated Project Delivery Office

A well identified gap in the Canadian astroparticle physics ecosystem is the lack of engineering and technical resources at the Universities. Such a resource:

- Will enable Canadian researchers to take on major leadership responsibilities within large international collaborations to deliver significant components of those projects. Hence elevating the stature of the Canadian contributions.
- Will provide a blend of technical skills accessible by the entire community where having all those skills locally would be impossible.
- Allows the community to retain the expertise in underground physics while the various projects move through the typical life cycles of design, fabrication, and commissioning where significant engineering resources are most needed.

Managing the IPDO

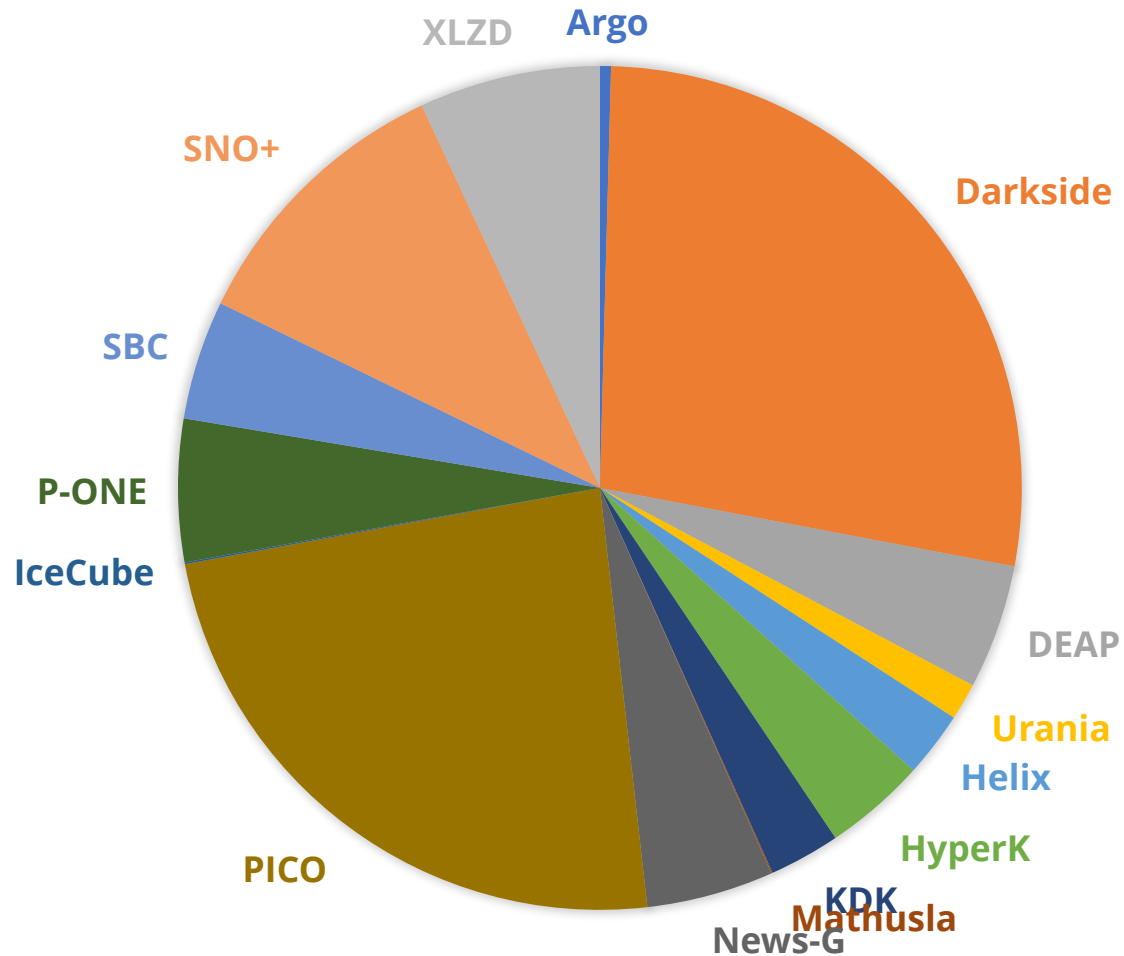
- Relevant proposals are first reviewed by a “Project Feasibility Committee” with appropriate engineering and technical expertise to evaluate the technical feasibility of the request. This may involve some iteration with the proponents.
- The “Resource Allocation Committee” evaluates the scientific merit and alignment of feasible proposals and makes a recommendation on the appropriate level of support.

Engineering and Technical Staff in the IPDC

Queen's	Koby Dering P.ENG	Mechanical, Structural, Process, PM, Technical Director
	Jonathan Corbett P.ENG	Cryogenic, Mechanical
	Mackenzie Dean	Mechanical
	Armin Mir	Mechanical
	Nicholas Moss	Mechanical
	Jeff Kingma	Machinist
	Robert Gagnon	Research Technologist
Carleton	Farrokh Rad P.ENG	Project Management
	Ryan Crampton P.ENG	Design Engineer
	John Sosiak	Lab Management
Alberta	Michael Rangen	Electronics Technologist
	Steve Perricone	Mechanical
McGill	Naman Walia	Mechanical, Cryogenic
Montreal	Mathieu Lauren ++	Research Scientist
UVIC	Sam de Jong	Detector Technologist
SFU	Chris Ng	Mechanical
TRIUMF++	Leanne Beet	Facility Manager
	Roger Brammall	Electronics Engineer in Training
	Benjamin Smithers	Detector Scientist
	James Nikkel	Research Scientist



DISTRIBUTION OF SUPPORT PRIOR TO IPDC



- Rough base line of activity prior to fully launching IPDC
- Fractions are % FTE working on project
- TRIUMF and Montreal not reporting hours yet
- Several entries based on a few weeks only so not that representative.

Pooled Funding Competitions:

• Graduate Student Competition: Round 1	17	(11 MSc, 6 PhD)
• Graduate Student Competition: Round 2	14	(2 UG, 9 MSc, 3 PhD)
• Postdoc Competition: Expt: Round 1	5	
• Postdoc Competition: CITA: Round 1	3	
• Postdoc Competition: Theory: Round 1	5	
• Postdoc Competition: Theory: Round 2	3	
Total:	47	(2 UG, 20 MSc, 9 Phd, 16 Pdf)

Basic Program support

Program	UG	MSc	PhD	PDF	RS	Eng/tech	EIT	Admin	Total
Theory	2	2		1					5
PICO				1					1
HK			1						1
SuperCDMS		1		7.7	.75				9.45
Tech Dev				1		4			5
IPDC						22			22
LAr	1		1	1	2	5.7		2	12.7
SBC				1		.5			1.5
P-ONE						.5			0.5
SNO+						.3	2		2.3
Sensei		1							1
XLZD	1		3						4
CUTE					.25				.25
Ricochet	2								2
LIGO				1					1
Mathusla				.3					.3
Other						2		4	6
Total	6	4	5	14	3	35	2	6	75

Current Support Summary

- 47 HQP supported through pooled funding program so far. New competitions on the way.
- 75 HQP supported through funds to partner Institutions
- Plus, 9 administrative support positions funded through the indirects (not the main NSERC-MRS grant).
- Plus 4 HQP working on astroparticle physics related STEM curriculum development in Faculty of education
- A total of 135 positions currently being supported, with good coverage of the program, particularly SuperCDMS and the LAr program (mostly Darkside)
- Strong engineering and technical support through the IPDC

Highest MI Priorities (in no particular order)

- **XLZD/nEXO2.0** amalgamation.
 - Potentially best of both worlds if $0\nu\beta\beta$ comes together with dark matter.
 - First phase will give world leading DM result at large scale and $0\nu\beta\beta$ at similar sensitivity to nEXO without isotopic enrichment (exact sensitivity to be determined).
 - Excellent potential home at SNOLAB. (But other labs are interested too)
 - Ready made second phase with xenon enrichment.
 - Capturing imagination of scientists, and agencies are willing to explore.
 - Still a long row to hoe to get fully funded/designed etc. A developing concept. PandaX is a competitor.
- **SNO+**
 - So close to being able to load with Te. (The main focus of MI support for SNO+).
 - Still very competitive.
- **SuperCDMS**
 - In the process of commissioning. Reached temperature. Chasing usual sources of noise, thermal leaks....
 - After decades of effort, on the verge of exciting new physics results. A must complete
- **Darkside 20**
 - Enormous Canadian investment to construction phase. Follows from successful DEAP program in Canada. Excellent PSD demonstrated.
- **Theory**
 - Modest amounts of support leads to big impact, connected vibrant community. Elevates community “into the conduction band”.

Near top MI Priorities

▪ P-ONE

- Great enthusiasm for neutrino telescope in Canada using ONC infrastructure
- Adds to the global community, overall sensitivity, complementary sky coverage
- Important to have P-ONE and KM3Net for multi-messenger astronomy with transient events where opacity of earth to high energy neutrinos can be a limitation.
- Technology is generally understood for vanilla detector (to be refined and optimized based on pathfinder strings).
- MI support generally focused on support for getting first strings built and deployed.
- Less well aligned to MI mandate. (Originally focused on the connection to SNOLAB)
- No clear path yet to fully funded km³ array.

Breadth

Experiments which are at the smaller/earlier stage. Important, but feasibility or ability to implement a next step needs to be demonstrated. MI willing to provide **modest support** in the short term. Next phase to be determined based on success at this level. Otherwise, these projects may be sun-set in the eyes of MI.

- **PICO**
 - Imperative that PICO 500 is completed. At this stage construction is nearly complete. Only operational support required.
 - No clear next generation scaleup
 - Possible interest in swapping fluids to push to lower mass WIMP
- **SBC**
 - Small scale demonstrator needs to run its course
 - Possible coalescence of community (PICO/SBC merger) if promise of SBC can be demonstrated.
- **NewsG**
 - Needs to finish operations at SNOLAB. Next phase is 3-m SPC at Boulby. Less connected to MI
- **Deap'/DSLIM**
 - Extensions to DEAP (isotope spikes, ARGO tests and Darkside Low Mass (DSLIM) are interesting ideas.
- **Super Fluid Helium:** Some interesting developments in using superfluid He as low mass DM detector should be explored

Lower Priorities

Experiments which have limited footprint in Canada, are less well aligned with MI, or not really needing the sorts of resources available from MI. These currently get limited or no funding from MI

- **Legend:** Small footprint in Canada. LNGS siting. SNO+ then Xe based $0\nu\beta\beta$ are priorities.
- **Halo:** Minimal resources needed.
- **DEAP 3600:** Important to finish but completion of DEAP has minimal or no resource cost to MI
- **KDK+:** Fundamental measurement of K decay, but not requiring SNOLAB, underground resources.
- **DUNE:** Longer time scale than HK, less Canadian footprint, not so well aligned with MI
- **Skipper CCDs:** Very interesting project, but no real footprint in Canada as yet (Potentially changing when Ana Botti arrives at UdeM).
- **Mathusla:** Not well aligned with MI for deep underground low background expt. No clear path to funding required. Limited existing support internationally.

Other Priorities

Experiments which have a high scientific impact but are less well aligned with MI and are not using Canadian facilities will be supported strategically to boost Canadian opportunities to lead on some of the scientific output.

- **Hyper-Kamiokande:** A very exciting, accelerator based, neutrino oscillation experiment in Japan. Very likely to be operation in the next couple of years and with Juno should make defining measurements of neutrino/PMNS matrix parameters, (mass hierarchy, CP phases, precision mixing angles....). Very strong Canadian contributions. Should be a key element of the SAP LRP but not so well aligned to MI mandate. A natural follow on from SNO, T2K etc. Modest support to help maintain Canadian Leadership.
- **LIGO/LISA GW:** Interesting to MI (not of relevance to SAP LRP) as a global success story with connections to multi-messenger physics. Modest support to amplify Canadian contributions



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Thank You