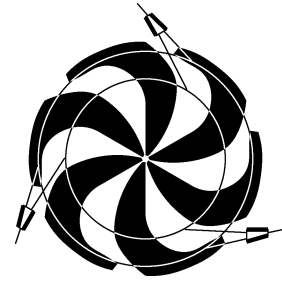


# TRIUMF



## ANNUAL REPORT SCIENTIFIC ACTIVITIES 2005

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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 2006

*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.*

## Appendix B

### SEMINARS\*

The following seminars were presented at TRIUMF this year.

- 06/01 *Development of Neutral Beam Injection for ITER (International Thermonuclear Experimental Reactor)*, Paul McNeely, MPI Plasmaphysik, Garching.
- 07/01 *KN Physics at Intermediate, Low and Unphysical Energies Revisited*, Leo Violini, Calabria U.
- 13/01 *Landmines to Vehicle Bombs - Canada's Effort in the Physics of Explosives Detection*, Anthony Faust, Defence R&D Canada, Suffield.
- 21/01 *The Majorana Questions*, Boris Kayser, Fermilab.
- 26/01 *Description of Neutrino-Deuteron Reaction Based on Standard Nuclear Physics Approach and Effective Field Theory*, Satoshi Nakamura, RCNP, Osaka.
- 27/01 *Supersymmetric Q-Balls as Dark Matter*, Lee Loveridge, UCLA.
- 28/01 *High-Precision Frontier of Subatomic Physics: Fundamental Constants and the Search for New Physics*, Andrzej Czarnecki, U. Alberta.
- 02/02 *The New View of Nuclear Structure with RI Beam Studies*, Rituparna Kanungo, TRIUMF.
- 10/02 *Time-Reversal-Violating Nuclear Schiff Moments*, Joao de Jesus, U. North Carolina.
- 15/02 *Development of Uranium Carbide Targets for On-Line Production of Neutron-Rich Isotopes*, Luigi Tecchio, LNL, Legnaro.
- 21/02 *Violent Collisions of Spinning Protons: Past, Present and Future*, Alan Krisch, U. Michigan.
- 24/02 *Searching for Gravitational Waves with New Interferometers*, Michael Landry, LIGO, Hanford Observatory.
- 03/03 *Probing the Opposite Ends of Time with the Cosmic Background Radiation*, Matt Dobbs, LBNL/McGill.
- 08/03 *Probing Point Defects in Materials Using Positron Annihilation Spectroscopy*, Sharon May-Tal Beck, NRC, Negev.
- 09/03 *Physics Meets Philosophy: A Question of Space(time)*, Carrie Klatt, U. Victoria.
- 10/03 *Radioactive Ion Beams at Berkeley*, James Powell, LBNL.
- 17/03 *Quantum Entanglement Studies with Nuclear Probes*, Chary Rangacharyulu, U. Saskatchewan.
- 23/03 *Precision Muon Lifetime and Capture Experiments at PSI*, Françoise Mulhauser, PSI/U. Illinois.
- 31/03 *New Results from the Salt Phase of SNO*, Kathryn Miknaitis, CENPA, U. Washington.
- 04/04 *From Nuclear Forces to Nuclei and Neutron Stars*, Achim Schwenk, Nuclear Theory Center, Indiana U.
- 06/04 *New Directions in EDM Research: Magnetic Storage Rings*, Gerco Onderwater, KVI.
- 12/04 *Selected Charm Results from CLEO*, David Asner, U. Pittsburgh.
- 13/04 *Challenges of the ATLAS Experiment at the LHC*, Richard Teuscher, Enrico Fermi Institute, Chicago.
- 13/04 *First Principles Descriptions of Atomic Nuclei*, Erich Ormand, LLNL.
- 15/04 *The Path to an International Linear Collider*, Barry Barish, Caltech.
- 18/04 *Exotic Nuclei and Compact Stars*, Juergen Schaffner-Bielich, Johann Wolfgang Goethe U., Frankfurt.
- 25/04 *New Directions in Nuclear (Astro)Physics*, Carlos Bertulani, U. Arizona.
- 28/04 *Effective Field Theories of Weakly-Bound Nuclei*, Ubirajara van Kolck, U. Arizona.
- 05/05 *Marine Phytoplankton Feedbacks on Past and Present Global Climate*, Maite Maldonado, UBC.
- 09/05 *Magnetic Moments of  $T=3/2$  Mirror Nuclei and a New Type of Configuration Mixing for Drip Line Nuclei*, Isao Tanihata, ANL.
- 12/05 *Squeezing the Nucleus to Get Nuclear Incompressibility*, Umesh Garg, U. Notre Dame.
- 13/05 *Precision Measurements with Trapped Radioactive Ions*, Guy Savard, ANL/U. Chicago.
- 16/05 *Some Thoughts on the Technology Transfer Process and the Industry/Laboratory Relationship*, Bill Alvord, CTI Molecular Imaging.
- 17/05 *Synchronizing Cultures in the Past: Pushing Methods of Natural Sciences and Humanities to Their Limits*, Walter Kutschera, U. Vienna.
- 18/05 *Supernova/Acceleration Probe: A Dark Energy Mission Overview*, Natalia Kuznetsova, LBNL.
- 26/05 *The Revolution in Nuclear Physics*, Byron Jennings, TRIUMF.
- 02/06 *Beta-Neutrino Correlation Measurements with Trapped Radioactive Nuclei*, Nicholas Scielzo, ANL.
- 07/06 *A Precision Measurement of  $G_p E/G_p M$  at BLAST*, Chris Crawford, MIT.
- 13/06 *Nuclear Physics from Atomic Tools*, Matthew Pearson, TRIUMF.
- 16/06 *Anti-Kaon Mediated High-Density Nuclear Systems*, Toshimitsu Yamazaki, RIKEN.
- 20/06 *Testing High-Order Corrections in QED with Ortho-Positronium*, Ian Johnson, U. Zurich.
- 24/06 *Spin-Liquid States in Two-Dimensional Frustrated Quantum Spin Systems*, Hiroshi Kageyama, Kyoto U.
- 05/07 *Nuclear Structure Studies Using Resonant Laser Ionization*, Mark Huyse, Catholic U., Leuven.
- 06/07 *Neutrino Physics - Past and Future*, Koichiro Nishikawa, Kyoto U.
- 13/07 *New Results from the CLAS Pentaquark Search Experiments*, Ken Hicks, Ohio U.

- 21/07 *Accelerator Facilities at PSI*, Markus Schneider, PSI.
- 26/07 *Massive Neutrinos: Dirac or Majorana?*, Samoil Bilenky, SISSA, Trieste/JINR, Dubna.
- 28/07 *Synthetic Paths to the Heaviest Elements*, Walter Loveland, Oregon State U.
- 09/08 *Neutron Rich Matter in Astrophysics and in the Laboratory*, Chuck Horowitz, Indiana U.
- 11/08 *Neutron Stars as a Laboratory for Dense Matter Physics*, James Lattimer, SUNY Stony Brook.
- 17/08 *Characterization of TRIUMF DC  $H^-$  Ion Sources for Enhanced Brightness*, Yong-Seok Hwang, Seoul National U.
- 18/08 *First Results from the G-Zero Experiment*, Larry Lee, TRIUMF.
- 19/08 *Operation and Applications of a 400 W Average Power Terahertz Free Electron Laser Based Upon an Energy Recovery Linac*, Boris Knyazev, Budker INP, Novosibirsk State U.
- 01/09 *Making Atoms Tell Time*, Tom Swanson, U.S. Naval Observatory.
- 02/09 *Electron Impact Ionization Experiments Using a Reaction Microscope*, Conny Hoehr, ANL.
- 08/09 *Have We Finally Cracked the Nuclear Force Problem?*, Ruprecht Machleidt, U. Idaho.
- 15/09 *Interactions Between Ultracold Atoms and Hot Surfaces*, Jeffrey McGuirk, SFU.
- 21/09 *Coupling Phonons in Finite Nuclei*, Carlo Barbieri, TRIUMF.
- 23/09 *Resonant Electric Dipole-Dipole Interaction Between Cold Rydberg Atoms*, Kourosh Afrousheh, U. Waterloo.
- 29/09 *The  $d+d$  Reactions in Metallic Environments and Their Relation to "Cold Fusion"*, Armin Huke, Technische U. Berlin.
- 06/10 *Facets of ( $d, {}^2\text{He}$ ) Charge-Exchange Reactions: From NN-Scattering to Astrophysics to Double Beta Decay*, Dieter Frekers, U. Muenster.
- 07/10 *Phase Space State Reconstruction and Modified Quantum Accelerator Modes with Neutral Atoms in Optical Lattices*, Jalani Fox, U. Toronto.
- 20/10 *Muon Decay and the Standard Model: Measurement of the Transverse Polarization of the Decay Positrons and Its Implications for the Fermi Constant and Time Reversal Invariance*, Wulf Fetscher, ETH Zurich.
- 26/10 *Physics with Ultra-Cold Atoms: an Experimentalist's View*, Kirk Madison, UBC.
- 02/11 *Relativistic Shifts of  $g_\mu$  in Muonic Atoms*, Jess H. Brewer, UBC.
- 10/11 *SUSY Dark Matter After WMAP and Before the LHC*, Vassilis Spanos, U. Minnesota.
- 17/11 *The Secret Life of Neutron Stars*, Jeremy Heyl, UBC.
- 24/11 *Baryon Asymmetry of the Universe, CP and CPT*, Maxim Pospelov, U. Victoria.
- 05/12 *The Radioactive Ion Beam and Other Major Accelerator Activities in India*, Arup Bandyopadhyay, Variable Energy Cyclotron Centre, Kolkata.
- 08/12 *Simplicity and Complexity in the Study of Nuclei*, David Dean, ORNL.
- 13/12 *The FAMILON Experiment: Theoretical Motivations, Conception and Simulation*, Victor Gordeev, Petersburg NPI.
- 15/12 *Production Yield Measurements at ISAC*, A. Colin Morton, TRIUMF.
- 15/12 *Partial Wave Analysis (PWA) as a Tool to Identify States by Their Characteristic  $J^{PC}$  Quantum Numbers*, Mina Nozar, TRIUMF.
- 16/12 *The Pierre Auger Observatory: A Description, Status, and First Results*, Matthew Malek, Fermilab.
- 20/12 *Accelerator Mass Spectrometry of Heavy Ions*, Christof Vockenhuber, TRIUMF.

The following ISAC seminars were presented at TRIUMF this year.

- 23/02 *Simulation and Off-Line Testing of a Square-Wave-Driven RFQ Cooler and Buncher for TITAN*, Mathew Smith, TRIUMF/UBC.
- 02/03 *Asymmetric Quantum Rotors*, Chakrawarthy Ravuri, TRIUMF.
- 16/03 *Charge State Breeding of Radioactive Ions*, Friedhelm Ames, TRIUMF.
- 30/03 *Fundamentals of Laser Resonant Ionization*, Tobias Achtzehn, TRIUMF/Darmstadt.
- 07/04  *${}^{12}\text{B}$ ,  ${}^{12}\text{C}$  and the Red Giants - 50 Years Later*, Hans O.U. Fynbo, U. Århus.
- 11/05 *Shape Coexistence in Lead and Polonium Nuclei*, Andrei Andreyev, TRIUMF.
- 25/05 *Collinear Laser Spectroscopy at ISAC*, Thomas Cocolios, McGill U.
- 14/06 *Science with an EBIT: X-Ray Crystal Spectrometry*, Johannes Braun, MPI, Heidelberg.
- 22/06 *An Overview of Accelerator Operations for Experiments at TRIUMF*, Andrew Hurst, TRIUMF.
- 14/09 *Loading of a Far Off Resonance Dipole Force Trap for Stable  ${}^{39}\text{K}$* , Erika Prime, UBC/TRIUMF.
- 23/11 *Radioactive Ion Beam Targets*, Marik Dombbsky, TRIUMF.

The following lunchtime and technical seminars were presented at TRIUMF this year.

- 14/02 *Visualization HowTo*, Jon Johansson, U. Alberta.
- 28/02 *MPI HowTo*, Masao Fujinaga, U. Alberta.
- 01/03 *CAEN Products for Nuclear Physics*, Franco Vivaldi and Jacopo Givoletti, CAEN Technologies Inc.
- 07/03 *Collaboration/AccessGrid HowTo*, Brian Corrie, SFU.
- 14/03 *OpenMP HowTo*, Edmund Sumbar, U. Alberta.

- 28/04 *Wiener New Products for Nuclear Physics*, Andreas Ruben, Wiener.
- 03/06 *TACTIC Time Projection Chamber*, Goetz Ruprecht, TRIUMF.
- 07/06 *A Large Area Silicon Drift Detector Array for Low-Energy X-Ray Spectroscopy*, Johann Zmeskal, Stefan Meyer Institut, Vienna.
- 17/06 *VAMOS: a VAriable MOde high acceptance Spectrometer for Identifying Reaction Products Induced by SPIRAL Beams*, Hervé Savajols, GANIL.
- 24/06 *Highlights of Real Time Conference 2005*, Pierre Amaudruz and Dave Morris, TRIUMF.
- 30/06 *A TPC for the T2K Near Detector*, Juergen Wendland, UBC.
- 20/09 *Approaching the Speed of Light – Demonstrating Special Relativity Using the TRIUMF Cyclotron*, Stan Yen *et al.*, TRIUMF.
- 25/11 *From GANIL to TRIUMF: An Overview of ECR Ion Sources*, Nathalie Lecesne, GANIL.

The following student seminars were presented this year.

- 11/05 *Introduction to the Standard Model of Basic Building Blocks and Fundamental Interactions*, Erich Vogt, UBC.
- 18/05 *Overview of the TRIUMF Research Program*, Jean-Michel Poutissou, TRIUMF.
- 25/05 *From Paper-Making to Disease Prediction: The Use of Radiotracers in the Physical and Biomedical Sciences*, Tom Ruth, TRIUMF.
- 01/06 *Nuclear Astrophysics: The Lives and Deaths of Stars*, Lothar Buchmann, TRIUMF.
- 15/06 *Weak Interaction Symmetries with Laser Traps*, John Behr, TRIUMF.
- 22/06 *The ISAC Linear Accelerators*, Bob Laxdal, TRIUMF.
- 24/06 *Casting Light on Antimatter: ALPHA Antihydrogen Project*, Makoto Fujiwara, TRIUMF.
- 29/06 *Cyclotrons and Other Circular Accelerators*, Mike Craddock, TRIUMF/UBC.
- 06/07 *Symmetries, Parity-Violation and the Structure of the Proton*, Larry Lee, TRIUMF.
- 20/07 *Solar Neutrinos*, Juergen Wendland, UBC.
- 03/08 *Taking a Close Look at Muon and Its Decay*, Mina Nozar, TRIUMF.
- 10/08 *Long Baseline Neutrino Oscillation Experiment*, Akira Konaka, TRIUMF.
- 17/08 *CP Violation with BaBar*, Neil Knecht, UBC.
- 12/10 *The Sudbury Neutrino Observatory*, Juergen Wendland, UBC.
- 19/10 *How do You Mix Science and Business?*, Ann Fong, TRIUMF.
- 26/10 *Cyclotrons and Other Circular Accelerators*, Mike Craddock, TRIUMF/UBC.
- 02/11 *Nuclear Physics from Atomic Tools*, Matthew Pearson, TRIUMF.

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\* All matters concerning TRIUMF seminars should be referred via e-mail to [seminar@triumf.ca](mailto:seminar@triumf.ca)

The latest listing of TRIUMF seminars can be seen at <http://admin.triumf.ca/netdata/seminars/list>