Canadian Institute of Nuclear Physics
Institut canadien de physique nucléaire

Newsletter #21, November 2022

The Canadian Institute of Nuclear Physics (CINP) is a formal organization of the Canadian nuclear physics research community to promote excellence in nuclear research and education, and to advocate the interests and goals of the community both domestically and abroad.

1. SAPES Fall Orientation Meeting

The NSERC Subatomic Physics Evaluation Section (SAPES) activities for the 2023 competition have recently begun, following the closing date for most applications on Nov 1.

To reduce their workload during 'competition week' in February, SAPES has decided to move the institute presentations by CINP, IPP, TRIUMF, SNOLAB, Perimeter, McDonald, CFI to their Fall Orientation session on Dec 12. The purpose of the session is to update and familiarize SAPES about the SAP Canadian funding and research landscape, prior to their review of this year's applications. SAPES feels that having the input from the institutes prior to their reading the grant applications will help them gain a better perspective of the Canadian subatomic physics research environment.

My usual practice is to brief SAPES on the major activities undertaken by the CINP in supporting Canadian subatomic physics research endeavors, and present some slides on the breadth of Canadian nuclear physics research and important current and future priorities. Each Institute/presenter will have 15 minutes to present, leaving time for questions.

If you have something to contribute, such as:

- a major research award or recognition received,
- a recent research highlight, such as a publication in a prestigious journal,
- approval or commissioning of a new research capability or technique,

please let Garth Huber know ASAP, and preferably no later than December 1, so he can send you an example slide using the CINP PPT template. His contact information is on the back page of this newsletter.

2. Report from the TRIUMF Science Council (submitted by Corina Andreoiu, SFU)

Located in Vancouver, on the campus of University of British Columbia, TRIUMF is Canada's particle accelerator center, and it is owned by a consortium of 14 Canadian universities. Recently, TRIUMF became a not-for-profit corporation and has a new governance structure. Under the bylaws of TRIUMF Inc., there are three main core elements for its governance: 1.) A Members' Council composed of one representative from each member University, 2.) A Science Council, and 3.) A Board of Governors. A detailed description of the TRIUMF's governance structure can be found at **https://www.triumf.ca/node/230/governance**

The role of the TRIUMF Science Council is to be an advisory body to the TRIUMF Board on a) the scientific direction of TRIUMF in connection to the Five-Year Plan, b) TRIUMF's engagement strategy with the scientific community and its founders, c) TRIUMF's scientific risk appetite statement and major scientific risks, and d) other matters that need input form the TRIUMF Science Council as required by the Board.

TRIUMF Science council is currently composed of 19 members with scientific expertise in the fields relevant to TRIUMF's activities. 14 are nominated by the Universities, and 5 are TRIUMF scientists. Corina Andreoiu, representing Simon Fraser University, was

elected as Chair from June 2021 to September 2022, and was asked to serve for another year at the recommendation of the TRIUMF's Nomination Committee. In addition, Deen Taposh is the National Research Council (NRC) representative and an observer. As Chair of the TRIUMF Science Council, Andreoiu serves as a member on the TRIUMF Board of Governors. A list with the TSC members, their affiliations, and contact details is given on Table 1.

The TRIUMF Science Council meets at least once per year at the time of the TRIUMF's Annual General Meeting, and as often as the Board or the Science Council finds it pertinent to discuss any science matter related to TRIUMF's activities.

So far, the TRIUMF Science Council has met three times in April, May, and October 2022. In May 2022, the TRIUMF Science Council endorsed the 20-Year Vision that has been proposed by TRIUMF and reviewed new member applications and recommended them for approval to the Board. It is expected that in future the number of members of Canadian Universities will increase, and the TRIUMF Science Council will expand accordingly. Future activities of the TRIUMF Science Council include involvement in the Five-Year planning, approval of new members, being part of the Advisory Committee Of TRIUMF (ACOT) meetings as an observer or the International Peer Review as part of the NRC evaluation and reporting to the Board.

After the first year since its inception, the TRIUMF Science Council is expanding its role. Currently its next task is to fully engage in the Five-Year planning. In this respect the TRIUMF users and the community might want to contact the Chair or any of its member for discussions and suggestions related to this important task.

Table 1: Members of the TRIUMF Science Council, their affiliations, and e-mails

Aksel Hallin, University of Alberta; aksel@ualberta.ca
Alain Bellerive, Carleton University; alainb@physics.carleton.ca
Carl Svensson, University of Guelph; sven@uoguelph.ca
Claude Leroy, Université de Montréal; claude.leroy@umontreal.ca
Corina Andreoiu, Simon Fraser University; corina_andreoiu@sfu.ca
Gerald Gwinner, University of Manitoba; gerald.gwinner@umanitoba.ca
Graeme Luke, McMaster University; luke@mcmaster.ca
Gwen Grinyer, University of Regina; gwen.grinyer@uregina.ca
Ken Clark, Queen's University; kenneth.clark@queensu.ca
Michel Lefebvre, University of Victoria; lefebvre@uvic.ca
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Wendy Taylor, York University; taylorw@yorku.ca
William Trischuk, University of Toronto; william@physics.utoronto.ca
Ania Kwiatkowski, TRIUMF; aniak@triumf.ca
Conny Hoehr, TRIUMF; choehr@triumf.ca
Kenji Kojima, TRIUMF; kojima@triumf.ca
Reda Tafirout, TRIUMF; tafirout@triumf.ca
Petr Navratil, TRIUMF; navratil@triumf.ca
Deen Taposh, National Research Council; deen.taposh@nrc-cnrc.gc.ca

TRIUMF

3. Grad classes offered by TRIUMF
(submitted by Marcello Pavan, TRIUMF)

TRIUMF periodically offers a few graduate-level courses, usually in the fall and winter terms, which could be of interest to your students. The courses are run online through UBC or UVic. Typically students would register at their local department in a 'directed studies' or 'special topics' course, though students in western Canada could take advantage of the Western Dean's Agreement to transfer course credit directly.

In the Winter 2023 term, the following courses are being offered. Students are asked to contact the lecturer directly is they are interesting in taking, or want more information about, the course.

UBC PHYS 505 — Nuclear Physics

https://phas.ubc.ca/~behr/phys505/

Nucleons and their structure, hadrons and isospin, two-nucleon systems, the *NN* interaction; bulk properties of nuclei, nuclear excitations and radioactivity, nuclear models; strong and electromagnetic decay, symmetries and weak interaction; nuclear reactions, nuclear astrophysics.

In 2021, this course was taken by 5 UBC students and 9 from other universities. It will again be taught entirely remotely.

Prerequisites: PHYS 500 Quantum Mechanics I or equivalent (one semester of grad QM)

Textbook: Samuel S.M. Wong, Introductory Nuclear Physics, 2nd ed. Wiley (.pdf available at publisher with UBC library privileges)

Contact: Dr. John Behr <behr@triumf.ca>

UBC PHYS 560 / UVic PHYS 522 Physics and Engineering of Particle Accelerators

The course will provide an introduction to the physics and technology of particle accelerators concentrating particularly on proton and ion accelerator technology. The course will include a survey of existing accelerator types and an introduction to transverse and longitudinal beam optics. The course will also include an introduction to the physics and technology of ion sources and charge state breeders, an overview of radioactive ion beam production, an introduction to accelerator radio-frequency principles, key fundamentals of superconducting radio-frequency technology, and more detailed aspects of room temperature and superconducting linear accelerators, cyclotrons and high energy circular machines. The course should appeal to students of Accelerator Physics, as well as to students of Experimental Nuclear and Particle Physics and other students interested in Particle Accelerators.

Pre-requisites: Classical Mechanics, Classical Electro-dynamics

Lecturers: The course will be given by a team of lecturers made up of experts from the TRIUMF Accelerator Division. Each lecturer is responsible for about 3-5 lectures.

Contact: Dr. Oliver Kester <okester@triumf.ca>

UBC PHYS 528 Elementary Particle Physics
(to be offered ONLY if there is sufficient demand)

https://particletheory.triumf.ca/PHYS528/

This course will cover the underlying theory of the Standard Model (SM) of particle physics. Starting from Feynman diagrams and quantum electrodynamics (QED), we will build up the other elements of the SM including the strong and weak forces and the Higgs mechanism. We will also connect the SM to experimental observations at high energy colliders and beyond.

Prerequisite: Familiarity with QED at the level of tree-level Feynman rules.

Contact: Dr. David Morrissey <dmorri@triumf.ca>

4. NSERC Support for CINP

NSERC provides funding for many CINP activities through the Subatomic Physics Major Resources Support (SAP-MRS) program. The installment for 2022-23 is $75,000.

5. Representation and Input to Various Agencies

The CINP is an advocate and representative of the Canadian nuclear physics community and is asked to attend various meetings or make presentations on your behalf. As a member, you can provide valuable input to CINP.

To provide input to any of these matters, or request further information, please see the Executive Director contact information at the end of the newsletter.

- The **Advisory Committee on TRIUMF** (ACOT) meets and reports to the NRC twice a year. Garth Huber represents the CINP as a "community observer". ACOT met in person for the first time since 2019 on Oct 24-25, and had many very useful interactions with the TRIUMF community. CINP made a brief presentation to ACOT on the final day. The next meeting will be April 2023. Please let us know if you have specific information that would be useful to CINP's input.

- The formulation of the next European Nuclear Physics Long Range Plan has recently begun by NuPECC (Nuclear Physics European Collaboration Committee). CINP is a formal observer to NuPECC and submitted a short document on Oct 27, "Canadian Nuclear Physics Research context for the NuPECC Long Range Plan", summarizing areas of common interest from the Canadian Subatomic Physics Long Range Plan 2022-26. The previous NuPECC LRP was published in 2017.

- The NSERC Major Resources Support program (MRS) provides funds to several facilities across Canada, for the technical support needs of the Subatomic Physics Community. A new Pan-Canadian MRS Coordination Board has recently been set up, with the CINP Executive Director as an ex-officio member. The Board is quite active, meeting about 6 times a year. One of the goals of this Board is to improve access to the MRS funded facilities to SAP researchers across Canada.

There is an openness to support detector projects from CINP members. The new Pan-Canadian MRS Coordination Board would like CINP member input regarding community needs and priorities for MRS personnel by area of specialization (e.g. cryogenics, electronics, photodetectors, software engineering, etc.) The Board would use this input to formulate a strategy for assessing potential new MRS applications to NSERC, and balancing resources among existing MRS grants.

Please visit **https://cinp.ca/subatomic-physics-major-resources-support-facilities** or contact Garth Huber for more information.

- **CINP can provide letters of support** for major projects to foreign agencies, where we describe the context for how your project fits within the CINP Long Range Plan *"The 2022–2036 Horizon for Nuclear Physics in Canada: From the Core of Matter to the Fuel of Stars"* or the Canadian Subatomic Physics Long Range Plan 2022-26.

- The TRIUMF Director, Nigel Smith, has instituted a regular set of meetings between senior TRIUMF leadership and the Directors of CINP, IPP and McDonald Institute. This is a positive development, which has improved communication between TRIUMF and the institutes. So far, we have met twice, with the expectation of 3 meetings/year.

- Every year, the CINP Executive Director is asked to **suggest new members of the NSERC Subatomic Physics Evaluation Section (SAPES)**, to replace the specific expertise of outgoing members. The most recent suggestions were sent to NSERC on May 26, 2022. Your suggestions for next year's committee can be either international or domestic, from any subatomic physics sub-discipline, keeping in mind the Tri-Council conflict of interest guidelines, which stipulate that committee members cannot be applicants in that competition.

6. CINP posting of Job Opportunities

We regularly post Nuclear Physics Job Opportunities on the CINP website, at:
https://cinp.ca/announcements

- Researchers looking for positions are encouraged to regularly consult this page.
- Please let the Executive Director know if you are recruiting for a position and want your announcement to be distributed.

7. Winter Nuclear and Particle Physics Conference (WNPPC 2023)

(submitted by Timothy Friesen, Calgary)

The Winter Nuclear and Particle Physics Conference is a national meeting for the Canadian subatomic physics community, with a special focus on providing a forum for junior researchers (students and postdocs) and interaction with groups across Canada.

WNPPC 2023 is being organized by the University of Calgary and TRIUMF. Topics at the conference include (but are not limited to):

- Dark Matter searches
- Electroweak and Higgs physics
- Neutrino properties
- QCD and hadrons
- Physics beyond the Standard Model
- Nuclear structure
- Nuclear and particle astrophysics

The meeting runs from Thursday February 16th, until Sunday February 19th, 2023. Participants should arrive Wednesday evening, February 15th or Thursday afternoon, February 16th-- there will be a Thursday evening session, followed by a Reception. The conference will conclude Sunday at 12 pm.

For more details, please consult the conference web site **https://wnppc.triumf.ca/2023/** and stay tuned for more updates.

Important Dates:

Registration opens:	Nov 30, 2022
Abstract submission deadline:	Dec 15, 2022
Early registration deadline*:	Dec 15, 2022
Registration closes:	Jan 6, 2023
Banff Centre hotel booking deadline:	Jan 19, 2023

* Early registration is **FREE** for students

8. 2023 WNPPC Graduate Student Travel Awards

The Canadian Institute of Nuclear Physics (CINP) is making available up to eight graduate student travel awards to the 2023 WNPPC. Each award will be for up to $650 towards student travel expenses. Students must be enrolled in graduate studies at a Canadian university and performing research in experimental or theoretical nuclear physics. The application deadline is Friday, January 6. For more information and application forms, please visit:

https://cinp.ca/wnppc-graduate-student-travel-awards

9. GRIDS 2023
(submitted by Marcello Pavan, TRIUMF)

The Graduate Instrumentation and Detector School (GRIDS) is currently planned to happen June 5-16 at TRIUMF. GRIDS is a summer school that was started in 2018 for graduate students and new post-docs in nuclear, particle, and astroparticle physics to get hands-on training with the detector and instrumentation technology used in modern experiments. It is aimed primarily for those students and post-docs with limited experience with experimental hardware.

The school will offer a diversified program, combining plenary lectures on a variety of topics from leading experts with hands-on laboratory experience with typical detector and instrumentation technologies.

Participants will develop a basic understanding of the interactions of particles with matter that are relevant to radiation detecting and of the physical mechanisms for collecting energy deposited by radiation.

Participants will also develop lab skills to operate commonly-used equipment for radiation detection in a safe and effective manner.

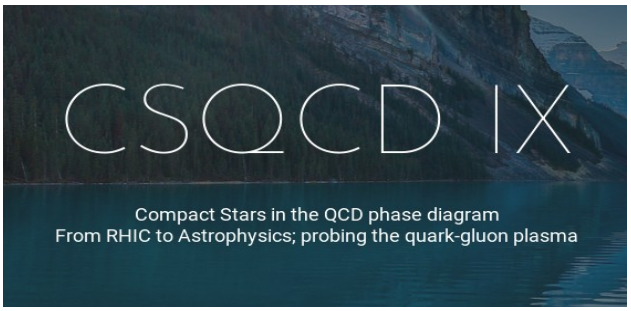
The school is open to National and International graduate students, and new post-docs. Acceptance to the school is limited.

More information on the school will become available in late 2022.

10. TSI2024

The TRIUMF Summer Institute (TSI) in 2024 is projected to occur in August 2024 on the topic of nuclear physics. The plan is to hold it immediately preceding the Nucleus-Nucleus Collisions Conference (NN2024) **https://nn2024.triumf.ca**.

More information will be shared once it becomes available.



11. Highlights of CSQCD IX, held at the Banff Centre, July 31 to Aug. 6, 2022
https://quarknova.ca/CSQCDIX/
(submitted by Rachid Ouyed, Calgary)

CSQCD IX is only the second CINP-sponsored conference to be held in-person since the COVID pandemic. The Banff meeting was focussed on recent explorations of the quark-gluon phase using colliders (e.g. RHIC and LHC) and on the renewed interest on neutron and quark matter in astrophysics, particularly in the gravitational wave era. There were total of 33 talks with 30% of them given by women. All of the session chairs (except for one) were women. There were also posters presentations and 5-minute poster talks session. In the spirit of the CSQCD meetings, the talks at CSQCD IX will be published as proceedings (this time in the journal of Physics conference series; IOP publishing) and will be made available via the CSQCD main site where past meetings and proceedings can be found: **https://www.quarknova.ca/CSQCD.html**

During the week, the participants enjoyed daily short organized hikes near the Banff Centre, an organized dinner in downtown Banff, an excursion up the Gondola to the top of Sulphur Mountain and a bus excursion took participants to Lake Louise to see the famous Chateau and Lake in its spectacular mountain setting. The conference banquet was held at the Banff Centre on Wednesday evening with an awards presentation for the best student talks, certificates for the student posters and certificate of appreciation for the students involved in the organizations.

The highlights of the science sessions on Monday were invited talks by Jochen Wambach on Nuclear Matter at high baryon density, by Tetyana Galatyuk on Probing neutron-star matter in the laboratory, by Jamie Karthein on Fluctuations of Conserved Charges and QCD Phase Structure, and by Roy Lacey on Characterization of the critical endpoint in the nuclear matter phase diagram.

For Tuesday, the invited talks were by Fridolin Weber on The Phases and the Equation of State (in memory of Stefan Schramm), by Vivian de la Incera on Topology's role in the feasibility of a neutron star's matter phase candidate, by Cristina Manuel on Chiral Transport Phenomena and Compact Stars and by Debora Mroczek on Finding hyperons and quarks in neutrons stars using Gaussian processes.

Science session highlights for Wednesday were the invited talks by James Lattimer on Constraints on the Nuclear Symmetry Energy from Experiments, Theory and Observations and Implications for Hybrid Stars and by Efrain J Ferrer on Axion Polaritons in Magnetized Dense Quark Matter: A possible solution for the Missing Pulsar Problem.

Thursday morning focused on results from TRIUMF with invited talks by Jason Holt on Ab initio theory for heavy nuclei and physics beyond the standard model, by David McKeen on Using neutron stars to learn about the universe, and by Nicole Vassh on Neutron star merger nucleosynthesis. Thursday afternoon switched topics to Gravitational Waves and QCD with highlights in the invited talks by German Lugones on Stellar stability in the presence of reacting interfaces: consequences for hybrid stars, and by Dabora Menezes on Gravitational waves as a tool to probe hybrid stars and QCD phase transitions.

The last day of the meeting was highlighted by the invited talks by Mark Alford on Neutron star mergers as materials science, by Cecilia Chirenti on Imprints of the neutron star equation of state on the gravitational wave signal, and by the final talk of the conference by Cole Miller on NICER implications for neutron stars.

The participants expressed their appreciation for all aspects of the conference (scientific content and presentation quality, the various excursions, the location of the conference and the hospitality of the Banff Centre) at the Banquet on Wednesday evening. We, the organizers of the CSQCD IX, take this opportunity to thank all of the sponsors: UofCalgary, CITA, CINP, PI, CASCA, IPP, as well as private donations.

12. CINP Conference Support

The CINP extends partial funding to workshops, meetings and conferences of broad relevance to nuclear physics in Canada. Requests are appraised against the mission and goals of the CINP, and funding is contingent upon satisfactorily showing that the event will further the aims of the CINP and be of benefit to its members. Application forms for external conference support are available from **https://cinp.ca/conference-support**

13. Junior Scientist Travel Support Program (JSci)

The goal of the JSci program is to allow graduate students and PDFs to broaden their research horizons and become more mature scientists. Two types of expenditures are supported:

1) Funding to allow graduate students and PDFs to attend specialized workshops and schools not directly related to their research project, such as workshops or training opportunities on the practical applications of subatomic physics detector techniques, new computer or digitization technologies, advanced computation techniques, or technology transfer training.

2) Funding to enable PDFs to present their work at conferences or workshops. Conferences and workshops already receiving funds from CINP will not be eligible. Preference will be given to international meetings held either in Canada or abroad.

How to Apply:

The application form can be obtained from the CINP website at: **https://cinp.ca/junior-scientist-travel-support-program-jsci**

Applications are accepted on a continuing basis. A standing committee consisting of: CINP Executive Director, Chair of the Education & Training SWG, and one representative of the CINP Board will evaluate applications as they are submitted and provide prompt feedback or decision to the applicant (typically within 2 weeks).

The total program funds available for 2022-23 are $7000. We are very pleased that people have been making use of the J.Sci. program now that in-person activities are resuming slowly after COVID. So far this year, we have approved four applications to this program.

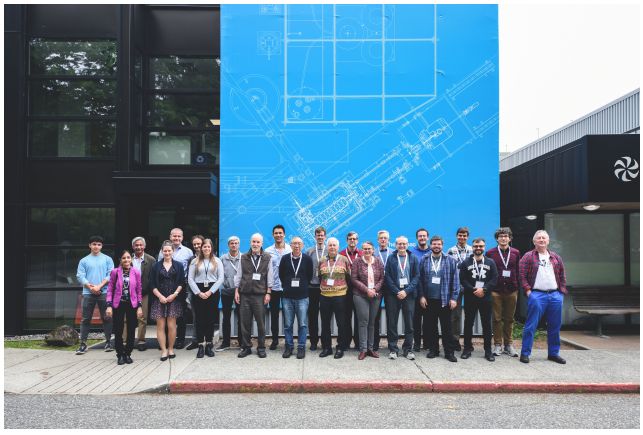
14. New Scientific Opportunities at the TRIUMF ARIEL e-Linac

The workshop "New Scientific Opportunities at the TRIUMF ARIEL e-Linac" took place at TRIUMF, in Vancouver, Canada, May 25-27, 2022

(submitted by Jeff Martin, Winnipeg and Ross Corliss, Stony Brook)

The workshop was a hybrid of in-person and online attendance via Zoom, gathering together theorists and experimentalists with shared interests in MeV-scale physics at the intensity frontier, in order to stimulate ideas and collaboration for novel applications of new, high-intensity, modest-energy accelerators like the ARIEL e-Linac.

While the LHC and its large detector collaborations continue to seek BSM physics at the energy frontier, and increasingly large subterranean detectors probe neutrino and dark matter signals with greater and greater sensitivities, the increasing scale of these experiments represents a substantial undertaking, in terms of cost and timeline. These have yielded important results, confirming the existence of the Higgs and furthering our understanding of neutrino dynamics, but they have not yet provided a clear view of what lies beyond the Standard Model. The prevailing expectations of the previous decades—minimal supersymmetry, WIMP-based dark matter—have not yet been observed.



A complementary experimental thrust in the quest for new physics is to probe lower energy scales at the intensity and precision frontiers. Such experiments can be mounted more nimbly, and in parallel, to focus

on different reported anomalies as lampposts, to improve precision in places where new physics may lurk, and to test new classes of BSM physics that may arise at those energies. With no definitive guidance on the form an underlying theory must take, this is an increasingly appealing approach to the search. Modern accelerator designs can provide higher and higher beam currents, achieving high luminosities without the need for thick targets, unlocking new experimental avenues. Energy Recovery Linacs (ERLs) at the sub-GeV scale are a particularly exciting emerging platform, with a series of machines at various levels of development, including the planned upgrade for ARIEL, the MESA accelerator complex currently under construction, and the planned PERLE facility.

The presentations showcased the experimental avenues now being explored, or which could be undertaken at ARIEL and similar-scale accelerators, as well as theoretical studies in these regimes, and the status of accelerators that will enable these and future experiments that aim to address current anomalies and outstanding questions in particle and nuclear physics.

The workshop was funded by the Gordon and Betty Moore Foundation, to which the organizing committee give their sincere thanks. Proceedings are being published in the IOP Journal of Physics Conference Series. Many presentations are also available from the workshop website **https://meetings.triumf.ca/event/262/**.

The organizing committee:
Jan Bernauer (CFNS, Stony Brook University and RIKEN BNL Research Center)
Ross Corliss (CFNS, Stony Brook University)
Michael Hasinoff (University of British Columbia)
Rituparna Kanungo (Saint Mary's University)
Jeffery Martin (University of Winnipeg)
Richard Milner (Massachusetts Institute of Technology)
Katherine Pachal (TRIUMF)
Stanley Yen (TRIUMF)

15. CINP Board of Directors

The CINP Institutional Members had their annual meeting via Zoom on May 17. One of the agenda items was to elect two Board members, who are listed below. The Board office arrangements have seen a lot of changes this year, with the recruitment of new members.

Name	Institution	Role	Email	Term Ends
Thomas Brunner	McGill	Secretary	thomas.brunner @ mcgill.ca	June, 2025
Michael Gericke	Manitoba		mgericke @ physics.umanitoba.ca	June, 2023
Gwen Grinyer	Regina	President	gwen.grinyer @ uregina.ca	June, 2024
Rituparna Kanungo	Saint Mary's		ritu @ triumf.ca	June, 2025
Jeffery Martin	Winnipeg		j.martin @ uwinnipeg.ca	June, 2023
Chris Ruiz	TRIUMF	Vice-President	ruiz @ triumf.ca	June, 2024

16. CINP Contact Information

CINP Executive Director:

If you require information about any CINP programs, please do not hesitate to contact:

Garth Huber, Ph.D.
CINP Executive Director
c/o University of Regina
306-585-4240
huberg@cinp.ca

CINP Treasurer:

Greg Hackman
TRIUMF
treasurer@cinp.ca

CINP Institutional Members:

Memorial University of Newfoundland
Saint Mary's University
Mt. Allison University
McGill University
University of Guelph
University of Manitoba
University of Winnipeg
University of Regina
University of Northern British Columbia
Simon Fraser University
TRIUMF

Scientific Working Group Chairs:

Fundamental Symmetries:
Gerald Gwinner (Manitoba)
Hadronic Physics/QCD:
Svetlana Barkanova (Memorial)
Nuclear Astrophysics: Iris Dillmann (TRIUMF)
Nuclear Education and Training:
Juliette Mammei (Manitoba)
Nuclear Structure: Adam Garnsworthy (TRIUMF)
Nuclear Theory: Alexandros Gezerlis (Guelph)

This Newsletter was edited by Garth Huber. Email regarding the content of this newsletter, or suggestions for content in future CINP newsletters should be sent to huberg@cinp.ca