

Canadian Institute of Nuclear Physics Institut canadien de physique nucléaire

Newsletter #15, November 2019

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. CINP Board of Directors (2019-20)

The CINP Institutional Members had their annual meeting via teleconference on May 10, 2019. One of the agenda items was to elect two new Board members. There were no changes in Board membership, as both Sangyong Jeon and Rituparna Kanungo were re-elected to new 3 year terms.

The Board is listed below, along with their assigned responsibilities.

Name	Institution	Role	E-mail	Term Ends
Michael Gericke	University of Manitoba		mgericke @ physics.umanitoba.ca	June, 2020
Gwen Grinyer	University of Regina		gwen.grinyer @ uregina.ca	June, 2021
Sangyong Jeon	McGill University	Secretary	jeon @ physics.mcgill.ca	June, 2022
Rituparna Kanungo	Saint Mary's University	President	ritu @ triumph.ca	June, 2022
Jeffery Martin	University of Winnipeg	Vice-President	j.martin @ uwinnipeg.ca	June, 2020
Chris Ruiz	TRIUMF		ruiz @ triumph.ca	June, 2021

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

TRIUMF is offering specialized graduate-level courses to students at TRIUMF's member universities, when such courses are not available at their home institution.

UBC Physics 560/UVic Physics 522 (Physics and Engineering of Particle Physics)

Offered in the winter 2020 semester to any student in Canada eligible to take grad courses for credit. Lectures can be taken through a video-conference link using a modern lecture conferencing system. Interested students are asked to contact Prof. Tobias Junginger ungingejr@uvic.ca at UVic or Dr. Oliver Kester okester@triumf.ca at TRIUMF for more course details, including how to register.

Looking ahead to 2020-21 Academic Year:

1. UBC Physics 505 (Introductory Nuclear Physics)

It is anticipated to be taught in the fall 2020 semester, but may move to winter 2021 semester.

2. UBC Physics 528 (Elementary Particle Physics)

Might be offered in winter 2021 semester. Prerequisites: Quantum field theory and Introductory Particle Physics.

For more information on any of these courses, please contact the TRIUMF Academic Committee at trac@triumf.ca

Winter Nuclear & Particle Physics Conference



WNPPC 2020



3. Winter Nuclear and Particle Physics Conference (WNPPC 2020)

(submitted by B Jamieson, Winnipeg)

The 57th annual Winter Nuclear and Particle Physics Conference (WNPPC) will take place from February 13 – 16, 2020 in Banff, Alberta. The WNPPC provides a special forum for junior researchers (students, postdocs) and is a stimulating and engaging environment for everyone interested in subatomic physics research in Canada.

We have lined up an excellent set of introductory talks in particle and nuclear physics. This year's invited speakers are:

- Nikolina Ilic — ATLAS and DUNE experiments
- Matthew Williams — Studies of Astrophysical Reactions at ISAC
- Miram Diamond — Dark Matter Direct Detection Searches
- Claire David — Higgs
- Patrick de Perio — Hyper Kamiokande experiment
- Daniel Siegel — Multi messenger astrophysics

Important dates:

December 13, 2019 – early registration deadline (free for students!) Registration is now open.

January 10, 2020 – abstract submission deadline

Additional information can be found on the conference website:

<http://wnppc.triumf.ca/2020/>

4. 2020 WNPPC Graduate Student Travel Awards

The Canadian Institute of Nuclear Physics (CINP) is making available up to seven graduate student travel awards to the 2020 WNPPC. Each award will be for up to \$600 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 Monday, January 13.** For more information and application forms, please visit:

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

5. NSERC Support for CINP

The CINP gratefully acknowledges support from NSERC in the form of a Subatomic Physics Major Resources Support (SAP-MRS) grant. This grant supports the CINP's external conference support program, the undergraduate research scholarship program, expenses for the Long Range Plan, and other initiatives. The CINP MRS grant was renewed for 5 years in the 2015 competition, and the installment for 2019-20 is \$48,000.

The CINP MRS grant is up for renewal in the coming competition, and an application supporting increased activities was recently submitted. More details will follow once the decision of SAPES on the award is known.



6. Representation and Input to External Agencies

The CINF is an advocate and representative of the Canadian nuclear physics community and is asked to attend various meetings or make presentations on its behalf.

- We have been approached by NSERC to begin planning the activities for the next Canadian Subatomic Physics Long Range Plan, covering the period 2022-26, but also a look ahead to 2036. Compared to previous plans, the two community-driven institutes, CINF and IPP, have been asked to play a larger role in the process. Together, we have been assisting with crafting the terms of reference for the Long Range Planning Committee (LRPC), and nominating potential members. Like last time, the CINF and IPP are also expected to prepare briefs that will be submitted to the LRPC by the fall of 2020. The LRPC would then lead the consultation of the community up to the summer of 2021, with the intent being to submit its report by fall 2021.

You should anticipate a call to provide your input to CINF this spring, with a likely CINF Town Hall meeting at the 2020 CAP Congress

- On May 22, the CINF and IPP Executive Directors jointly wrote a letter to Danika Goosney, NSERC Vice-President of Research Grants & Scholarships regarding the allocation of funding increases arising from the 2018 federal budget. The letter asked for greater clarity on how the funding allocations are decided, and raised several issues relating to funding of the Subatomic Physics Envelope. We received a written reply from her on September 3, where she acknowledged the “*need for increased transparency on how NSERC is allocating newly secured funds.*” Copies of these letters are available upon request to CINF members.
- The CINF and IPP presented the joint document on *The Context and Environment of Canadian Subatomic Physics Research at Canadian Universities* to the Subatomic Physics Evaluation Section (SAPES) at their November 21 fall orientation meeting. This document is needed because many SAPES members are not very familiar with the Canadian research funding process and the

research environment at Canadian universities. The document was last updated in 2017, and is planned to be updated again next year. The document can be downloaded from: <http://cinp.ca/node/219>

- Every spring, the CINF Executive Director is asked to suggest new members of the NSERC Subatomic Physics Evaluation Section (SAPES), to replace the specific expertise of outgoing members. **Please let us know if you have any suggestions for the 2020-21 committee.** Your suggestions can be either international or domestic, from any subatomic physics sub-discipline. When making suggestions, please keep in mind the Tri-Council conflict of interest guidelines, which stipulate that committee members cannot be applicants in that competition.
- The CINF will make a short presentation to SAPES on *The Breadth of Canadian Nuclear Physics Research and Important Current and Future Priorities* at Large Projects Day, scheduled for Sunday, March 1, 2020 in Ottawa. **Please send information on your significant 2019-20 research highlights, new research capabilities, or honors received by February 20,** so we may prepare the presentation from your submissions and relevant information from the 2017-21 Subatomic Physics Long Range Plan.
- The Advisory Committee on TRIUMF (ACOT) is a panel of international experts that meets and reports to the NRC twice a year. Garth Huber represents the CINF as a “community observer”. The committee generally finds our input to be quite valuable, providing a Canadian perspective on TRIUMF’s planning and operations. **Please let us know if you have specific information that would be useful to CINF’s input.** The next ACOT meeting is expected in April 2020.
- **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.**

7. Junior Scientist Travel Support Program (JSci)

The goal of the JSci program is to allow graduate students and PDFs to broaden their research horizon 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, and hence not normally funded from their supervisor's NSERC grant. Examples include workshops or training opportunities on the practical applications of subatomic physics detector techniques (e.g. muon tomography in archaeology, medical imaging, etc.), new computer or digitization technologies, advanced computation techniques, or technology transfer training (e.g. patent law, venture capital, etc.).

2) Funding to enable PDFs to present their work at conferences or workshops, so they may receive external recognition for their work, improve their communication skills, and better position them for successful careers in subatomic physics. 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:

<http://www.cinp.ca/node/565>

The logo for the Junior Scientist Travel Support Program (JSci) features the letters 'JSci' in a stylized font. The 'J' is green, and 'Sci' is blue.

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 2019-20 is \$10000.



8. Graduate Instrumentation and Detector School (GRIDS)

(submitted by Mark Richardson, Queen's and Marcello Pavan, TRIUMF)

The Graduate Instrumentation and Detector School (GRIDS) is a fantastic summer school opportunity for graduate students and new post-docs in nuclear, particle, and astroparticle physics. This school includes a comprehensive introduction to the range of detector technologies that exist in modern experiments. This is achieved through hands-on experiment projects combined with lectures delivered by world-class scientists. This summer school is aimed primarily for those students and post-docs with limited experience with experimental hardware, or who may have experience in only one detector technology.

GRIDS 2020 will be at the Université de Montréal for two weeks, from May 25 - June 5, 2020. Each week will include one day of lectures, and four days of detector experiments and analysis, with facilitators from across Canada. Please see our website for more information <http://grids.triumf.ca>. If you have any questions, please contact us at grids@triumf.ca.

Note, the application period has not yet opened, but more information will be posted soon.



9. CINP Conference Support

The CINP extends partial funding to workshops, meetings and conferences of broad relevance to nuclear physics in Canada.

Some recently funded events include:

- 13th International Conference on Stopping and Manipulation of Ions and related topics (SMI-2019), held last July in Montréal.
- Theory Canada 2019 Workshop (specific nuclear physics support), held last June in Vancouver.
- Student prize funds for the John d’Auria Symposium during the CAP Congress at SFU.
- Student prize funds for the upcoming 2020 WNPPC.

We are now taking support applications for conferences/workshops to be held in 2020 and 2021. Application forms are available from <http://cinp.ca/node/22>

Once it is confirmed that the necessary information has been received, the Chairs of the Scientific Working Group most closely related to the conference topic will be consulted, and a recommendation forwarded to the CINP Board for final approval. 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 its members.



Thomas Brunner and Antoine Belley, 2019 CINP Undergraduate Research Scholarship recipient, at the CINP Table during the CUPC Grad Fair

10. Undergraduate Student Conference Support

The CINP awarded four \$600 travel grants to support undergraduate students giving talks on nuclear physics related projects at the 2019 Canadian Undergraduate Physics Conference (CUPC) held at McGill University in Montreal, QC, on November 7-10, 2019. The applications were evaluated by: Gwen Grinyer (Board member—Regina), Juliette Mammei (NuclEducation SWG Chair—Manitoba) and Garth Huber (ExecDir—Regina).

Student	Supervisor	CUPC Talk Title
James Giroux (Regina)	Zisis Papandreou (Regina)	Machine-Learning Algorithms for Particle-Pattern Classification
Sebastien Roy-Garand (Saint Mary's)	Rituparna Kanungo (Saint Mary's)	Search for 0^+ excited states in neutron-rich Krypton isotopes
Rebecca Tobin (Dalhousie)	Adam Sarty (Saint Mary's)	Nucleon polarizabilities via Compton scattering at MAMI-A2
Mario Tovar (McMaster)	Makoto Fujiwara (TRIUMF)	Signal Estimate for an Axial Signal Detector in ALPHA-g

All students were asked to acknowledge the financial support by the CINP in their presentation.

11. CINP Table at CUPC Grad Fair

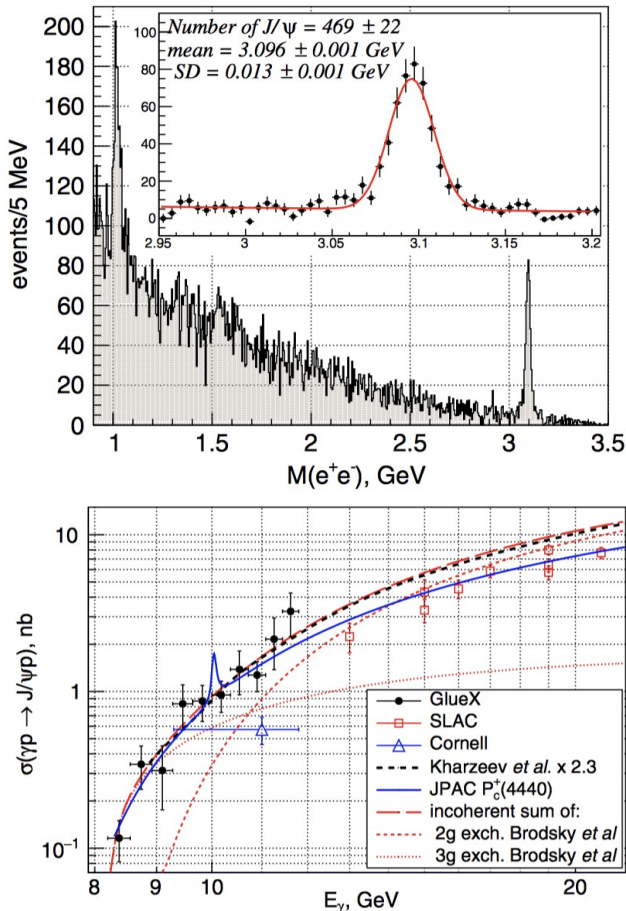
In addition to the student travel grants to the CUPC described above, the CINP has been a bronze or silver level sponsor (depending on cost) of the CUPC for many years. This year’s silver level sponsorship allowed the CINP to have a table at the Grad Fair, and we want to give Thomas Brunner (McGill) a very large thanks for staffing the table for us. The table was used to promote the research opportunities in nuclear physics across Canada. Members of the Nuclear Education Working Group were asked to send brochures, and we thank those that did so. Thomas also had an information sign-up sheet that has since been distributed.

Following our Nov 8 request for announcements, research milestones, etc. for the newsletter, Zisis Papandreou and Paul Garrett offered these research highlights. Reports from other CINP members are always welcome.

12. GlueX @ JLab Research Highlight (submitted by Zisis Papandreou, Regina)

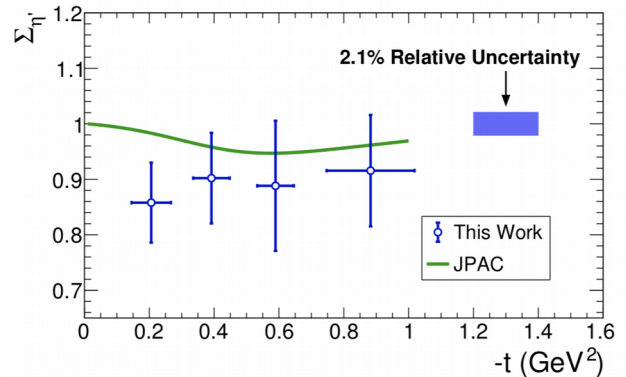
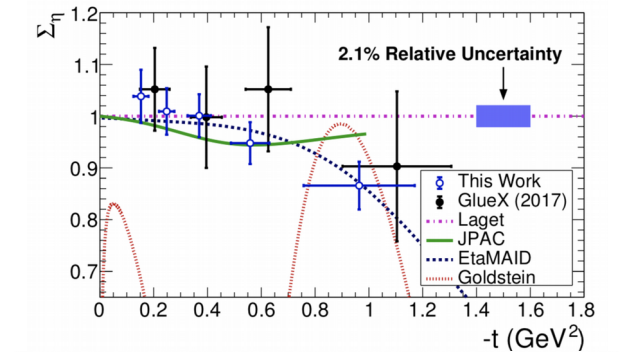
Following an extensive data taking and calibration effort, the GlueX Experiment published two papers this year, the first on J/ψ production and the second on the beam polarization asymmetry of the η and η' mesons.

1) The $\gamma+p \rightarrow J/\psi+p$ cross section at $E_\gamma=8.2-11.8$ GeV was extracted using a tagged photon beam in the GlueX Experiment and shown to fall towards the reaction threshold energy faster than expected from two-gluon exchange models. To this end, the exclusive reaction $\gamma+p \rightarrow e^+e^-+p$ was analyzed in the region of the e^+e^- invariant mass > 0.90 GeV, which includes the narrow ϕ and J/ψ peaks, and the continuum dominated by the Bethe-Heitler process. The LHCb pentaquark candidates



$P_c^+(4312,4440,4457)$ can be produced via the s -channel mechanism in this reaction. No evidence for these pentaquarks was seen, and GlueX set model-dependent upper limits on their branching fractions, based on a clean sample of 470 J/ψ events, from an initial data set, as seen in Fig.1. This sample has now grown close to 2000 events, based on the full 2016-17-18 data sets. The J/ψ cross section as a function of beam energy is shown in Fig.2, together with data from the literature and theoretical predictions. The collaboration is now looking at $\gamma+p \rightarrow \mu^+\mu^-+p$ events.

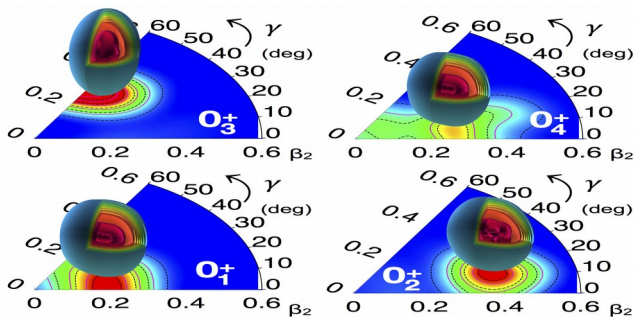
2) The beam asymmetry Σ for the photo-production of η and η' mesons via the reactions $\gamma+p \rightarrow \eta+p$ and $\gamma+p \rightarrow \eta'+p$, using an 8.2-8.8 GeV linearly polarized tagged photon beam incident on a liquid hydrogen target was just published in Physical Review C. The results were compared to theoretical predictions based on t -channel quasi-particle exchange. The ratio $\Sigma_{\eta'}/\Sigma_\eta$ was also compared to these models, as this ratio is predicted to be sensitive to the amount of ss -bar exchange in the production. It was found that photo-production of both η and η' are dominated by natural parity exchange with little dependence on t . These results, shown in Figs.3 and 4, have significantly higher statistical precision than earlier (2017) GlueX measurements, and are the first ever measurements of $\Sigma_{\eta'}$ in this energy range.



13. ISAC Research Highlights (submitted by Paul Garrett, Guelph)

We have had two major successes this year in our research, the first in our long-standing program of studying the origin and behavior of collectivity in nuclei, and the second with the first successful coupling the full DESCANT array with the GRIFFIN spectrometer at ISAC:

1) For more than two decades, we have led a program of study of collective states in nuclei, a major cornerstone of which has been the detailed examination of the Cd isotopes. The stable, mid-shell Cd isotopes have been used as textbook examples of nuclei that were thought to possess vibrations about an approximately spherical shape. Combining very detailed spectroscopy performed at TRIUMF-ISAC with the 8π spectrometer, and lifetimes using the inelastic neutron scattering reaction at the University of Kentucky, we found evidence for rotational-like bands built on excited 0^+ states in ^{110}Cd and ^{112}Cd . These results were interpreted within the framework of state-of-the-art beyond mean field calculations, and suggest that each 0^+ state possesses a different underlying shape.



This was published in Physical Review Letters and was selected as an Editors' Suggestion, in the Oct. 4th issue, that also stuck a chord with the science writers. It has been featured by AIP:

Synopsis: Nuclear Spectroscopy Reveals New Shapes of Excited Nuclei

<https://physics.aps.org/synopsis-for/10.1103/PhysRevLett.123.142502>

and also by Nature Research:

Squashed nuclei undermine long-held doctrine of nuclear structure

<https://www.nature.com/articles/d41586-019-03006-4>

in Nature Physics:

Of all shapes

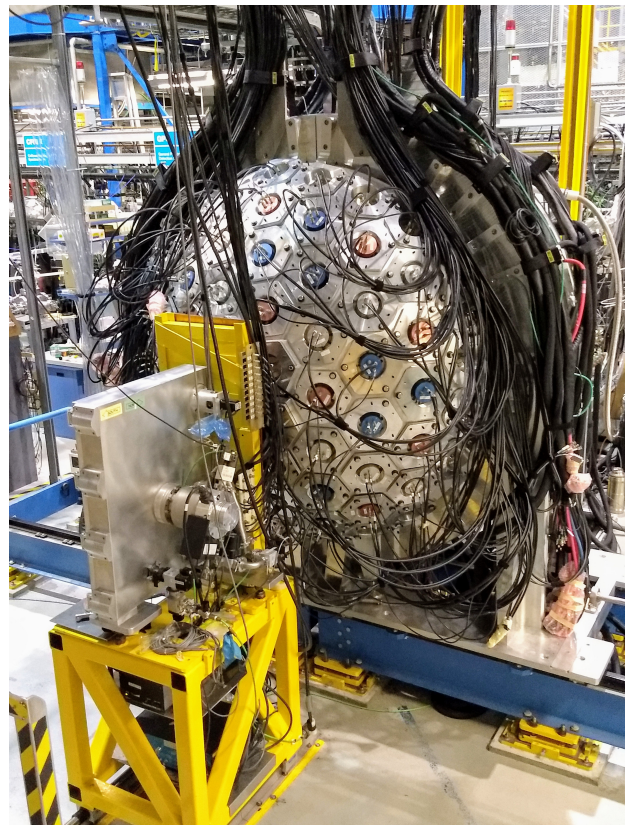
<https://www.nature.com/articles/s41567-019-0719-x>

and even in the Frankfurter Allgemeine Zeitung:

Atomkerne aus der Form geraten

<https://www.faz.net/aktuell/wissen/physik-mehr/stabile-atomkerne-muessen-nicht-immer-kugelrund-sein-16433373.html>

2) A major milestone was achieved in an experiment at TRIUMF-ISAC to study the beta-decays of $^{51,52,53,54}\text{K}$ in Nov. 2019. In its first non-commissioning experiment, the full DESCANT array, which is designed to detect fast neutrons, was coupled with the GRIFFIN gamma-ray spectrometer. DESCANT employs a liquid scintillator based on deuterated benzene, and has the ability to distinguish neutron and gamma-ray events. In the experiment, the beta-decays that resulted in a subsequent emission of a neutron could be cleanly identified. The DESCANT and GRIFFIN combination provides a powerful new capability at TRIUMF-ISAC for such studies. The photo below shows DESCANT mounted on the GRIFFIN spectrometer.





14. CINF Sessions at the CAP 2020 Congress

As is now customary, the CINF and IPP are hosting a joint session at the CAP Congress at McMaster University in Hamilton, ON. The CINF sessions are planned near the end of the Congress, following the Vogt Medal talk. This year, we are tentatively planning a full-day CINF Town Hall meeting at the end of the Congress, to gather input for the 2022-26 Subatomic Physics Long Range Plan.

Please plan your travel accordingly.

Time	Event (tentative schedule)
Thursday, June 11, 2020	
7:30	CINF Breakfast Board Meeting (by invitation only)
9:15	CAP-TRIUMF Vogt Medal talk
9:45	CAP-CRM Prize talk
10:15	Health Break
10:45	CINF+IPP Joint Session
Friday, June 12, 2020	
9:00	CINF Town Hall Meeting (with lunch)

15. CINF Contact Information

CINF Executive Director:

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

Garth Huber, Ph.D.
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c/o University of Regina
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CINF Treasurer:

Iris Dillmann
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CINF Institutional Members:

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Mt. Allison University
McGill University
University of Guelph
University of Manitoba
University of Winnipeg
University of Regina
University of Northern British Columbia
TRIUMF

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Adam Garnsworthy (TRIUMF)

Nuclear Astrophysics:

Iris Dillmann (TRIUMF)

Fundamental Symmetries:

Gerald Gwinner (Manitoba)

Hadronic Physics/QCD:

Svetlana Barkanova (Memorial)

Nuclear Education and Training:

Juliette Mammei (Manitoba)

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