Proceedings of Plenary Sessions and HQP Workshop

HQP Workshop Day

Hosting an HQP networking/professional development day is a staple of the McDonald Institute Annual Community Meeting. This year we were excited to introduce the Astroparticle Physics Card Game to the participants who all had the opportunity to create a personnel card for themselves prior to the event. In the game, players build research teams of personnel cards and apply their skill points to project cards in order to win. Personnel cards also include a short bio, some research focus keywords, and a description of that person's strengths, goals, and challenges, as well as contact information, making them a kind of "enhanced business card". During the networking workshop, participants traded copies of their own cards with each other and proceeded to try and make synergistic connections for the people they met, based on information available on the cards.

Following the networking activity, guest speaker Dr. Leela Viswanathan gave a talk about Leadership in Science which highlighted…

Attendees were invited to visit the Miller Museum of Geology where an Art and Dark Matter exhibit was installed featuring UK-based artist, Jol Thoms. The exhibit included several of Thom's two dimensional digital prints, as well as videos, sculptures, and installations. Thoms created the artwork for the DRIFT: Art and Dark Matter exhibition which toured Canada in 2021-22.

In the afternoon, the HQP group was introduced to a collaborative mock grant assessment exercise where groups of 4-6 developed a strategy to review, evaluate, and choose winning grant applications. Several teams chose to scan the applications for relevant keywords in an effort to quickly eliminate unqualified submissions. Some groups created rubrics to help standardize the evaluations and split the work of reviewing between the team members. A discussion followed the hectic exercise where is was clear that in all cases, shortcuts of one kind or another were necessary to process the amount of material. Participants came away from the workshop with an experiential understanding of how grant review committees work, and how applications that follow a format, are clear on the requirements, and make keywords obvious, have a much better chance of being considered.

DAY 1

REVIEW OF MI PROGRAMMING

RETROSPECTIVE OF CFREF SUPPORTED WORK OF THE INSTITUTE

Dr. Tony Noble's presentation reflects on the successes of the McDonald Institute over the past seven years, under the CFREF (Canada First Research Excellence Fund) initiative. He begins by acknowledging the partnership of eight universities and five institutes, which received $63.7 million in funding starting in 2016. This funding has supported the development of subatomic physics research, particularly astroparticle physics, across Canada.

A significant aspect of the McDonald Institute's contribution has been connecting the community of researchers and supporting experimental and theoretical research in astroparticle physics. Dr. Noble highlights the decade-long effort required before deploying experiments at facilities like SNOLAB, emphasizing the need for student involvement in the research and development phase. This preparation includes detector design, engineering, and installation work, which has often been underfunded in the past.

The McDonald Institute also made crucial hires to strengthen both the experimental and theoretical components of the field. They brought in 15 new faculty members across various disciplines, including physics, chemistry, and mechanical engineering. These hires have significantly bolstered Canada’s leadership in projects like SuperCDMS, a dark matter detection experiment, and enhanced interdisciplinary collaboration.

Additionally, Dr. Noble mentions the importance of administrative support, which includes roles focused on education, outreach, communications, and equity, diversity, and inclusion (EDI). This infrastructure has allowed the McDonald Institute to provide resources that individual departments may not have been able to sustain independently.

As the initial seven-year funding period comes to an end, Dr. Noble reflects on the institute’s achievements and its plans for the future. He discusses the completion of several key projects, the expansion of theoretical research, and the integration of new partners; Simon Fraser University, University of Victoria, Sherbrooke University, and

CITA (Canadian Institute for Theoretical Astrophysics). The institute's success in surpassing the anticipated matching contributions from its partner institutions is also noted as an essential factor in securing future funding.

Dr. Noble concludes by expressing optimism for the next phase of the McDonald Institute's work, supported by new funding, while ensuring the seamless wrap-up of current initiatives.

NEW RESEARCH FUNDING AND FORWARD PROGRAMMING

Dr. Tony Noble discussed the transition to new funding for the McDonald Institute, detailing key terms and changes for future research efforts. The institute received five years of additional funding from the Canadian government, amounting to $45.5 million (approximately $9.1 million annually), which was an unexpected increase from the previously agreed two-year extension. The shift from a two-year to a five-year funding period was crucial in ensuring long-term project sustainability, particularly in hiring and retaining researchers, as short-term funding posed challenges for recruitment.

Moving forward, Dr. Noble emphasized the importance of strategic planning and budgeting. One of the primary concerns is ensuring that the new funding model continues to support the McDonald Institute's mission, supporting university-based astroparticle physics researchers, theoretical and experimental research, and early-career researcher and engineering support. The institute will continue to focus on funding high-quality personnel, with separate committees to evaluate theoretical and experimental projects, improving decision-making processes.

In terms of long-term goals, the McDonald Institute aims to strengthen partnerships with other institutions, like SNOLAB and TRIUMF, while also enhancing Canada's role in international collaborations. The institute's leadership is also preparing for potential challenges, such as navigating changes in government science funding policies and the ongoing need for commercial viability in future grant applications.

This strategic approach reflects the institute's commitment to maintaining its role as a leading hub for subatomic and astroparticle physics in Canada, despite evolving funding landscapes.

CFREF SUCCESSES

Members of the McDonald Institute administrative team and the HQP (Highly Qualified Personnel) community gave presentations highlighting the successes of several key areas of the Institute's operations and outlined the goals for the coming years. In summary, these presentations highlight the McDonald Institute's progress in fostering a collaborative, inclusive, and engaged research community, with a strong emphasis on supporting early-career scientists, promoting diversity, enhancing education and outreach, and building strategic industrial partnerships. The institute's success is reflected in its ability to secure long-term funding, grow its network of collaborators, and continue making significant contributions to the field of astroparticle physics.

HQPAC (Highly Qualified Personnel Advisory Committee)

The HQP Committee plays a role in supporting early-career researchers, including graduate students, postdoctoral fellows, and young professionals across the McDonald Institute. Committee members Jeremy Savoie, Hussain Rasiwala, Sarah Nowicki, explained that the committee focuses on fostering a strong community among HQP members by improving connectivity between institutions and providing networking and professional development opportunities. Recent initiatives include regular surveys to gather feedback on the needs and challenges of HQP, developing a newsletter to disseminate job opportunities and resources, and organizing in-person and virtual meetings to strengthen engagement across institutions. The committee also emphasizes mental health and wellbeing by exploring initiatives like mentor programs and community-building activities.

Equity, Diversity, Inclusion, and Indigenization

Equity, Diversity, Inclusion, and Indigenization (EDII) have been a central focus within the McDonald Institute's mission. Manager for EDII Capacity Development, Dr. Alexandra Pedersen emphasizes the need to create a welcoming and supportive environment for underrepresented groups in the astroparticle physics community. The McDonald Institute has implemented several initiatives to advance EDII goals, such as providing workshops, developing policies and programs to support equity, and highlighting the contributions of diverse scientists. These efforts are aimed at increasing the representation of women and minorities in the field, as well as ensuring that all members feel a sense of belonging and have equal access to resources.

Education & Outreach

Education and outreach initiatives have been a cornerstone of the McDonald Institute's impact. The focus has been on increasing public awareness and understanding of astroparticle physics through programs aimed at both students and the general public. This includes educational workshops, public lectures, and summer student programs that engage participants in scientific research and provide exposure to the field. Manager for Education and Public Outreach, Dr. Mark Richardson outlined how outreach initiatives also play a role in inspiring the next generation of scientists by demonstrating the relevance of astroparticle physics to society, as well as by demystifying science for the broader community.

Industrial Engagement

Industrial engagement has been another area of success for the McDonald Institute. By fostering partnerships with industry, the institute has been able to enhance its research and innovation efforts. This collaboration benefits both the scientific community and the private sector, as industries gain access to cutting-edge technologies and research expertise, while the institute secures funding, resources, and opportunities to apply scientific advancements to real-world challenges. Associate Director, External Relations, Edward Thomas spoke to why these partnerships have been especially valuable in developing technologies related to astroparticle detection and other scientific instruments, opening new avenues for commercialization and industrial applications.

Communications

Communications has been a key focus for enhancing visibility and engagement both within the McDonald Institute and with the external community. The communications strategy involves regularly updating the broader community about the institute's activities, successes, and opportunities through newsletters, social media, and public relations efforts. Communications Officer Zachary Kenny explained that an important goal has been to improve internal communication among researchers at different institutions and to ensure that all members of the McDonald Institute feel connected and informed. Externally, communication efforts have aimed to raise awareness of the institute's scientific contributions and to foster collaborations with national and international partners.

INSTITUTIONAL PARTNER SUCCESSES

SNOLAB, presented by SNOLAB Director Dr. Jodi Cooley

SNOLAB has ambitious plans to advance both its research capabilities and its infrastructure. Several major experiments are currently undergoing upgrades or are set to begin operations soon. DEAP-3600, a dark matter experiment, is set to complete its upgrades this fall and resume science operations by next year. PICO-500 also had a successful technical design review and expects to start commissioning next year. SNO+ continues to take geo-neutrino data and SuperCDMS development is proceeding as expected.

In terms of infrastructure, SNOLAB is planning a phased expansion to create additional space for more large-scale experiments. This includes new caverns and lab areas to accommodate the growing demand from the scientific community. These plans are essential to ensuring that SNOLAB remains at the forefront of astroparticle physics research, with an estimated eight years needed for full development.

SNOLAB is also diversifying its research portfolio. A notable new initiative is its quantum program, which includes the underground testing of qubits, funded by the US Army Research Office. Additionally, the facility continues to collaborate on nuclear forensics projects with Health Canada, contributing to isotope detection research.

SNOLAB has established a formal EDI committee and integrates Indigenous knowledge into its educational programs. This includes a planetarium show that combines traditional Indigenous astronomy with scientific perspectives, along with commissioned art pieces that reflect Indigenous culture.

TRIUMF, presented by TRIUMF Director, Dr. Nigel Smith.

Key Initiatives:

1. **Cyclotron Upgrades and ISAC**: TRIUMF is expanding its 500 MeV cyclotron capabilities and continuing the development of the Isotope Separator and Accelerator (ISAC) facility, which is pivotal for nuclear physics research. This includes studying radioactive ion beams to better understand stellar burning, supernovae, and nuclear reactions. The Aerial project aims to add a new proton beamline and upgrade TRIUMF’s ISAC facility.

2. **Medical Isotope Production**: A significant focus is on medical isotopes, with TRIUMF expanding its efforts through the Institute for Advanced Medical Isotopes (IAMI). This facility will enhance both commercial isotope production and cancer treatment research. TRIUMF's high current capabilities support large-scale isotope production, benefiting both research and medical applications.
3. **Quantum and Green Technologies**: TRIUMF is also exploring emerging fields like quantum technology and green energy solutions. The facility's expertise in particle accelerators and sensors provides a strong foundation for advancements in quantum sensors and environmentally sustainable technologies.
4. **Strategic 20-Year Vision**: In its 20-year vision, TRIUMF outlines plans to expand its scientific scope into material science, nuclear medicine, and quantum technology, while maintaining a core focus on particle and nuclear physics. This long-term vision includes securing future funding to maintain and grow its infrastructure.
5. **International Collaboration and Talent Development**: TRIUMF continues to play a key role in global research efforts, partnering with CERN, SNOLAB, and other international facilities. Additionally, the facility emphasizes talent development through the HQP program and plans to foster more collaborations across disciplines.

These plans position TRIUMF to continue leading in nuclear physics and expand into new research areas while addressing global challenges such as medical innovation and sustainability.

CITA, Presented Director, Dr. Dick Bond

Dr. Dick Bond, Director of the Canadian Institute for Theoretical Astrophysics (CITA), presented* a strategic overview emphasizing the institute's future directions.

Key Focus Areas:

1. **Astroparticle Physics & Dark Matter**: CITA plays a crucial role in advancing dark matter research, working in close collaboration with experimental facilities like SNOLAB. The integration of theoretical and experimental approaches is a central goal, with efforts to design experiments based on theoretical predictions. CITA is supporting multiple dark matter-related projects, including the search for dark

photons and other exotic particles, with the involvement of top-tier postdoctoral researchers and faculty.

2. **Collaboration & National Leadership**: As a national center of excellence, CITA's leadership extends across Canada, bringing together institutions and researchers through the CITA National Fellowship program. This program supports early-career scientists and strengthens collaboration between theoretical and experimental researchers in particle astrophysics. The institute also fosters international partnerships, ensuring that Canada remains competitive on the global stage in astroparticle and cosmology research.
3. **Cross-disciplinary Research**: In addition to dark matter, CITA researchers are involved in various fields of theoretical astrophysics, including gravitational waves, cosmic microwave background (CMB) studies, and nuclear astrophysics. This broad scope allows CITA to address fundamental questions about the universe's formation and evolution while contributing to experimental designs in these domains.
4. **Funding & Growth**: Dr. Bond highlighted ongoing financial challenges, particularly the need for more funding to support postdoctoral fellows and theoretical research across Canada. Despite this, CITA continues to grow its influence through strategic hires and fostering connections between theory and experiment.

Overall, CITA's plans are centered on advancing theoretical research that underpins experimental efforts, particularly in the areas of dark matter and cosmology, while continuing to play a leadership role in Canadian astrophysics.