

**Pan-Canadian Board for NSERC MRS  
Supported Technical Teams  
2025 Report**

**James L. Pinfold, for the Board**

# Board Composition as of June 2025

- Jean-François Arguin - Université de Montréal - Montréal MRS manager
- Miriam Diamond - University of Toronto – at large
- Kevin Graham - Carleton University - Carleton MRS manager
- Garth Huber - University of Regina - CINP executive director
- Blair Jamieson - University of Winnipeg - Winnipeg MRS manager
- Rituparna Kanungo – Saint Mary’s University – at large
- James Pinfold - University of Alberta - UofA MRS manager - *Board Chair*
- Fabrice Retiere - TRIUMF
- Carsten Krauss - University of Alberta - IPP director
- Brigitte Vachon – McGill University – McGill MRS manager

# Rationale for the MRS Management Board

- *Why have MRS resources?*

- *To enable the development of a pool of available technology experts across Canada that are free of charge*
- *Thus innovative ideas can start small, often without funding, can be leveraged by MRS resources to larger national and international project*

- *Why do we need coordination?*

- *To dynamically match MRS resource to SAP community needs*
- *To complement support from existing non-MRS-funded resources (SNOLAB, TRIUMF, McDonald Institute) and project-specific professionals (e.g. CFI-funded)*

- *The PanCanadian Board was created to provide the above. Its composition is:*

- *Representatives from resource providers: MRS, TRIUMF,*
- *Representative from users i.e the Directors of CINP and IPP*
- *Other members who provide additional needed expertise and outlook.*

# Operation of the Board

- **Just fill a form in on the IPP or CINP websites**
  - **IPP** - <https://particlephysics.ca/community/major-resources/>
  - **CINP** - <https://cinp.ca/subatomic-physics-major-resources-support-facilities>
- **Request goes out to the board:**
  - *Further details and clarifications may be sought*
  - *The Board votes to approve - so far none have been rejected*
- **At last year's CAP** Miriam suggested implementing a ticket-based system within new dedicated website – we should beta test this approach.
- **Reporting – aiming to enhance transparency**
  - *Meet every 4 months – in between discuss by e-mail.*
  - *Standardized forms and meeting minutes on goggle drive*
  - *This material would move to a new dedicated website*
- **Allocation:** *try to choose the best technical match & perhaps refine request*

# Strategizing Resource Usage and Expertise

- *MRS resources are free to the user, though with limitations*
  - *Concentrated commitment over a big chunk of time (~a month or two) is strongly discouraged due to the need for access of other users.*
- *Other resource areas potentially available at McDonald Institute, SNOLAB and TRIUMF*
  - *Getting access to TRIUMF resources can be problematic*
  - *McDonald Institute resources are, presumably, available only for SNOLAB related projects*
- *CFI provides project-based resources*
- *Another issue is the use of technical “hardware” resources owned by the MRS facilities.*
  - *The use of MRS funds to upgrade these technical resources is severely limited by MRS rules*
  - *There are no special grants for the hardware-type technical resources that are not related to a particular experiment and are generally available.*
- *Is there a longer-term solution? We need a national SAP discussion: A Canadian Advisory board for Subatomic physics Instrumentation, resulting in Pan-Canadian application for funds?*

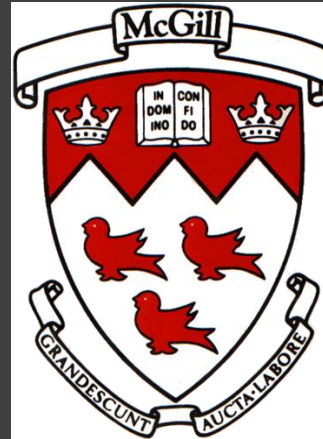
# MRS Group Sites



1. *Mech. Engineer (with stamp)\**
2. *Electronics Eng.*
3. *Detector Tchnlgist*



1. *Machinist/Tech.*
2. *Electronics Eng.*
3. *Electronics Tech.*
4. *Designer*



1. *Firmware Eng.*



1. *Electronics Eng.*
2. *Electronics Eng.*
3. *Electronics Tech.*
4. *Software design.*
5. *Detector tchnlgst*



1. *Electrical Eng.*

**\*NB Note that Mitchel Baker is the only registered engineer in the MRS resource**

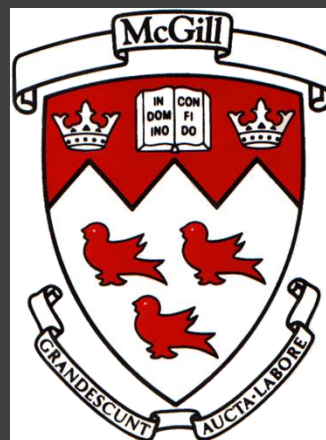
# Recent MRS Group Activity



1. ATLAS –LUCID
2. ATLAS- AFP
3. DARKSIDE
4. DEAP
5. EIC CAL.
6. HYPER-K
7. MoEDAL-MAPP
8. MATHUSLA (new)
9. nEXO
10. PICO
11. P-ONE
12. SNO+



1. ARIEL
2. ATLAS-ITK
3. ATLAS-sTGC
4. EXO
5. DEAP
6. Hyper-K
7. MOLLER
8. PICO



1. JUST HIRING.



1. ATLAS
2. BELLE II.
3. DUNE.
4. nEXO.
5. PICO
6. SBC



1. DEAP.
2. HAICU
3. TUCAN
4. MOLLE
5. nEXO

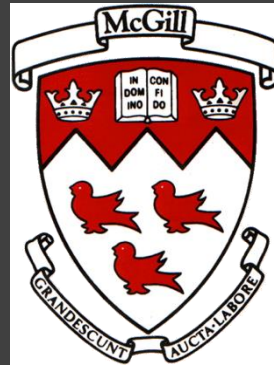
# MRS Group Abilities



1. **Registered engineer (CAD, FEI, Thermal)**
2. **Cryogenic design**
3. **Fast Analog & digital electronics design**
4. **Multi-layer PCB des.**
5. **DAQ software**
6. **ASIC design**
7. **FPGA programming**
8. **CNC machining**
9. **Radon Free const.**
10. **Detector design**
11. **Glass blowing**



1. **Fast Analog & digital electronics design**
2. **Multi-layer PCB des.**
3. **DAQ software**
4. **FPGA programming**
5. **CAD design (FEA)**
6. **CNC machining**
7. **DAQ software**



1. **FPGA firmware.**



1. **Fast Analog & digital electronics design**
2. **Multi-layer PCB des.**
3. **DAQ software**
4. **FPGA programming**
5. **Pellatron Tandem beams**
6. **Precision machining**



1. **Fast electronic design**
2. **Precision Current sources**
3. **Analog & Digital electronic design**
4. **Multi-layer PCB des.**
5. **HV monitoring**
6. **DAQ Software**

# Recent MRS Awards

- *Three NSERC SAP Awards were up for renewal for the period 2025 - 2030*
  - *Alberta ( CPP+ ), Montreal , Winnipeg*
- *We were required to apply for a 5-year grant; previously, a 3-year grant was required.*
- *RESULTS of the NSERC requests*
  - *Alberta MRS was awarded a 5-year grant cut by 29%*
  - *Montreal MRS was awarded a 5-year grant cut by 16%*
  - *The Winnipeg MRS award was cancelled (they will reapply in 2025)*
- *The NSERC report on the Alberta and Montreal resources was glowing. The cuts were blamed on the shortage of funds.*
- *Conclusions & summary:*
  - *The cuts will result in the effective loss of at least 2 MRS personnel and their collective knowledge and experience, although they will try to be retained using other funding*
  - *No special commitment by NSERC to “protect” community wide MRS resources*
  - *The relatively recent increase in NSERC funding do not seem to be making a difference*

# REPORTS FROM MRS FACILITIES

# Alberta MRS Resource

- Based at the University of Alberta, the CPP+ MRS Centre is available to support SAP-NSERC funded projects. The Current grant & MRS personnel:

GRANT SUMMARY	
Applicant:	James Pinfeld
Application Number:	SAPMR-2022-00004
Title:	CPP+, the MRS Application for the Centre for Particle Physics
Administering Organization:	University of Alberta
Amount of Award:	1/3 2022/2023 \$230,000 2/3 2023/2024 \$350,000 3/3 2024/2025 \$350,000
Co-Applicant(s):	Gingrich, Douglas Hallin, Aksel Huber, Garth Krauss, Carsten Moore, Roger Piro, Marie-Cécile Yáñez Garza, Juan Pablo
Award Start Date:	April 1, 2022
Award End Date:	March 31, 2025

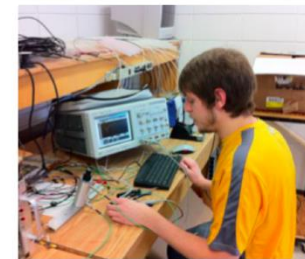
- Over the past several years the CPP+ MRS Resource made important contributions to 80% of the SAP experiments “taking data”



**Dr Richard Soluk**  
**MRS Detector Technologist**



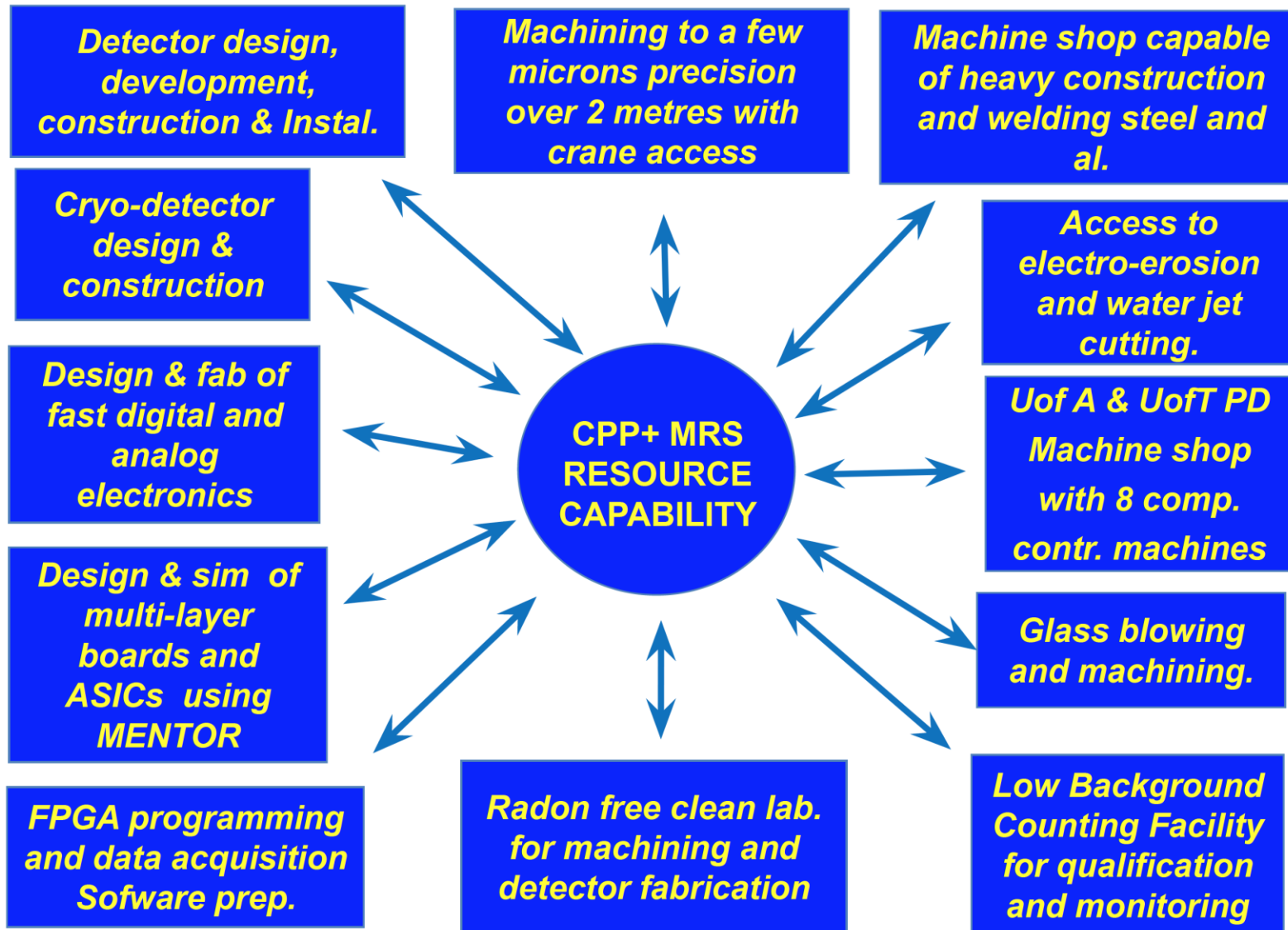
**Mitchel Baker**  
**MRS Engineer (with Stamp!)**



**Paul Davis**  
**MRS Electronics Engineer**

# Alberta MRS Resource

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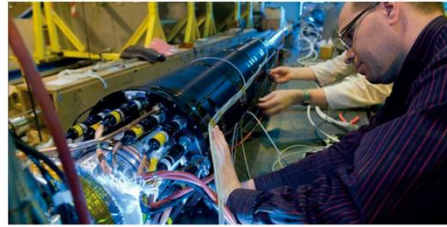


# Alberta MRS Resource - Current & Recent Users

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ATLAS AFP



ATLAS LUCID



MoEDAL-MAPP



DARKSIDE



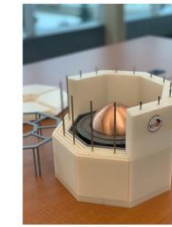
DEAP



IceCube



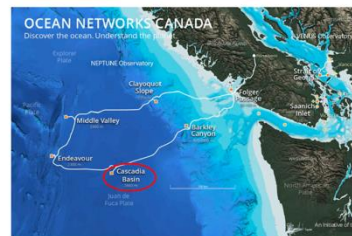
MATHUSLA  
(starting)



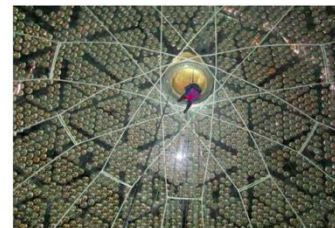
NEWS-G



PICO-500



P-ONE (planned,  
requested by  
external user)



SNO+



SBC

# Carleton Technical Team (MRS Supported)

## ■ Personnel

- **Electrical Engineer and Electronics Technician**
  - simulation, circuit design, testing, FPGA programming
  - analog and digital readout systems, power supplies, equipment certification
  - soldering, cabling, system modeling, and control
- **Machinist/Technician**
  - precision small parts fabrication, welding, vacuum/gas system cleaning and assembly, leak-checking
  - C&C milling/programming
- **Designer**
  - 3-D modeling, concept development, detailed design drawings for fabrication (e.g., CNC), as-built drawings, FEA calculations

⇒ have worked closely with TRIUMF, McDonald Institute, and SNOLAB engineers

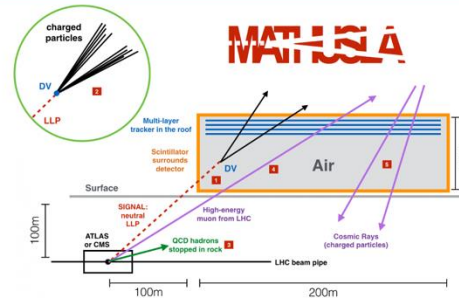
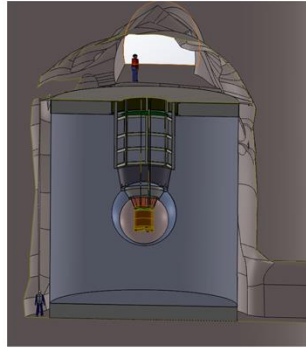
## ■ Facilities, Equipment, and Expertise

- machine shop, electronics lab, clean rooms (CNC mill, lathe, water jet, 3D printing, etc.)
- Carleton Science and Technology Centre (STC)
- cryogenic, vacuum, and gas handling equipment (Swagelok, VCR, Conflat, KF, custom)
- electronics and DAQ (NIM, VME, LabView, FPGA)
- EUDET silicon pixel telescope
- Department of Electronics CUMFF/FANSSI facility

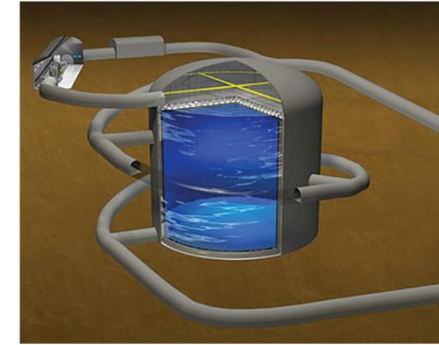
# Select Contributions from the Carleton Technical Team

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## EXO



## Hyper-Kamiokande

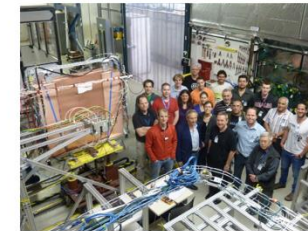


## DEAP

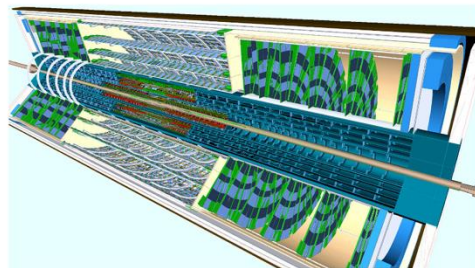


For more than 20 years, the Carleton Technical Team has been contributing to subatomic physics via R&D, Testing, Large-Scale Assembly and Delivery, and Maintenance of particle detector systems for a variety of projects in Canada and around the world.

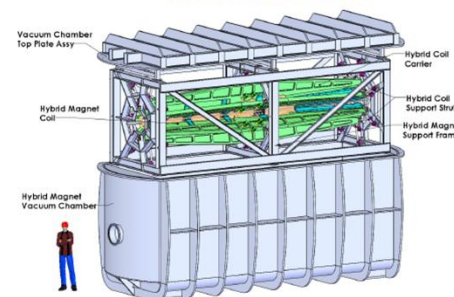
## ATLAS-sTGC



## ATLAS-ITK



## MOLLER



## PICO



# McGill MRS Resource

- **Funded resource:** *Specialized firmware engineer*
- **Examples of types of support envisioned:**
  - Consultancy in high-level design of complex firmware projects.
  - Hardware-specific firmware optimization.
  - Expertise in firmware implementation of interfaces to generalized readout components developed for subatomic physics research.
  - Firmware design and implementation in highly integrated readouts of state-of-the-art sensors.
  - Firmware implementation of machine learning algorithms in large-scale FPGA-based embedded systems.
- **Status:**
  - Hiring delays due to recruitment challenges.
  - Preferred candidate now identified, and currently going through immigration process to finalize contract.
  - Timescale of start of contract depends on immigration delays.

# Montreal MRS Resource: Machine Shop and Beam

- **Machine shop**
  - **Team: currently two machinists with extensive experience working on subatomic physics experiments**
  - **State-of-the-art equipment**
  - **Recently built custom-made equipment for:**
    - **TUCAN, Darkside-20k, SBC, PICO, ATLAS, nEXO, etc**
- **Tandem beam:**
  - **Pelletron Tandem that can produce e.g. proton beam up-to 11 MeV with 15 μA current**
  - **Can produce a mono-energetic neutron beam for calibrating dark matter detectors**
- **More information about the Montreal Resource can be found at: <https://wiki.umontreal.ca/display/LTA/Home>**

# Montreal MRS Resource: Electronics Lab

- **Wide-ranging expertise in electronics design, DAQ, FPGA firmware, trigger, slow control, detector mechanics, etc**
- **Team: 3 PhD physicists, 1 electronics engineer, 1 tech**
- **Recent projects:**
  - **DUNE:**
    - Data-filter system (software), timing system (firmware)
  - **ATLAS:**
    - ITk tracker: interlock system design, tests of front-end chips
  - **PICO:**
    - Design of acoustic amplifier boards
  - **SBC**
    - Design of LED light ring
  - **nEXO:**
    - Electronics for muon veto system
  - **Belle-II:**
    - LYSO scintillator beam monitoring system

# Uwinnipeg MRS Resource – Shomi Ahmed

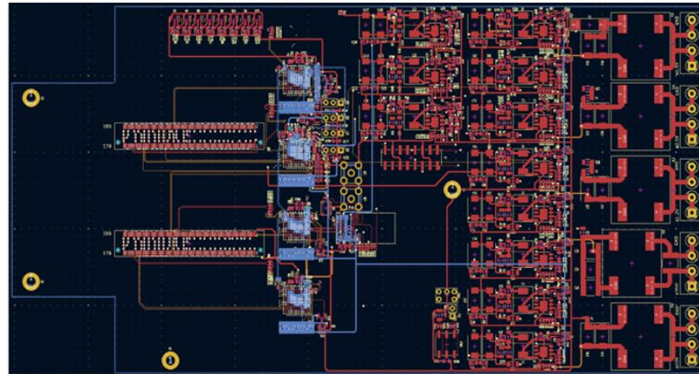
- **BSc Electrical Engineering (Electronics engineering)**
- **MSc Physics (University of Manitoba), supervisor Jeff Martin**
- **Working towards P.Eng designation**
  - Accepted as Engineering Intern (EIT) in Nov. 2021
  - P.Eng Mentoring at 4/4 years required work experience
  - After work experience prof. practice exam
- **Examples of past and ongoing projects**
  - Ultrastable precision current sources (<1ppm)
  - HV leakage current monitoring (+-250kV,<100pA)
  - 64-ch shim coil current source using DACs and MUX
  - Underwater photogrammetry camera systems
  - Degaussing system relay boxes (CSA compliant, 60A contactors)

# Uwinnipeg MRS Resource – Projects

- Lolx SiPM bias and amplifier boards for DEAP, HAICU, TUCAN and nEXO
  - Ensured QA and verification before installation
- HVMAPS readout systems using IpGBT for MOLLER (with Carleton MRS)
  - Breakout cable flex board design, high-speed readout routingS



Lolx board



HVMAPS board

