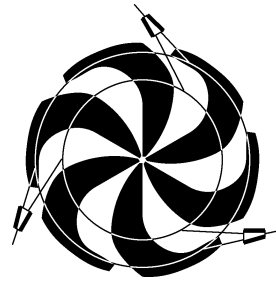


TRIUMF



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**CANADA'S NATIONAL LABORATORY
FOR PARTICLE AND NUCLEAR PHYSICS**

OPERATED AS A JOINT VENTURE

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UNDER A CONTRIBUTION FROM THE
NATIONAL RESEARCH COUNCIL OF CANADA

DECEMBER 2003

The contributions on individual experiments in this report are outlines intended to demonstrate the extent of scientific activity at TRIUMF during the past year. The outlines are not publications and often contain preliminary results not intended, or not yet ready, for publication. Material from these reports should not be reproduced or quoted without permission from the authors.

CONFERENCES, WORKSHOPS AND MEETINGS

JOINT BELLE-BABAR WORKSHOP ON DETECTOR ISSUES

The Joint Belle-BaBar Workshop on Detector Issues was held at TRIUMF February 14–16. Belle, located at KEK in Japan, and BaBar, located at the Stanford Linear Accelerator Center in California, are similar experiments with the common physics goal of studying CP violation and heavy-flavour physics.

This meeting – the first joint meeting of the two collaborations – allowed the groups to compare experiences with detector operations and plans for future upgrades. There were 10 participants from Belle and 19 from BaBar.

The program included plenary presentations from each collaboration on the major detector subsystems: tracking, calorimetry, particle identification, vertexing, trigger, data acquisition, and computing. Detailed discussions were held in parallel sessions on several of these topics. Informal discussion – one of the most rewarding aspects of the meeting – continued at a reception and banquet.

Detailed information about the meeting, including copies of all presentations, is available at <http://www.triumf.ca/people/desilva/index.html>.

2002 LAKE LOUISE WINTER INSTITUTE: FUNDAMENTAL INTERACTIONS

The 17th Lake Louise Winter Institute (February 17–23) was devoted to a variety of topics of current interest. The invited speakers did a wonderful job of presenting pedagogical lectures that brought the present status of development of each area of interest. The audience consisted of 70 participants with 35 of them being students. The rest were faculty members and post-doctoral fellows from many countries of Europe and Asia in addition to North America. The Winter Institute had the following main lecturers:

- E.G. Adelberger, *Ultraweak Forces*
- S. Bhadra, *QCD in Lepton Hadron Collisions*
- A. Manohar, *Heavy Quark Physics*
- R.D. Pisarski, *QCD and Heavy Ion Physics*
- M.H. Shaevitz, *Neutrino Physics*

The pedagogical lectures were complemented by 48 contributed talks that brought the latest information on experimental and theoretical developments. All the major experiments had sent representatives to present the latest data and new results. The presence of participants from different experiments and countries brings to reality that physics is really universal and the Lake Louise Winter Institute, with the outstanding facilities of the Chateau Lake Louise, is glad to provide a forum

for these presentations and in-depth discussions. The invited lectures and the contributed talks will appear as proceedings to be published by World Scientific. The format for the Winter Institute was to have lectures in the morning and evening and the afternoons were left free for the participants to enjoy the scenery and the excellent skiing offered by the location. The participants fully utilized the facilities and in the process made new friends and perhaps future collaborations.

The Winter Institute was made possible by financial assistance from TRIUMF, the Institute of Particle Physics, the University of Alberta conference fund and the Dean, Faculty of Science, University of Alberta. The infrastructure support of the Physics Department, University of Alberta is invaluable in making this event possible, for which the organizers are grateful. Finally, thanks go to Lee Grimard, Secretary, who did a great deal of the organizational work to make the Winter Institute a success.

Organizing Committee: Faqir Khanna, Bruce Campbell, Manuella Vincter and Alan Astbury.

WORKSHOP ON LOW ENERGY PRECISION ELECTROWEAK MEASUREMENTS

Considerable interest has developed in low-energy precision electroweak observables, stimulated by a number of recent measurements which have searched for a deviation from standard model predictions, e.g., deep inelastic neutrino-nucleus scattering, $g-2$ of the muon, and cesium atomic parity violation. Together with the apparent deviation of the CKM matrix from unitarity, such results may provide new clues about physics which lies beyond the standard model, complementing what can be learnt from high energy collider studies and neutrino physics.

Against this backdrop, an array of new precision measurements – either under way or being planned – will provide additional insights about the shape of the “new” standard model. These measurements include: the neutron lifetime and beta-decay correlation coefficients; the pion beta-decay branching ratio; the weak charges of the electron and proton; “isotope ratios” in atomic parity violation; the Michel parameters in muon decay; and μ to e conversion in the nuclear domain.

The objectives of the workshop (held April 4–6) were to bring together a group of particle, nuclear, and atomic theorists and experimentalists to address two primary questions: 1) In what ways do precision low-energy measurements and high-energy collider studies (at the Tevatron, LHC, Tesla, etc.) provide complementary information about new physics? 2) What theoretical and experimental work should be undertaken

to ensure that low-energy measurements can be cleanly interpreted in terms of new physics?

To address these questions, the workshop included speakers representing both the low- and high-energy perspectives. Attendance (68 delegates) and participation in the workshop exceeded all expectations. Details of the program of the workshop and copies of the transparencies shown during the various discussions can be found on the Web site. The workshop concluded with a panel discussion with open participation, which resulted in the following specific recommendations:

(I) Establish a working group dealing with low-energy precision electroweak measurements. Michael J. Ramsey-Musolf and Jens Erler were charged with organizing this working group of experimentalists and theorists. The purpose of the working group is:

- to create a coherent and noticeable “voice” for this emerging subfield; many experimental efforts are ongoing worldwide at various different facilities. The working group is to provide cohesion to these efforts.
- to ensure proper representation of these efforts at major meetings by proposing invited talks, topical sessions, and so on.
- to organize its own workshops on a regular basis (with a frequency of once every two years).
- to establish a Web site with: 1) a listing of important measurements at an easily accessible site; 2) a file with the more important graphical depictions; 3) a listing of links to experiments; 4) a listing of links to relevant experimental and theoretical publications.
- to produce an annual progress report.
- to fulfill the role of advocacy for this emerging subfield where required.

(II) Strongly encourage an increase in the funding supporting the subdiscipline. It was noted that there are at present very few permanent theory positions for the subdiscipline. It is apparent that a preponderance of electroweak radiative corrections have to be calculated to realize the full impact of the precision electroweak measurements program.

In summary, the workshop placed great emphasis on performing precision electroweak measurements testing various aspects of the standard model, e.g., neutron beta-decay and the question of unitarity of the CKM matrix; nuclear beta-decay and extraneous interactions with right-handed gauge bosons; atomic parity violation, parity violating Moeller scattering, parity violating electron-proton scattering (and their intercomparison), as well as high energy collider efforts (the latter at Q^2 values beyond the Z^0 pole) and the search for a superweak force; $g-2$ of the muon and the

question of supersymmetry; the muon decay Michel parameters and right-handed gauge bosons; deep inelastic neutrino-nucleus scattering (is the anomaly a mere isospin effect?); improved precision measurements for various kaon decays. Clearly this is a multifaceted program of experiments and one can add to this several other experiments, like the searches for electric dipole moments, double beta-decay searches, and CP non-conservation, which were not discussed at the workshop. The complementarity of the lower energy experiments with very high energy experiments needs to be stressed. The experiments are extremely challenging and require great attention to detail. Theoretical predictions require sophistication in particular where it concerns radiative corrections. Almost all experiments have lurking hadronic effects at some level. There is a paucity of in-depth evaluations of hadronic structure effects.

Certainly the standard model is a restricted concept of an ultimate description of the physical world. There are indications of the physics beyond the standard model. The recent data on solar and atmospheric neutrinos give evidence of new physics. The quest for such physics is to be pursued vigorously. This requires that substantial resources and funding be made available. The emerging subdiscipline of low-energy precision electroweak measurements invokes great excitement and presents a great challenge! It is to be noted that in the latest Nuclear Science Advisory Committee Report the search for physics beyond the standard model is categorized by the nuclear physics community as one of four forefront research thrusts to be pursued in the immediate future.

The workshop was organized by: Roger Carlini, Jlab (carlini@jlab.org); John Ng, TRIUMF (mistry@triumf.ca); Michael J. Ramsey-Musolf, Caltech (mjrm@krl.caltech.edu), Willem T.H. van Oers, Manitoba (vanoers@physics.umanitoba.ca).

TITAN WORKSHOP

The ion trap workshop was held April 11–13 at TRIUMF. The organizing committee consisted of Pierre Bricault, Elly Driessen, and Jens Dilling. Funding for the workshop was provided by TRIUMF.

The Canadian Subatomic Physics Five Year Planning Committee had given, in its 2001 report, the recommendation “to establish a state-of-the-art Penning trap facility at TRIUMF ... to exploit the available high intensity beams of exotic nuclei at ISAC”.

Together with H.-Jürgen Kluge (GSI), who was at TRIUMF for a 6 month sabbatical, a concept for such a Penning trap system was developed. A Letter of Intent to the TRIUMF Experiments Evaluation Committee (EEC) for an ion trap facility at ISAC/TRIUMF was

received very positively at the meeting in December, 2001. The Committee “strongly encourages the development” of such a system.

The aim of the workshop was to present the new concept of the TITAN project (TRIUMF’s ion trap for atomic and nuclear science) and to further explore the research potential of the system for experiments in a broad range of science, e.g., nuclear, atomic, astro, and solid-state physics, and to discuss technical issues of this unique facility. The workshop also provided the opportunity to motivate a collaboration which will coordinate efforts towards funding requests, preparation of experiments and theoretical support.

Approximately 40 scientists and students from various universities and national laboratories in Canada, the United States, Europe and Asia participated in the meeting, which consisted of 27 talks including a TRIUMF special seminar. Lively question rounds followed the talks, and discussions in the breaks contributed to the successful and fruitful atmosphere at the workshop. The workshop was structured in two days of presentations, and on the third day an excursion to Whistler provided additional opportunities for plenty of “informal” discussion. Overall, the clear message was that a system such as TITAN would have tremendous potential and deserves strong support.

The program for the first two days was as follows, with time for discussions in between and a conclusion and discussion session at the end:

April 11:

- J.-M. Poutissou, TRIUMF, *Welcome*
- P. Schmor, TRIUMF, *ISAC overview*
- J. Dilling, TRIUMF, *TITAN overview*
- B. Moore, McGill U., *Cooling concepts in RFQs*
- D. Douglas, UBC, *Collisions, cooling, linear quadrupole ion guides and traps*
- V. Shapiro, *Idea of rotating RFQ traps and coolers*
- S. Schwarz, MSU, *Ion beam manipulation and transport in the LEBIT project*
- F. Buchinger, McGill U., *Collinear laser spectroscopy on pulsed exotic beams. What do we gain?*
- H.-J. Kluge, GSI, *Radioactive and highly-charged ions (HCIs) in traps: the European networks*
- G. Bollen, MSU, *Ion traps – precision measurements and more* (TRIUMF Seminar)
- J. Crawford, McGill U., *Laser spectroscopy in Paul traps*
- R. Thompson, U. Calgary, *Laser-induced fluorescence: more than just a spectroscopic tool*
- M. Wada, RIKEN, *On-line collection of energetic ^8Li ions by RF ion-guide*

- H. Schüssler, Texas A&M, *Mass measurements with parametric exc. and a linear trap*

April 12:

- R. Marrs, LLNL, *EBIT concept and design*
- J. Crespo López-Urrutia, MPI Heidelberg, *EBIT experiments at MPI HD*
- D. Fischer, MPI Heidelberg, *Experiments with extracted HCIs*
- E. Pinnington, U. Alberta, *M1 transition rates in HCIs*
- F. Ames, LMU Munich, *Accumulation, cooling and charge breeding for REXISOLDE*
- T. Beier, GSI, *QED investigations with HCIs*
- M. Pearson, TRIUMF, *HCIs for experiments with polarized atoms in gas*
- K. Blaum, CERN, *Accuracy limits on mass measurements with Penning traps / mass measurements of highly-charged ions in a Penning trap*
- G. Bollen, MSU, *The Penning trap system at MSU*
- S. Rainville, MIT, *Single ion mass spectrometry at 100 parts per trillion and beyond*
- K. Sharma, U. Manitoba, *Recent on-line results from CPT*
- J.M. Pearson, U. Montreal, *Hartree-Fock mass formulas and exotic nuclei*
- M. Wiescher, U. Notre Dame, *Masses for nuclear astrophysics*

ALPHA THERAPY WORKSHOP

In an attempt to identify research areas for the next 5 year plan for TRIUMF, a series of workshops were organized for the various user communities. One of these focused on the use of the ISAC facilities for the Life Sciences program. This workshop, held on April 29, explored the possibility of producing high specific activity alpha emitting radionuclides for radioisotope therapy (RIT).

There were 72 attendees with 22 from outside the Lower Mainland. The workshop was Webcast and viewed by interested parties from Europe and Australia as well as from eastern Canada and the US. Web viewers were provided the opportunity to email questions for live interaction with the speakers.

Six invited speakers plus two contributed talks covered topics from the very basic radiobiology of the interaction of radiation with living matter to the chemistry for the isolation and incorporation of radioactive species in biologically active molecules. A couple of presentations described ongoing clinical trials using ^{211}At and ^{213}Bi as therapeutic agents. The topics extended beyond alpha emitters to discuss the utility of beta emitters as well.

One presentation of particular relevance described the use of the ISOLDE facility at CERN for the production and isolation of alpha emitting radionuclides. This was followed by a presentation on the unique capabilities of ISAC.

Following the formal presentations there was a round table discussion on the future of radioisotope therapy and the role for facilities such as ISAC.

There are at least three separate camps:

- Fundamental studies on the interaction of radiation with matter (low dose and low dose rates radiation).
- Studies in animal models of human disease (dosing regimens).
- Human clinical trials using α -emitting radioisotopes coupled with the potential for full scale use in treating cancer (with commercial spin-offs).

One of the primary issues to be dealt with is matching biological clearance (half-life) with the useful physical half-life of the tracer. The known useful α -emitters have $t_{1/2}$ ranging from 46 minutes to 10 days.

The Director of TRIUMF pointed out that TRIUMF cannot meet the needs of the clinical trial demands. However, the participants felt that there is definitely potential for world class research in fundamental radiation biology and the use of α -therapy in animal models for which ISAC could play a major role.

14th INTERNATIONAL CONFERENCE ON ELECTROMAGNETIC ISOTOPE SEPARATORS AND TECHNIQUES RELATED TO THEIR APPLICATIONS

The 14th meeting of the International Conference on Electromagnetic Separators and Techniques Related to their Applications (EMIS-14) was held in Victoria, BC, from May 6–10. The conference also included a special visit (on May 11) for conference participants to the new TRIUMF-ISAC facility. There were 159 delegates (see Fig. 258).

This conference is part of a series of such international meetings on the use of electromagnetic isotope separators for scientific purposes. The previous conferences were held at Harwell (1955), Amsterdam (1957), Vienna (1960), Orsay (1962), Aarhus (1965), Asilomar (1967), Marburg (1970), Skövde (1973), Kiryat Anavim (1976), Zinal (1980), Los Alamos (1986), Sendai (1991), and Bad Dürkheim (1996).

The goal of this series of conferences is to bring together the scientific, technical and professional experts involved with the design, building and use of electromagnetic isotope separators from around the world. In the past this has concentrated mainly on ISOL (isotope separation on-line) systems. The exciting new aspect of the Victoria conference was the growing focus on radioactive beam facilities, both ISOL and projectile fragmentation based systems, in operation and the challenges that exist in the building of the next generation facilities.

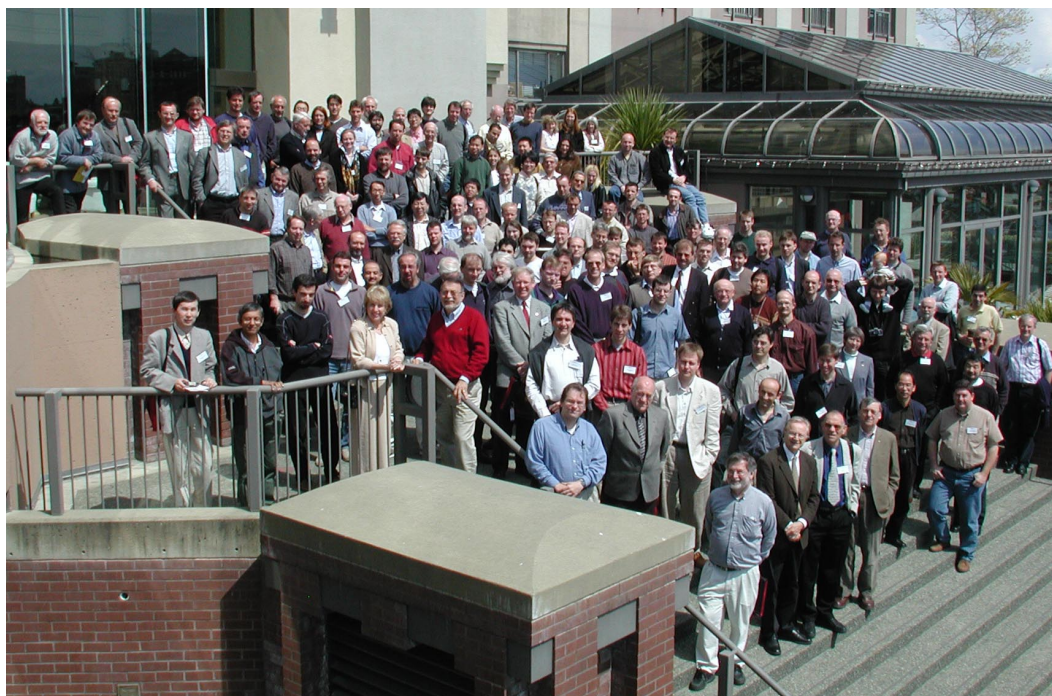


Fig. 258. The EMIS-14 participants outside the Delta Victoria Ocean Pointe Resort where the conference was held.

Today, radioactive beam facilities (which are based upon EMIS type devices) are used to perform a wide range of disciplines including nuclear astrophysics, nuclear spectroscopy, nuclear reactions, studies of exotic nuclides far from stability, condensed matter physics, nuclear medicine and fundamental symmetries among others. The need for developing ever improving facilities, based upon the mature technique of electromagnetic separation, to service this wide and diverse group of interdisciplinary research areas requires that experts in these fields gather to discuss the challenges. In this conference many of these new approaches and ideas were described, disseminated and discussed. One of the bright highlights of the conference was the large number of young scientists and professionals of both genders who participated and presented their studies.

The proceedings of this conference will appear in Nuclear Instruments and Methods B.

During the conference, the International Advisory Committee met and selected France as the location of the next conference. The GANIL Laboratory has agreed to assume the responsibility of organizing EMIS-15.

One essential aspect for a successful conference is the financial arrangements. Organizing such events is becoming expensive and participants cannot always meet the rising costs of registration fees. EMIS-14 was a success in part due to the contributions of the sponsors, namely, NSERC (Natural Sciences and Engineering Research Council of Canada), the Provincial Government of British Columbia, Simon Fraser University, Canberra, Dehnel Consulting, Gamble Technologies, MDS Nordion, Scionix, the UMA group, and VARIAN. A special thanks goes to the TRIUMF laboratory which not only contributed financially, but also with a number of its scientists and professionals who played key roles in all aspects of the conference.

Apart from the chair of EMIS-14, John M. D'Auria, a number of individuals who volunteered their time and efforts for this conference must also be acknowledged. Special thanks go to Martin Comyn for his patience and extra efforts keeping all of the devices needed in the presentations running properly. He also played a key role in preparing the abstracts properly. Jana Thomson worked very diligently on both the abstracts and the conference proceedings. Elly Driessen was very important in putting together a successful social program. Thanks also go to Anna Gelbart for the preparation of the poster and all art work, Mindy Hapke for the excellent photos, Don Hunter and Anthony Lee for putting together the Web page, Irene Tsui for help with financial aspects, Lorraine King for help with the manuscripts and operation of the conference, and Glenn Jones for ensuring that Internet oper-

ations worked well for all registrations. Both the Local Organizing Committee and the International Committee (see Fig. 259) were also essential in assisting with the organization of this conference.

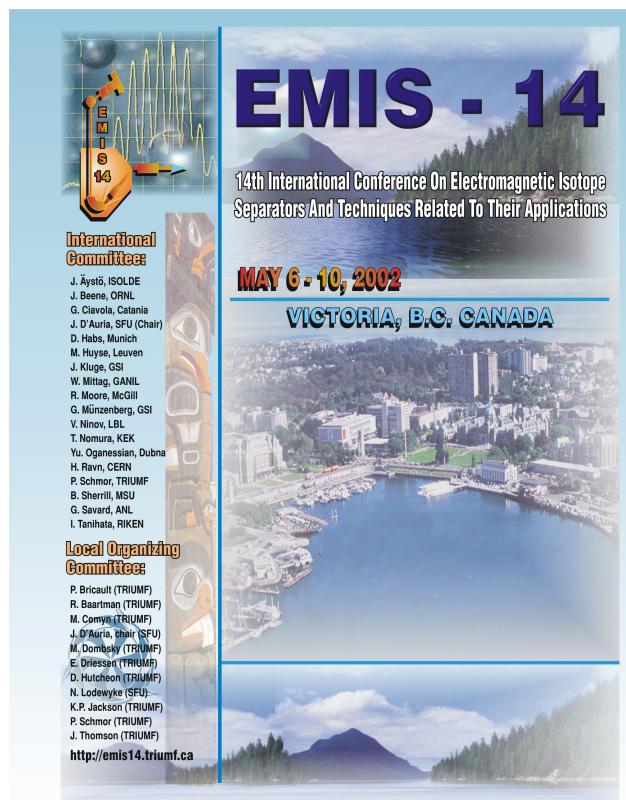


Fig. 259. The EMIS-14 conference poster showing the organizing committees.

SUMMER NUCLEAR INSTITUTE AT TRIUMF (SNIT) – NUCLEAR ASTROPHYSICS: OBSERVATION, EXPERIMENT, THEORY

Nuclear astrophysics is concerned with the impact and influence of nuclear structure and nuclear reactions on astrophysical processes from the beginning of the universe in the big bang through the evolution of stars. It was the goal of this year's Summer Nuclear Institute at TRIUMF (SNIT 2002, June 10–21) to give an introduction to this exciting field.

The summer institute attracted a record number of participants (43), mostly graduate students, but also one undergraduate student and 2 postdocs. The participants came from Canada (19), the United States (15), Europe (7), and Asia (2); 37 work in experimental physics, 6 in theory. About one quarter of the students received graduate credit for SNIT 2002. The eleven invited lecturers came from TRIUMF, the United States, Denmark and Germany and covered a variety of important aspects of the field:

- L. Buchmann, TRIUMF, *Selected problems in low energy nuclear scattering*
- C.W. Johnson, San Diego State U., *The nuclear shell model, with applications to astrophysics*
- D.L. Lambert, U. Texas at Austin, *Nuclear astrophysics – observations*
- K. Langanke, Aarhus U. (Denmark), *Supernovae and nuclear physics*
- G.C. McLaughlin, North Carolina State U., *Neutrino oscillations: theory and application to astrophysics*
- B.S. Meyer, Clemson U., *Explosive nucleosynthesis*
- C. Rolfs, Ruhr-U. Bochum (Germany), *Experimental nuclear astrophysics, an introduction*
- H. Schatz, Michigan State U., *Experimental nuclear astrophysics with radioactive beams*
- A. Shotter, TRIUMF, *Nuclear astrophysics – a general view and the TRIUMF connection*
- K.A. Snover, U. Washington in Seattle, *The ${}^7\text{Be}(p, \gamma){}^8\text{B}$ reaction and solar neutrinos*
- E.W. Vogt, TRIUMF, *Nuclear halo states*

Despite the great weather, attendance at the lectures was high, the homework assignments were taken very seriously, and the discussion sessions revealed intelligent, probing questions. A large group of about 30 participated in the two-hour tour of TRIUMF, given by Marcello Pavan.

The social program consisted of a pizza reception and a banquet at Brock House. In addition, Peter Jackson organized spontaneously (upon popular demand) a beer-and-pizza party at TRIUMF and Lothar Buchmann made his private cabin available for a weekend get-together. These informal meetings served as a great forum for discussions between the lecturers and the students.

For those who are interested, lecture notes and photos from SNIT 2002 are available at <http://www.triumf.ca/snit/2002/>.

The 2002 Summer Institute was organized by Jutta Escher, Lothar Buchmann, Greg Hackman, and Byron Jennings.

5th INTERNATIONAL CONFERENCE ON HYPERONS, CHARM AND BEAUTY HADRONS

The 5th International Conference on Hyperons, Charm and Beauty Hadrons was held June 25–29 at the University of British Columbia. It was the fifth in a series of particle physics meetings started in 1995 centred on the physics of heavy quarks and hyperons. Heavy quark physics has figured prominently in the Canadian particle physics community, and we were

pleased to have Canada host this conference for the second time.

Conference history	
BEACH 1995	Strasbourg, France
BEACH 1996	Montreal, Canada
BEACH 1998	Genoa, Italy
BEACH 2000	Valencia, Spain
BEACH 2002	Vancouver, Canada
BEACH 2004	Chicago, USA

The conference was formatted as four and a half days of plenary sessions only. It was well attended, with 116 participants from 21 countries, including 14 graduate students. The participants were approximately half theorists, half experimentalists, with most of the major heavy quark and hyperon particle physics experiments represented.

Full details on the conference, program, bulletins, electronic versions of talks, link to published proceedings (when available), participants and their email addresses, are available from the conference Web pages: <http://beach2002.physics.ubc.ca>.

TRIUMF Director Dr. Alan Shotter gave a brief set of opening remarks, welcoming participants to Vancouver, reminding visitors from around the world that we have TRIUMF, Canada's national subatomic laboratory, here in Vancouver. He described highlights of the locally based research program, and stressed that TRIUMF also plays a key role in providing infrastructure to many Canadian particle/subatomic experiments, including international experiments based at CERN, SLAC, SNO, BNL, DESY, as well as at TRIUMF.

Professor Aneesh Manohar of the University of California, San Diego, gave an excellent opening overview talk on the physics of beauty, charm and hyperons, presenting his perspectives on some of the new and controversial issues/results that would be presented later in the conference.

UBC Vice-President of Research, Professor Indira Samarasekera, sponsored the opening reception and gave a heart-warming address on the importance of physics research in Canada in general and in particular, particle physics here at UBC.

The very difficult task of closing the conference with the Summary Talk was superbly done by Professor Jonathan Rosner of the University of Chicago and the Enrico Fermi Institute; there has been much theoretical activity and many new experimental results in the fields of heavy quarks and hyperons in the past year, and Rosner's summary was very well done.

The conference talks were all plenary, grouped into seven sessions:

- Heavy Baryons
- Heavy Quark Physics at the Z Pole and Beyond
- Results from the B Factories and CP Violation
- Beauty and Charm Decays and CKM Elements
- Hadronic Heavy Quark Decays and Effective Field Theories
- Charmonium, Charm Production and Decay
- Hyperon and Kaon Decays

The conference banquet was held at the UBC Museum of Anthropology. A half day excursion to Grouse Mountain and the North Shore took place in the middle of the conference.

The organizing committee was:

- Janis McKenna, UBC (Chair)
- Tom Mattison, UBC
- John Ng, TRIUMF/UBC
- Marco Bozzo, U. Genoa/INFN Genoa
- Calvin Kalman, Concordia U. (Chair International Advisory Committee)
- Zoltan Ligeti, Lawrence Berkeley National Lab
- Miguel Angel Sanchis-Lozano, Universitat de Valencia/IFIC Valencia
- Paul Singer, Technion-Israel Inst. of Technology

Proceedings were submitted for publication in November, 2002, and will appear in Nuclear Physics B (Proc. Suppl.) 115 in February, 2003.

BEACH 2004 will be held in Chicago, USA, organized by the Illinois Institute of Technology and the University of Chicago, and will include a session dedicated to Leon Lederman's 80th birthday.

The organizing committee thanks sponsors:

- The Institute of Particle Physics of Canada – for generous subsidization of every graduate student's registration fee.
- The Office of the Vice-President of Research, Professor Indira Samarasekera, for sponsorship of the conference opening reception.
- The Faculty of Graduate Studies, Professor Frieda Granot, for the 4 student conference assistants: Travis Beals, Patrick Bruskiwich, Mark Laidlaw and Douglas Thiessen.
- The Department of Physics and Astronomy – for unfailing secretarial assistance from Mabel Ng and Janet Johnson.
- TRIUMF – Anna Gelbart who designed the popular conference logo and provided excellent advice and guidance for the poster.
- CAP Particle Physics Division.

WORKSHOP ON BIG DRAGON: A RECOIL SEPARATOR FOR ISAC-II AT TRIUMF

A workshop on the science with, and technology of, a recoil separator for use with the radioactive ion beams to be delivered by the ISAC-II facility was held on July 18–19 at TRIUMF. Such a separator will be one of the main components of the ISAC-II experimental program. The first part of the workshop focused on the science program of ISAC-II, the present status of the facility, and planned experimental stations at ISAC-II. This was followed by presentations on several existing recoil separators at facilities worldwide, with an emphasis on present achievements and challenges. Other topics discussed included potential targets and focal plane detectors for the separator.

The workshop, sponsored by TRIUMF, was well attended and drew over 35 attendees from various laboratories. The invited speakers included:

- P. Schmor, *ISAC-II Overview*
- A. Chen, TRIUMF/McMaster U., *Nuclear Astrophysics at ISAC-II*
- D. Dean, ORNL/U. Tennessee, *Nuclear Structure at ISAC-II*
- M. Stoyer, Lawrence Livermore National Lab, *Heavy Element Physics at ISAC-II*
- Y. Oganessian, JINR, *Heavy Element Research at Dubna*
- G. Hackman, TRIUMF, *The TIGRESS Spectrometer*
- J. Dilling, TRIUMF, *Ion Traps*
- B. Fulton, York U. (UK), *ISAC-II Physics with a Charged Particle Array and Recoil Separator Combination*
- F. Sarazin, TRIUMF, *Particle Detector Arrays and Target Set-ups*
- D. Hutcheon, TRIUMF, *The DRAGON Recoil Separator*
- C. Davids, ANL, *The Fragment Mass Analyzer at Argonne*
- C. Gross, ORNL, *The HRIBF Recoil Mass Spectrometer: Its Capabilities and Science*
- F. Strieder, Bochum, *The ERNA Recoil Separator*
- D. Bardayan, ORNL, *Nuclear Astrophysics Studies using the Daresbury Recoil Separator at the ORNL Holifield Radioactive Ion Beam Facility*
- C. Beausang, Yale, *SASSYER and the Future*
- B. Tribble, Texas A&M, *Radioactive Beams with MARS and their Applications in Nuclear Astrophysics and Weak Interactions*
- A. Yeremin, JINR, *Status of the VASSILISSA and other Recoil Separators at the FLNR-JINR*
- J.M. Casandjian, Ganil, *EXOGAM/VAMOS*

- K. Gregorich, LBL, *The Berkeley Gas-filled Separator*

Overall, the calibre of the talks was very high, resulting in interesting and fruitful discussions during the workshop. The meeting concluded with a round table discussion on possible design concepts for the new recoil separator, and on taking steps toward establishing an international collaboration. The workshop was organized by U. Greife (chair), A. Chen, J. D'Auria, and D. Hutcheon.

SYMPOSIUM ON SYMMETRIES AND THE WEAK INTERACTION: IN CELEBRATION OF SIR DENYS WILKINSON'S 80th BIRTHDAY

On September 5, a symposium and dinner were held at TRIUMF in celebration of the 80th birthday of Sir Denys Wilkinson and also for the past fifteen years of his retirement during which he has spent substantial time at TRIUMF each year and has been remarkably productive in science ideas.

The Symposium on Symmetries and the Weak Interaction had a program of four talks:

- Viktor Flambaum, Sydney, Australia and Seattle, *Time Reversal and Parity Violation in Heavy Atoms*
- W. Clark Griffith, Seattle, *The Search for a Permanent Electric Dipole Moment of Hg Atoms*
- Peter Jackson, TRIUMF, *The TRIUMF Neutral Atom Trap (TRINAT)*
- Sir Denys Wilkinson, TRIUMF, *Remarks*

The remarks in the last talk pertained to Sir Denys' many recent papers on the analysis of nuclear beta decays to obtain information about the elements of the Cabibbo-Kobayashi-Maskawa quark-mixing matrix and about the unitarity of the matrix. Denys guided his audience through the multitudinous and delectable corrections to the matrix elements of beta decay as analyzed for this purpose.

The dinner following the symposium was held at the Seasons in the Park restaurant. The symposium and dinner were attended by about forty TRIUMF participants and about a dozen out-of-town participants who came to Vancouver for this purpose. In his remarkable career Sir Denys has had a wonderful influence on the development of TRIUMF.

THE ITALIAN-CANADIAN INTERFACE FOR THE DEVELOPMENT AND EXPLOITATION OF STABLE AND EXOTIC ION BEAMS

A group of 36 Italian and Canadian scientists held a meeting at TRIUMF October 16–20, to present work

done at their respective laboratories and to discuss projects of mutual interest. The Italian delegation comprised five delegates: G. deAngelis and G. Fortuna (Laboratorio Nazionale di Legnaro), A. Bracco (University of Milano), M. Lattuada and E. Migneco (Laboratorio Nazionale di Sud). TRIUMF was represented by the Director and several research scientists as well as university faculty members.

The program started with an introduction to TRIUMF including a tour which largely concentrated on ISAC. Next day the guests gave an overview of their home institutions, i.e. the Laboratorio Nazionale di Legnaro (LNL), close to Padova, and the Laboratorio Nazionale di Sud in Catania, and the physics programs performed there. This included descriptions of the accelerator systems and experimental facilities. Thereafter, the experimental physics done as part of the nuclear and nuclear astrophysics program in Italy and Canada was presented and extensively discussed.

The next day started with a discussion of applications of the nuclear program on both sides, many of them concerning condensed matter problems. The subject then shifted to future facilities of short term and long term range both at TRIUMF and the Italian nuclear laboratories. These projects either concern future radioactive beam facilities or experimental stations at such facilities. The day included a tour of the superconducting cavity development facility at BC Research, an area where TRIUMF and LNL work closely together. The meeting concluded with a round table discussion of future possibilities for collaboration.

TRIUMF USERS' GROUP ANNUAL GENERAL MEETING

The TRIUMF Users' Group Annual General Meeting was held on Wednesday, December 11, sandwiched between the Subatomic and Materials Science two-day EEC meetings. The meeting had 41 paid registrants attending the majority of the talks, double that number for certain talks, and over 25 people who were unable to travel to TRIUMF watched the live video stream on the Web via <http://video.triumf.ca/> where the sessions are archived.

Graeme Luke, the chair of the TRIUMF Users' Executive Committee (TUEC), opened the meeting by welcoming both the Users in the Auditorium and those around the world watching the video stream. He then went on to pay tribute to Nate Rodning, the past chair of TUEC, who had died so unexpectedly in late April.

The very full agenda began with the traditional status reports by the Director and division heads. Alan Shotter outlined the accomplishments of the past year and the challenges ahead, including preparations for the Five Year Plan review. Jean-Michel Poutissou re-

ported on the scientific achievements of the past year and the results and publications anticipated before the review committee visit in 2003. Gerardo Dutto described the cyclotron refurbishments performed since the present five year plan funding began in April 2000, the work to be performed in future shutdowns, and the overall performance of the cyclotron with regard to reliability and increased accelerated and extracted beam currents. Paul Schmor reviewed the performance and future developments of ISAC-I, the status of ISAC-II civil construction, and progress on the ISAC-II accelerator systems.

After lunch two of the DRAGON graduate students, Sabine Engel and Shawn Bishop, gave talks on the commissioning and early results from DRAGON. These were followed by a discussion of the Five Year Plan. Alan Shotter outlined the anticipated timetable, which was unfortunately still dynamic and shrinking. He described the discussions, meetings and planning which had occurred to date, the formation of the committee of protagonists that would draft the plan, and the role of the Users. Graeme Luke described the discussions and input from TUEC over the year, summarized the presentations and discussions at the Town Meeting held at TRIUMF on the weekend of September 21–22, and emphasized the need for ongoing input from the Users. The meeting was then opened for discussion from the floor.

A number of shorter topics were presented after the coffee break. Peter Jackson and Rob Kiefl described the positive outcomes of the NSERC reallocations exercise with respect to the two grant selection committees that fund the majority of TRIUMF experiments. Byron Jennings presented his ideas concerning a TRIUMF Virtual University. Marcello Pavan described the creation of the TRIUMF Outreach program, applications for funding, initiatives for high school science teachers, and the successful professional development day event hosted at TRIUMF on October 25 in conjunction with the BC Association of Physics Teachers which eighty-five high school teachers attended. Jim Hanlon gave an update on the status of the negotiations with UBC concerning the location, design and cost of the new TRIUMF House.

Graeme Luke reported on the activities of TUEC during the year. He announced that, by acclamation, J.E. Sonier (SFU) had been elected as chair-elect for 2003; and, after a vote, T.A. Porcelli (UNBC) and A. Chen (McMaster U.) had been elected as members for 2003/2004. TUEC nominates two members to represent the Users on the TRIUMF Operating Committee. In 2002 S. Yen (TRIUMF) moved from being alternate

to member, replacing G.M. Marshall (TRIUMF), and L. Lee became his alternate. G.M. Luke (McMaster U.) and J.E. Sonier (SFU) remained as the other member and alternate, respectively.

The afternoon session ended with Willem van Oers presenting a proposal for the formal organization of the nuclear physics community in Canada, along the same broad lines as the Institute of Particle Physics (IPP). The Users discussed his ideas informally during the buffet dinner and then returned to the Auditorium for the final session where an open discussion ensued under his chairmanship. The AGM ended almost twelve hours after it had begun.

Welcome	Graeme Luke
State of the Laboratory	Alan Shotter
Science Division Report	Jean-Michel Poutissou
Cyclotron Refurbishing	Gerardo Dutto
ISAC-I, ISAC-II	
Developments	Paul Schmor
The Awakening of the	
DRAGON: Commissioning	
and Operation	Sabine Engel
Nuclear Astrophysics	
at DRAGON: the	
$^{21}\text{Na}(p, \gamma)^{22}\text{Mg}$ Reaction	
and Oxygen-Neon Novae	Shawn Bishop
Five Year Plan	Alan Shotter / Graeme Luke
NSERC GSC Reallocations	Peter Jackson / Rob Kiefl
TRIUMF Virtual University	Byron Jennings
TRIUMF Outreach	Marcello Pavan
TRIUMF House	Jim Hanlon
TUEC Business Meeting	Graeme Luke
Proposal for the Formal	
Organization of the Nuclear	
Physics Community	Willem van Oers
Dinner at TRIUMF	
Open Discussion	Willem van Oers

TUEC Membership for 2002

G.M. Luke	McMaster U.	<i>Chair</i>
N. Rodning	U. Alberta	<i>Past Chair</i>
W.D. Ramsay	U. Manitoba	<i>Chair Elect</i>
G.D. Morris	LANL	2001/2002
J.E. Sonier	SFU	2002
G.S. Hackman	TRIUMF	2002/2003
M.M. Pavan	U. Regina/TRIUMF	2002/2003
M. Comyn	TRIUMF	<i>Liaison Officer</i>