

# Ottawa-Carleton Institute for Physics

## L. Institut de physique d. Ottawa Carleton

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## 1999 Newsletter

In 1999, the Ontario Council on Graduate Studies (OCGS) completed its periodic appraisal of the Ottawa Carleton Institute for Physics. As part of this review, that takes place every seven years, three external consultants each had three day visits to our departments, and submitted reports to OCGS. Each of the reviewers found the program to be of high quality, and the OCGS gave its highest rating to our program (A).

There were 4 Ph.D. graduates and 6 M.Sc. graduates during 1999. There were a total of 57 students registered in our graduate program, a slight increase from 55 in 1998.

Members of the institute gave 160 talks at conferences and institutions around the world. The publication rate continues to be strong, with 150 articles published in 1999. The total research funding of institute members is an impressive 3.8 million dollars.

Two important conferences were hosted on our campuses in 1999. The University of Ottawa was the site of the 67<sup>e</sup> Congrès de l'ACFAS (Association canadienne-française pour l'avancement des sciences). Gary Slater chaired the scientific committee, and many of the faculty members from the University of Ottawa Physics department participated in the organisation of the conference.

The 21<sup>st</sup> annual Montreal-Rochester-Syracuse-Toronto conference on High Energy Physics was hosted by Carleton University. Organizers, Pat Kalyniak, Steve Godfrey, and Basim Kamal, took the opportunity of having MRST at Carleton to celebrate the career in High Energy Physics of Prof. M.K. Sundaresan, and subtitled the conference as the "Sundarfest".

In 1999, there were several significant awards bestowed upon our members. Andre Longtin received an Ontario Premier's Research Excellence Award in the first round of this new program. Giles Santyr was the recipient of an Ontario Research and Development Challenge Fund award. Gary Slater was named the Researcher of the Year for the Faculty of Science at the University of Ottawa. Pawel Hawrylak received the 1999 Senior Scientist Humboldt Research Award. Marcel LeBlanc won the 1999 McNeil Medal for Public Awareness of Science awarded by the Royal Society of Canada. John Tse was awarded the Japan Society for Promotion of Science Fellowship. Clive Greenstock was the recipient of a Radiation Research Society Travel Award, 11th International Congress of Radiation Research, Dublin Ireland. Dave Rogers won the 1999 Farrington Daniels Award of the AAPM for the best paper in radiation dosimetry.

Our graduate students also received several awards. Jennifer Lam won the award for the best student poster at the 9<sup>th</sup> Canadian Semiconductor Technology Conference, Ottawa. Jean-François Mercier was awarded the 1999 Commission on Graduate Studies in Science Prize for his M.Sc. thesis.

Many members of the institute continue to offer the services to the physics community at large. Some of these activities are indicated below.

Pat Kalyniak served as chair of the NSERC grant selection committee for subatomic physics. Sylvain Charbonneau joined the NSERC GSC for condensed matter physics. He is also now the Associate Director for the Institute of Microstructural Sciences at NRC.

Robert Carnegie, continued as director of the Institute of Particle Physics, became a member of the NRC advisory committee on TRIUMF, and will continue as the Canadian representative on the International Committee on Future Accelerators until the end of 2001.

Marie D'Iorio leads the Advanced Materials group of the Institute for Microstructural Sciences at NRC. In 1999 she served as: Mentor, for the NRC WES (Women in Engineering and Science) program; Chair, Industrial Research Fellowship Selection Committee, NSERC; and a member of the Editorial Advisory Board, Canadian Journal of Physics. In June she became President of the Canadian Association of Physicists.

Simon Fafard served as a member of: the NSERC Scholarship and Fellowship Selection Committee; the international advisory committee, 3rd international conference on low dimensional structures and devices; and the advisory committee, NRC-Wide Research and Technology Development Forum.

Clive Greenstock was the associate editor and member of the editorial board for the Health Physics journal, 1999. He also was a member of the Organizing Committee and chief judge of the Renfrew County Regional Science Fair, Pembroke.

Pawel Hawrylak was chairman for the International Conference on Electronic Properties of Two-dimensional Electronic Systems, held in Ottawa in August of 1999.

Paul Johns is the chair of CRISM - Canadian Radiation & Imaging Societies in Medicine. This umbrella organization incorporates the various professional societies such as medical physicists, radiologists, and radiological technologists, that work with ionizing radiation in medicine or do medical imaging. CRISM exists to foster communication between the groups and to be a unified voice to the public and government on issues of the day.

Finally we would like to welcome Tony Waker to the institute. Dr. Waker, from the Radiation Biology and Health Physics Branch, AECL, Chalk River Laboratories, was appointed as an Adjunct Professor to the Physics Department at Carleton University in 1999.

Activities at the Institute can be consulted online at <http://www.ocip.carleton.ca>, which has links to the departmental web sites at the University of Ottawa and Carleton University.

Dean Karlen, Director

Ivan L'Heureux, Associate Director

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## 1999 OCIP Seminar Series

### Spring Graduate Student Seminar Day – University of Ottawa – 3 June 1999

Eric Benson	Bose-Einstein condensation of Excitons
Pascale Sevigny	Magnetic Resonance Imaging of Hyperpolarized Xenon in the Dissolved Phase
Christian Chouinard	Étude de l'oxyde de bismuth rendu dense par la pression
Ken Lagarec	Iron-Nickel, meteorites, Invar, anti-Invar, and all that...
Yvan Gauthier	Measurement of water diffusion in the brain using NMR: phantom study and Monte-Carlo simulations
Claude Desruisseaux	Molecular dynamics of end-labeled DNA in gel and in free solution

### Fall Graduate Student Seminar Day – Carleton University – 29 November 1999

Martin St-Hilaire	The effect of synaptic unreliability on information transfer in P-type electroreceptors
Daron Owen	Potential of Low Dose Rate Irradiation by Camptothecin
Steve Guillouzic	Fokker-Planck approach to stochastic delay differential equations
Debbie Smith	The radiobiological equivalence of Pulsed Dose Rate and Low Dose Rate Irradiation using the U87-MG cell line
Khalid Al-qadi	Temperature dependence of the electrical resistivity in amorphous metallic alloys

### OCIP Christmas Symposium – University of Ottawa – 17 December 1999

Cliff Hargrove	SNOing Neutrinos
Denis Rancourt	Fe-Ni Meteorites and the Solution to the Invar Problem
Basim Kamal	Making Heavy Matter From Light and Measuring the Strong Force
Serge Desgreniers	Pressure-Induced Modifications of Atomic Bonding and Ordering in

Dense Materials

Bob Clarke

High Intensity Focussed Ultrasound Surgery

Pawel Hawrylak

Building Electronic Droplets One Electron at a Time

## 1999 Departmental Seminars

DATE	U	SPEAKER	INSTITUTION	TITLE
Jan. 14	O	Alain St-Amant	University of Ottawa	Ab Initio Methods for Large Molecules
Jan. 18	C	Bob Clarke	Carleton University	High Intensity Focused Ultrasound Surgery - a progress report
Jan. 21	O	John R. Dutcher	Guelph University	Thermal Instabilities in Thin Polymer Films
Jan. 25	C	Peter Krieger	Carleton University	Searching for New Particles with Photonic Events at LEP2
Jan. 28	O	A.D. Fowler	University of Ottawa	Pattern Formation in the Earth Sciences - Mineral and Fossil Examples
Feb. 1	C	Alan E. Nahum	Institute of Cancer Research & Royal Marsden NHS Trust, UK	Tumour Control Probability Modelling and the DTCP Concept
Feb. 4	O	Stephen Morris	University of Toronto	Order from Instability: Nonlinear Patterns in Nature and the Laboratory
Feb. 11	O	Yves Deslandes	NRC	Time-of flight Secondary Ion Mass Spectrometry and X-ray Photoelectron Spectroscopy
Feb. 15	C	Pekka Sinervo	University of Toronto	Observations on Top
Feb. 18	O	Marc Pépin	University of Ottawa	Homopolymer Solubilization Limits in Block Copolymer Micelles: A Monte Carlo Study
Feb. 22	C	Tony Waker	AECL	Microdosimetric Aspects of Low Dose Radiation Exposure and Risk
Feb. 25	O	Philippe M. Teillet & Karl Staenz	NRC	Photons and Electrons: From the Solar Orb to Earth Science Information
Mar. 1	C	Jim Wright	Carleton University	Molecules in Intense Laser Fields: Coulomb Explosions, Bound States, and Fluctuating Reaction Barriers
Mar. 8	C	Dave Rogers	NRC	Improving cancer care by simulating the transport of ionizing radiation

Mar. 15	C	Peter Grutter	McGill University	Nanotechnology: Assembling matter atom by atom with a scanning electron microscope
Mar. 18	O	G.A. Botton	NRC	Probing the Nature of the Bonds and the Nanochemistry of Solids with Electron Energy Loss Spectroscopy: Theory and Experiments
Mar. 22	C	Greg Mahlon	McGill University	The Spin of the Top: Beyond the Helicity Basis
Apr. 19	C	Richard Richardson	AECL	Sizing of alpha-emitting particles on personnel air samplers using CR-39 autoradiography.
Apr. 22	O	S.F. Matar	ICMCB-CNRS	The Electronic Structures and the Chemical Bonding properties from LSDF Calculation in Material Science: How Physics and Chemistry Can Meet in the Solid State
Apr. 29	O	M. Zukermann	McGill University	Evolution, Rupture and the Physics of Lipid-Sterol Systems: A Theoretical Study
May 17	C	I.D. Ivanovic	Carleton University	Quantum Computing: An Overview
May 21	O	Luc Lévesque	Université Laurentienne	Coupling in Waveguiding Structures
Sept. 13	C	Julia Wallace	Carleton University	MRI Thermometry of Tissue During Rapid Heating
Sept. 16	O	Dr. Shyamal	Brock University	Electronic Structure and Related Properties of Disordered Metallic Systems: Linear Muffin-Tin Orbital Approach
Sept. 20	C	Kim Maltman	York University	Finite Energy Sum Rules From the Ground Up
Sept. 22	O	T.K. Sham	University of Ottawa	Canadian Light Source: Opportunities and Procedures
Sept. 29	C	Akira Konaka	TRIUMF	A conceptual design of a next generation nucleon decay/neutrino detector
Oct. 25	C	Mike Sherar	University of Toronto	Image Guided Thermal Therapy in Oncology
Oct. 28	O	Victor G.	University of	Symmetry and the Dynamics of Spiral

		Leblanc	Ottawa	Waves in Excitable Media
Nov. 1	C	Jan Dubowski	NRC	Laser Technology for Integrated Photonics
Nov. 4	O	Liang Chen	University of New Brunswick	Polarization Mode Dispersion in Single Mode Fiber
Nov. 15	C	Carlos Cabal	Santiago de Cuba	Magnetic Resonance (MRI and Relaxation) Studies in the Medical Biophysics Center of Santiago de Cuba
Nov. 16	C	James Cline	McGill University	Branes, extra dimensions, and cosmological expansion: catastrophe or serendipity?
Nov. 18	O	Xiaoyi Bao	University of New Brunswick	Distributed Fiber Optic Sensing Based on Brillouin Scattering
Nov. 22	C	Robert de Kemp	Ottawa Heart Institute	Quantitative Positron Tomography in the Management of Ischemic Heart Disease
Nov. 25	O	Jacques Roovers	NRC	A Comparison Between Dendrimers and Star Polymers
Dec. 2	O	Sylvain Raymond	NRC	Carrier Dynamics in Self-assembled Dots from Steady State Measurements: The Use of Proper Carrier Statistics
Dec. 7	O	Bernard Tinland	CNRS Strasbourg France	DNA Electrophoresis in New 3D Separation Media Using FRAP and Linear Dichroism. Comparison With Gels
Dec. 9	O	Xavier Chatellier	Université de Strasbourg	Adsorption of Polyelectrolytes on Surfaces in Aqueous Solutions
Dec. 16	O	R.L. Williams	NRC	Growth of Self-assembled Quantum Dots on Patterned Semiconductor Substrates



## Publications in Refereed Journals and Book Series in 1999

Author(s)	Title	Publication
I.D. Calder, E.M. Griswold, and G. Hillier	Characterization and Control of Epitaxial Material for HBT Manufacturing	Compound Semiconductor 5(7), 36 (1999).
H. Chen, R.M. Feenstra, P.G. Piva, R.D. Goldberg, I.V. Mitchell, G.C. Aers, P.J. Poole, <b>S. Charbonneau</b>	Enhanced group-V intermixing in InGaAs/InP quantum wells studied by cross-sectional scanning tunneling microscopy	Appl. Phys. Letters, 75, 79 (1999).
J.E. Haysom, A. Delage, J.-J. He, E.S. Koteles, P.J. Poole, Y. Feng, R.D. Goldberg, I.V. Mitchel, <b>S. Charbonneau</b>	Experimental analysis and modeling of buried waveguides fabricated by quantum well intermixing	IEEE J. Quantum Electronics, 35, 1354 (1999).
J.J. Dubowski, G. Marshall, Y. Feng, P.J. Poole, C. Lacelle, J.E. Haysom, <b>S. Charbonneau</b> , M. Buchanan	Multiwavelength monolithic semiconductor laser array fabricated by laser-induced quantum well intermixing	IEEE Photonic Technology Letters (1999).
J.T. Getty, O. Buchinsky, R.A. Salvatore, B. Mason, P.G. Piva, <b>S. Charbonneau</b> , K.S. Grabowski, L.A. Coldren	Monolithic series-connected 1.55 $\mu$ m segmented-ridge lasers	Electron. Lett., Vol 35, #15, pp 1257-1258 (1999).
M. Brooks, R. Brousseau, <b>S. Charbonneau</b> , J. Cook, Y. Deslandes, <b>M. D'lorio</b> , J. Dymont, J. Luong, P. Morley, A. Stolow, Y. Tao, D.A. Wayner	Perspective on Molecular Electronics	Physics in Canada, 55, 285 (1999).
<b>R.L. Clarke</b> , G.R. ter Haar	Production of Harmonics in vitro by High-Intensity Focused Ultrasound	Ultrasound in Med. & Biol. 25 No 9, 1417-1424.
G. X. Ding, <b>J. E. Cygler</b> , G. G. Zhang, and M. K. Yu	Evaluation of a commercial three-dimensional electron beam treatment planning system	Med. Phys , 26, 2571-2580, 1999.

<b>S. Desgreniers</b> , K. Lagarec	High-density ZrO <sub>2</sub> and HfO <sub>2</sub> : Crystalline Structures and equations of state	Phys. Rev. B 59, 8467 (1999).
D.G. Gobbi, <b>M.S. Dixit</b> , J. Dubeau, <b>P.C. Johns</b>	Photon-counting radiography with the gas microstrip detector	Phys. Med. Bio., Vol 44, 1317-1335 (1999).
S. Gauvin, F. Santerre, J.P. Dodelet, Y. Ding, A.R. Hlil, A.S. Hay, J. Anderson, N.R. Armstrong, T.C. Gorjanc, <b>M. D'lorio</b>	Organic light emitting devices containing a highly substituted isoindole or polyisoindole	Thin Solid Films, 353, 218-222 (1999).
J. Lu, A.R. Hlil, Y. Sue, A.S. Hay, T. Maindron, J.P. Dodelet, <b>M. D'lorio</b>	Synthesis and characterization of a blue light emitting polymer containing both hole and electron transport units	Chem. Mater. 11, 2501-2507 (1999).
R. Leon, C. Lobo, X.Z. Liao, J. Zou, D.J.H. Cockayne, <b>S. Fafard</b>	Island shape instabilities and surfactant-like effects in the growth of InGaAs/GaAs quantum dots	Thin Solid Films 357, 40 (1999).
D. Morris, <b>S. Fafard</b> , and N. Perret	Carrier Energy Relaxation by Means of Auger Processes in InAs/GaAs Self-Assembled Quantum Dots	Appl. Phys. Lett. 75, 3593 (1999).
<b>S. Fafard</b> , C. Ni. Allen	Intermixing in Quantum Dot Ensemble with Sharp Adjustable Shells	Appl. Phys. Lett. 75, 2374 (1999).
<b>S. Fafard</b> , Z. R. Wasilewski, M. Spanner	Evolution of the energy levels in quantum dot ensembles with different densities	Appl. Phys. Lett. 75, 1866 (1999).
R. Leon, S. Marcinkevicius, X.Z. Liao, J. Zou, D.J.H. Cockayne, <b>S. Fafard</b>	Ensemble interactions in strained semiconductor quantum dots	Phys. Rev. B 60, R8517 (1999).
<b>S. Fafard</b> , Z. R. Wasilewski, C. Ni. Allen, K. Hinzer, J.P. McCaffrey, Y. Feng	Lasing in Quantum Dot Ensembles with Sharp Adjustable Electronic Shells	Appl. Phys. Lett. 75, 986 (1999).
<b>S. Fafard</b> , Z. R. Wasilewski, C. Ni. Allen, D. Picard, M. Spanner, J.P. McCaffrey, P.G. Piva	Manipulating the Energy Levels of Semiconductor Quantum Dots	Phys. Rev. B 59, 15368 (1999).
Z. R. Wasilewski, <b>S. Fafard</b> , J.P. McCaffrey	Size and shape engineering of vertically stacked self-assembled quantum dots	J. Crystal Growth 201, 1131 (1999).
S. Raymond, X. Guo, J.L. Merz, <b>S. Fafard</b>	Excited-states radiative lifetimes in self-assembled quantum dots obtained from state-filling spectroscopy	Phys. Rev. B 59, 7624 (1999).

F. Yang, K. Hinzer, C. Ni. Allen, <b>S. Fafard</b> , G. C. Aers, Yan Feng, J. McCaffrey, <b>S. Charbonneau</b>	Quantum dot p-i-n structure in an electric field	Superlattices and Microstructures 25, 419-424 (1999).
<b>S. Fafard</b> , Z. R. Wasilewski, C. Ni Allen, D. Picard, P. G. Piva, J. P. McCaffrey	Self-assembled quantum dots: five years later	Superlattices and Microstructures 25, 87-96, (1999).
<b>S. Godfrey</b> , J. Napolitano	Light Meson Spectroscopy	Reviews of Modern Physics 71, 1411 (1999).
M. Doncheski, <b>S. Godfrey</b> , D. Peterson	Measurement of the $WW\gamma$ Coupling in the Process $e\gamma \rightarrow \nu qq$ off the W-boson Resonance	Physical Review D59, 117301-1 to -4 (1999).
<b>S. Godfrey</b> , T. Han, P. Kalyniak	Techni-omega Production in $e\gamma$ Collisions	Physical Review D59, 095006-1 to -5 (1999).
D.J. Paterson, <b>C.K.Hargrove</b> , I.S. Batkin	A proportional chamber to measure the screening potential in $^3\text{H}$ beta decay	Nucl. Instr. Meth. A 425 (1999) 232-253.
<b>C.K. Hargrove</b> , D.J. Paterson, I.S. Batkin	Measurement of the screening potential in $^3\text{H}$ beta decay	Phys. Rev. C60, 034608, 9 August 1999.
<b>P. Hawrylak</b> , <b>S. Fafard</b> , Z. Wasilewski	Engineering Quantum States in Self-Assembled Quantum Dots for Quantum Information Processing	Condensed Matter News 7, 16 (1999).
<b>P. Hawrylak</b> , C. Gould, A. Sachrajda, Y. Feng, Z. Wasilewski	Collapse of Zeeman gap in quantum dots due to electronic correlations	Phys. Rev. B59, 2801(1999).
<b>P. Hawrylak</b>	Excitonic artificial atoms: engineering optical properties of quantum dots	Phys. Rev. B60, 5597 (1999).
A. Wojs, <b>P. Hawrylak</b> , J.J. Quinn	Excitonic ions and pseudopotentials in two-dimensional systems: Evidence for quantum Hall states of an $X_{\perp}$ gas	Phys. Rev. B60, 11661 (1999).
R.J. Leclair, <b>P.C. Johns</b>	Analysis of Spectral Blur Effects in X-Ray Scatter Imaging	Medical Physics 26, 1811-1816 (1999).
<b>P.C. Johns</b>	Understanding and Comparing Ionizing Radiation Doses to Patients	Canadian Journal of Medical Radiation Technology, 30, 138-148 (1999).
Z. Zhou, <b>B. Joós</b>	Convergence Issues in Molecular Dynamics Simulations of Highly Entropic Materials	Mod. and Sim. in Mat. Sci. and Eng. 7, 383-395 (1999).

M. Plischke, D.C. Vernon, <b>B. Joós</b> , Z. Zhou	Entropic Rigidity of Randomly Diluted Two-and Three Dimensional Networks	Physical Review E. 60, 3129-3135 (1999).
K.C. Khulbe, T. Matsuura, S. Singh, <b>G. Lamarche</b> , S.H. Noh	Study on Fouling in Ultrafiltration by Electron Spin Resonance Technique	J. Membr. Science, 190, 1-11, (1999).
M. Quintero, A. Barreto, P. Grima, R. Tovar, E. Quintero, G. Sanchez Poras, J. Ruiz, J.C. Woolley, <b>G. Lamarche</b> , A.-M. Lamarche	Crystallographic Properties of I2Fe.IV.VI4 Magnetic Semiconductor Compounds	Mat. Res. Bull. 1999.
K.C. Khulbe, T. Matsuura, A.-M. Lamarche, <b>G. Lamarche</b>	X-Ray Diffraction Analysis of Dense PPO Membranes	J. Membr. Science 191, 1-9 (1999).
<b>I. L'Heureux</b> , A.D. Fowler	Branching and Oscillatory Patterns in Plagioclase and Mississippi-Valley Type Sphalerite Deposits	Growth, Dissolution and Pattern Formation in Geo-Systems, (Kluwer Academic Publishers, Dordrecht, 1999).
M.J. Chacron, <b>I. L'Heureux</b>	A new model of periodic precipitation incorporating nucleation, growth and ripening	Physics Letters A263 (1999) 70-77.
S. Guillouzic, <b>I. L'Heureux</b> , <b>A. Longtin</b>	Small Delay Approximation of Stochastic Delay Differential Equations	Phys. Rev. E 59: 3970-3982 (1999).
T.A. Hewitt, <b>B.T.A. McKee</b> , F. Noo, R. Clackdoyle, M.J. Chamberlain	Characterization of a pinhole tomograph with 180 acquisition	IEEE Trans. Med. Imaging, MI-46, 1093-1099, (1999).
<b>C.E. Ng</b> , S.K. Banerjee, M. Pavliv, G. Wang, <b>G.P. Raaphorst</b> , R.A. Aubin	P53 status, cellular recovery and cell cycle arrest as prognosticators of in vitro radiosensitivity in human pancreatic adenocarcinoma cell lines	Int. J. Rad. Biol., 75: 1365-1376, (1999).
J.A. Dolling, D.R. Boreham, D.L. Brown, <b>G.P. Raaphorst</b> , R.E.J. Mitchell	Cisplatin-modification of DNA repair and ionizing radiation lethality in yeast, <i>Saccharomyces cerevisiae</i>	Mutation Research 433, 127-136 (1999).
<b>G.P. Raaphorst</b> , D.E. Wilkins, J.P. Mao, J.C. Miao, <b>C.E. Ng</b>	Evaluation of cross resistance between responses to cisplatin, hyperthermia, and radiation in human glioma cells and eight clones selected for cisplatin resistance	Rad. Onc. Invest. 7, 153-157 (1999).

G. Alsbeih, B. Fertil, J. Boniver, E.P. Malaise, <b>G.P. Raaphorst</b>	Hypersensitivity to low single doses and split dose recovery: two manifestations of induced resistance that might be related	Int. J. Radiat. Biol. 73, 837-846 (1999).
G. Alsbeih, S. Malone, L. Grimard, <b>G.P. Raaphorst</b>	La radiosensibilité intrinsèque des fibroblasts de la peau peut identifier un groupe de patients ayant développé des complications sérieuses dans différents tissus sains après radiothérapie	Cancer/Radiothérapie 3, 318-324 (1999).
G. Alsbeih, <b>G. P. Raaphorst</b>	Differential induction of premature chromosome condensation by calyculin A in human fibroblast and tumour cell lines	Anticancer Research. Vol. 19(2A): 903-8 (1999).
<b>G.P. Raaphorst</b> , S. Boyden	Adaptive response and its variation in human normal and tumour cells	Int. J. Radiat. Biol. 75, 865-873 (1999).
<b>G.P. Raaphorst</b> , <b>C.E. Ng</b> , B.H. Shahine	Comparison of radiosensitization by 41°C hyperthermia during low dose rate irradiation and during pulse simulated low dose rate irradiation in human glioma cells	Int. J. Rad. Oncol. Biol. Phys., 44: 185-188, (1999).
<b>G.P. Raaphorst</b> , <b>C.E. Ng</b> , D.P. Yang	Thermal radiosensitization and repair inhibition in human melanoma cells: A comparison of survival and DNA double strand breaks	Int. J. Hyperthermia, 15: 17-27, (1999).
G.G. Zhang, <b>D.W. O. Rogers</b> , <b>J.E. Cygler</b> , T.R. Mackie	Monte Carlo investigation of electron beam output factors versus size of square cut-out	Med. Phys. 26: 733-750, (1999).
P.R. Almond, P.J. Biggs, B.M. Coursey, W. F. Hanson, M. S. Huq, R. Nath, <b>D.W.O. Rogers</b>	AAPM's TG--51 Protocol for Clinical Reference Dosimetry of High-Energy Photon and Electron Beams	Med. Phys. 26, 1847 - 1870 (1999).
G. Mora, A. Maio, <b>D.W.O. Rogers</b>	Monte Carlo simulation of a typical <sup>60</sup> Co therapy source	Med. Phys. 26, 2494 - 2502 (1999).
J. Borg, <b>D.W.O. Rogers</b>	Spectra and Air-Kerma Strength for Encapsulated <sup>192</sup> Ir Sources	Med. Phys. 26, 2441 - 2444 (1999).
<b>D.W.O. Rogers</b>	Correcting for electron contamination at dose maximum in photon beams	Med. Phys. 26, 533 - 537 (1999).
<b>D.W.O. Rogers</b> , C.L. Yang	Corrected relationship between %dd(10)x and stopping-power ratios	Med. Phys. 26, 538 - 540 (1999).
G.J. Wilson, <b>G.E. Santyr</b> , M.E. Anderson, P.M. DeLuca	T1 Relaxation Times of <sup>129</sup> Xe in Rat Tissue Homogenates at 9.4 T	Magn. Reson. Med., 41, 933-938 (1999).

Cron G.O., <b>G.E. Santyr</b> , F. Kelcz	Accurate and Rapid Quantitative Dynamic Contrast Enhanced Breast MR Imaging Using Spoiled Gradient-Recalled Echoes and Bookend T1 Measurements	Magn. Reson. Med., 42, 746-753 (1999).
Breeze S.R., S. Lang, I. Moudrakovski, C.I. Ratcliffe, J.A. Ripmeester, B. Simard, <b>G. Santyr</b>	Coatings for Optical Pumping Cells and Extending the Lifetime of Hyperpolarized Xenon	J. of Appl. Physics, 86, 4040-4042 (1999).
Breeze S.R., S. Lang, I. Moudrakovski, C.I. Ratcliffe, J.A. Ripmeester, B. Simard, <b>G. Santyr</b>	Coatings for Optical Pumping Cells and Short Term Storage of Hyperpolarized Xenon	J. of Appl. Physics, July 1999
S. Barsky and <b>G.W. Slater</b>	A Non-Equilibrium Molecular Dynamics Simulation of the Relaxation of a Bimodal Polymer Melt Upon Uniaxial Stretching	Macromolecules 32, 6348-6358 (1999).
G.I. Nixon and <b>G.W. Slater</b>	Relaxation Length of a Polymer Chain in a Quenched Disordered Medium	Phys. Rev. E. 60, 3170-3173 (1999).
H. Ren, A.E. Karger, F. Oaks, S. Menchen, <b>G.W. Slater</b> , G. Drouin	Separating DNA Sequencing Fragments without a Sieving Matrix	Electrophoresis 20, 2501-2509 (1999).
S. Davies, M. Eizenman, S. Pasupathy, W. Muller, <b>G.W. Slater</b>	Models of Local Behavior of DNA Electrophoresis Peak Parameters	Electrophoresis, 20, 1443-1454 (1999).
J.-F. Mercier, <b>G.W. Slater</b> , and H.L. Guo	Numerically Exact Diffusion Coefficients for Lattice Systems with Periodic Boundary Conditions. Part I: Theory	J. Chem. Phys., 110, 6050-6 (1999).
J.-F. Mercier and <b>G.W. Slater</b>	Numerically Exact Diffusion Coefficients for Lattice Systems with Periodic Boundary Conditions. Part II: Numerical Approach and Applications	J.Chem. Phys., 110, 6057-65 (1999).
C.R. Fu, <b>K.S. Song</b>	Role of the excited electron in the diffusion of interstitials in AgCl and AgBr	Phys. Rev. B59, 2529-2536 (1999).
C.R. Fu, <b>K.S. Song</b>	Self-trapped excitons in pure and Na- and TI-doped caesium halides and the recombination luminescence	J. Phys.-Condens.-Matter 11, 5517-5532 (1999).
C.R. Fu, <b>K.S. Song</b>	Decay of the self-trapped excitons near the (001) surface in NaBr and KBr	J. Phys.-Condens. Matter, 11, 5699-5708 (1999).
<b>Z.M. Stadnik</b>	Introduction: Physical Properties of Quasicrystals	Springer Series in Solid-State Sciences, Vol. 126, edited by Z.M. Stadnik (Springer-Verlag, Berlin,

		1999), p. 1-4.
<b>Z.M. Stadnik</b>	Spectroscopic Studies of the Electronic Structure	Physical Properties of Quasicrystals, (Springer-Verlag, Berlin, 1999), p. 257-293.
K. Uehara, <b>J.S. Tse</b>	Soft X-ray fluorescence spectra of photoluminescent layered polysilanes	Chem. Phys. Lett. 301, 474 (1999).
J. He, Y. Ba, C.I. Ratcliffe, J.A. Ripmeester, D.D. Klug, <b>J.S. Tse</b>	The Nature of Encapsulated Silicon Nanoclusters in Zeolite	Y. Appl. Phys. Lett. 74, 830(1999).
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<b>J.S. Tse</b> , D.D. Klug	Molecular Dynamics Studies of High-Pressure Transformations and Structures	High Pressure Molecular Science (Kluwer Academic Publisher, Dordrecht,(1999)), pg. 59-87.
Z.F. Liu, C.K. Siu, <b>J.S. Tse</b>	Ab initio molecular dynamics study on the thermal dissociation of acetic acid	Chem. Phys. Lett., 314, 317 (1999).
<b>J.S. Tse</b> , V.P. Shpakov, V.R. Belosludov	Vibrational spectrum, elastic moduli and mechanical stability of ice VIII	J.Chem.Phys., 24,11111 (1999).
Gutt, B. Asmussen, W. Press, C. Merkl, H. Casalta, J. Greinert, G. Bohrmann, E. Suess, <b>J.S. Tse</b> and A. Huller	Quantum Rotations in Natural Methane-Clathrates from the Pacific Sea-floor	Europhys.Lett., 48,269 (1999).
Z.F. Liu, C.K. Siu, <b>J.S. Tse</b>	Ab initio molecular dynamics study on the hydrolysis of molecular chlorine	Chem. Phys. Lett., 311, 93(1999).
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**Carleton members:** R.K. Carnegie, M.S. Dixit, M. Donkers, P.G. Estabrooks, P. Gagnon  
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M.J. Losty, H. Mes, F.G. Oakham, S. Towers, D. Waller, J. White



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G. Abbiendi et al., Eur. Phys. J. C11 (1999) 643-659

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Measurement of the  $\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau$  branching ratio

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G. Abbiendi et al., Phys. Lett. B447 (1999) 157-166

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G. Abbiendi et al., Eur. Phys. J. C8 (1999) 559-571

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G. Abbiendi et al., Eur. Phys. J. C7 (1999) 407-435

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G. Abbiendi et al., Eur. Phys. J. C8 (1999) 191-215

Measurement of the semileptonic branching ratio of charm hadrons produced in  $Z^0 \rightarrow c\bar{c}$  decays  
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G. Abbiendi et al., Eur. Phys. J. C8 (1999) 217-239

Search for chargino and neutralino production at  $\sqrt{s} = 181-184$  GeV at LEP  
G. Abbiendi et al., Eur. Phys. J. C8 (1999) 255-272

Di-Jet Production in Photon-Photon Collisions at  $\sqrt{s_{ee}} = 161$  and 172 GeV  
G. Abbiendi et al., Eur. Phys. J. C10 (1999) 547-561

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K. Ackerstaff et al., Eur. Phys. J. C6 (1999) 225-238

Tests of the Standard Model and constraints on new physics from measurements of fermion-pair production at 183 GeV at LEP  
K. Ackerstaff et al., Eur. Phys. J. C6 (1999) 1-18

Measurement of the strong coupling constant  $\alpha_s$  and the vector and axial-vector spectral functions in hadronic tau decays  
K. Ackerstaff et al., Eur. Phys. J. C7 (1999) 571-593

Measurement of the Michel parameters in leptonic tau decays  
K. Ackerstaff et al., Eur. Phys. J. C8 (1999) 3-21

Measurement of tau branching ratios to five charged hadrons  
K. Ackerstaff et al., Eur. Phys. J. C8 (1999) 183-189

Inclusive production of charged hadrons and  $K_S^0$  mesons in photon-photon collisions  
K. Ackerstaff et al., Eur. Phys. J. C6 (1999) 253-264

Measurements of Flavour Dependent Fragmentation Functions in  $Z^0 \rightarrow q\bar{q}$  events  
K. Ackerstaff et al., Eur. Phys. J. C 7 (1999) 369-381

Production of  $K_S^0$  and  $\Lambda$  in quark and gluon jets from  $Z^0$  decay  
K. Ackerstaff et al., Eur. Phys. J. C8 (1999) 241-254

## Publications in Refereed Conference Proceedings in 1999

Author(s)	Title	Conference/Publication
<b>I.D. Calder</b> , E.M. Griswold, and G. Hillier	Characterization and Control of Epitaxial Material for HBT Manufacturing	Proc. 1999 Int.. Conf. on Gallium Arsenide Manufacturing Technol.
Y Gauthier, <b>I.G. Cameron</b>	A Phantom Study of Restricted Diffusion in White Matter	International Society of Magnetic Resonance in Medicine, Philadelphia, May, 1999, p. 1802.
Y. Gauthier. L.L. Gates, <b>I.G. Cameron</b>	A Magnetic Resonance Study of Water Diffusion in the White Matter of the Brain	The American Physical Society, Atlanta, March, 1999, GP01 152, p. 371.
J.T. Getty, O. Buchinski, R.A. Salvatore, B. Mason, L.A. Coldren, P.G. Piva, <b>S. Charbonneau</b> , K.S. Grabowski	Enhanced differential efficiency with monolithic, series-connected, segmented ridge lasers	Proc. LEOS-99.
P.G. Piva, R.D. Goldberg, I.V. Mitchell, H. Chen, R.M. Feenstra, G.C. Weatherley, G.C. Aers, P.J. Poole, <b>S. Charbonneau</b>	A comparative study of interdiffusion in InGaAs/InP MQW structures using XSTM, energy dispersive X-ray and photoluminescence spectroscopy	Proc. ICPS-24.
F. Yang, K. Hinzer, G.C. Aers, <b>S. Fafard</b> , C.Ni. Allen, <b>S. Charbonneau</b>	Carrier escape processes in InAs/GaAs/AlGaAs self-assembled quantum dot detectors	Proc. ICPS-24, 236 (1999).
M. Soltani, C. Carlone, <b>S. Charbonneau</b> , S.M. Khana	Photoluminescence study of wurtzite Si-doped GaN thin film	Proc. SPIE vol. 3413 (1999).
R.D. Goldberg, I.V. Mitchell, P.G. Piva, H.H. Tan, P.J. Poole, G.C.Aers, <b>S. Charbonneau</b> , G.C. Weatherly, M.B. Johnson, M. Gal, T. SpringThorpo, H. Chen and R. Feenstra	Selective intermixing of ion irradiated semiconductor heterostructures	Proc. MRS-99, Boston.

J.J. Dubowski, G. Marshall, Y. Feng, P. Poole, C. Lacelle, J. Haysom, <b>S. Charbonneau</b> , M. Buchanan	Semiconductor laser array fabricated by Nd:YAG laser-induced quantum well intermixing	SPIE pceedings Vol. 3618 (1999).
R. Driad, Z.H. Lu, W.R. McKinnon, S. Laframboise, S.P. McAlister, P.J. Poole, S. Raymond, <b>S. Charbonneau</b>	Passivation of InGaAs/InP heterostructures	Mat. Res. Soc. Symp. Proc, 573, 227 (1999).
F. Santerre, J.P. Dodelet, Y. Sun, A.R. Hlil, A.S. Hay, <b>M. D'Iorio</b>	IS&Ts	NIP 15, 747-750 (1999).
J.P. McCaffrey, M.D. Robertson, Z. R. Wasilewski, <b>S. Fafard</b> , and L.D. Madsen	Size and shape engineering of vertically- stacked InAs quantum dots	Inst. Phys. Conf. Ser. No. 164, 107 (1999).
J. Wellman, T. George, R. Leon, <b>S. Fafard</b> , J. Zou, D.J.H. Cockayne	Transmission Electron Microscope Study of InGaAs/GaAs Structural Evolution near the Stranski-Krastanow transformation	MRS Proc. 570, 175 (1999).
D. Morris, <b>S. Fafard</b>	Carrier Dynamics in Stacked Self-Assembled InAs/GaAs Quantum Dots	Proc. of the 5th Int. Symposium on Quantum Confinement: Nanostructures, Proc. Vol 98-19, pp. 348-356 (1999), 194th Meeting of the Electrochemical Society (Boston, November 1-6, 1998).
<b>S. Fafard</b> , H.C. Liu, K. Hinzer, C.Ni. Allen, Z.R. Wasilewski, M. Gao, F. Yang, Y. Feng, <b>S. Charbonneau</b> , J. McCaffrey	Photon detection with quantum dot devices	Proc. 44th annual SPIE meeting (1999).
<b>S. Godfrey</b> , T. Han, <b>P. Kalyniak</b>	Techni-omega Production in $e\gamma$ Collisions	Proceedings of the XXIX International Conference on High Energy Physics, Vancouver, 1998, (World Scientific, Singapore 1999) p. 1720.
<b>S. Godfrey</b> , <b>P. Kalyniak</b> , B. Kamal, A. Leike	Searching for a W-Prime at the Next Linear Collider Using Single Photons	MRST'99, Ottawa. AIP Proceedings 488, (AIP Press, Woodbury NY 1999) p. 1.
<b>C.L. Greenstock</b> , K.J. Lenton	Using the Fluorescent Molecule beta- Phycoerythrin to Screen Antioxidants and Free Radical Scavengers	Proceedings of the 11th International Congress of Radiation Research, Dublin Ireland, Vol. 1, p.292, Allen Press, Inc. USA, 1999.

<b>C.L. Greenstock</b>	Health Effects: Low Dose Implications	Proceedings of the 44th Annual Health Physics Conference, Vol. 3-C, p.1, 1999.
<b>B.J. Jarosz</b>	Interstitial Instrumentation for Therapeutic Ultrasonic Heating: Modelling the Discrete Blood Vessels	16th IEEE Instrumentation & Measurement Technology Conference/Venice, Italy, 1999/ISBN: 0-7803-5276-9.
R.J. Leclair, <b>P.C. Johns</b>	Fundamental Information Content Accessible with Medical X-Ray Scatter Imaging	Proceedings of SPIE 3659, 672-681 (1999). (SPIE Conference on Physics of Medical Imaging, San Diego, CA 1999).
<b>P.C. Johns</b> , C. Buffet, S. Decossas, R.R. Scharf, R.J. Leclair	Measurement of X-Ray Scattering Properties of Biological Materials	Proceedings of 45th Annual Meeting of the Canadian Organization of Medical Physicists, 235-237 (Sherbrooke, 1999).
<b>B. Joós</b> , M. Plischke, D. Vernon, Z. Zhou	Entropic Rigidity	Rigidity Theory and Applications, Plenum Press 1999, p.315-328.
<b>D. Karlen</b>	Experimental Status of the Standard Model	Proc. of the 29 <sup>th</sup> International Conference on High Energy Physics, Vancouver, (World Scientific, 1999) pp. 47-61.
K.C. Khulbe, T. Matsuura, S. Singh, <b>G. Lamarche</b>	Study on Fouling in ultrafiltration by ESR Technique	Int. Conf on Membranes, Toronto, June 1999.
S. Guillouzic, <b>I. L'Heureux</b> , <b>A. Longtin</b>	Transition rates for stochastic delay differential equations	Proceedings of the Stochastic Dynamics Conferences, Ambleside U.K. (1999).
<b>G. Santyr</b> , P. Wilson, P. Sevigny, J. Wallace, S. Lang, S. Breeze, M. Anderson, P. DeLuca, J. Ripmeester	Transverse Relaxation Times of <sup>129</sup> Xe in Rat Tissue Homogenates and Blood	Eur. J. Radiology, 9, B43 (1999).
<b>I. Cameron</b> , <b>G. Santyr</b> , S. Lang, S. Breeze, J. Wallace, P. Sevigny, I. Moudrakovski, B. Simard, J. Ripmeester	A Centralized Approach to Production and Distribution of Hyperpolarized Xenon	Eur. J. Radiology, 9, B35 (1999).
<b>Z.M. Stadnik</b>	Electronic Structure of Quasicrystals	Proceedings of XXXIV Zakopane School of Physics (Zakopane, Poland), p. 173-178.
I. S. Batkin, <b>M. K. Sundaresan</b>	Coherent Conversion of Neutrino Flavor by collisions with Relic Neutrino Gas	Proceedings of High Energy Physics at the Millenium, MRST '99, Ottawa.

## Other Conference Presentations and Posters in 1999

Author(s)	Title	Conference
<b>I. Cameron, G. Santyr,</b> S. Lang, S. Breeze, J. Wallace, P. Sevigny, I. Moudrakovski, B. Simard, J. Ripmeester	A Centralized Approach to Production and Distribution of Hyperpolarized Xenon	Hyperpolarized Gases in Magnetic Resonance: Biomedical Investigations and Clinical Applications, Les Houches, France
<b>S. Charbonneau</b>	Fabrication de circuits intégrés photoniques par implantation ionique	Congrès de l'ACFAS, Ottawa.
J.E. Haysom, F. Yang, G.Aers, P.J. Poole, A. Delage, I.V. Mitchell, <b>S. Charbonneau</b>	Quantum well intermixing for photonics integration	CAP annual congress, Fredericton.
J.C. Wallace, <b>R.L. Clarke</b> and <b>G.E. Santyr</b>	MRI Mapping of One-Dimensional Temperature Gradients Across Ex-Vivo Liver Tissue During Rapid and Slow Heating	Intl. Society of Magnetic Resonance in Medicine, Philadelphia
J.C. Wallace, <b>R.L. Clarke</b> and <b>G.E. Santyr</b>	MRI Mapping of One-Dimensional Temperature Gradients Across Ex-Vivo Liver Tissue During Rapid and Slow Heating	Canadian Organization for Medical Physics, Sherbrooke
<b>J.E. Cygler,</b> C.B. Kwok, G.X. Ding	Clinical electron beam dosimetry - comparison between TG-21 and TG-51 dosimetry protocols	Annual COMP meeting.
M. MacPherson, <b>J.E. Cygler,</b> D. Wilkins	Commissioning of the brachytherapy module on Theraplan Plus	Annual COMP meeting.
G.X. Ding, M.K. Yu, <b>J.E. Cygler,</b> C.B. Kwok	Comparison between the absolute dose calibration between TG-21 and TG-51 protocols – photon beams	Annual COMP meeting.
C. Chouniard, <b>S. Desgreniers</b>	Caractérisation de la transition de phase cristalline à amorphe dans le Bi <sub>2</sub> O <sub>3</sub> soumis à des pressions hydrostatiques élevées	Congrès de L'ACFAS, Ottawa.

<b>S. Desgreniers, S. Pilod, C. Chouinard</b>	On the Pressure-induced Crystalline-to-Amorphous Transition in Bismuth Oxide	Internat. Union of Crystallography XVIII Conference, Glasgow.
<b>M. D'Iorio</b>	Molecular Materials for Microelectronics	Sunday Symposium on Materials for the 21st century, CAP Annual Congress, Fredericton.
<b>M. D'Iorio</b>	Dispositifs électro-luminescents organiques	Session sur la chimie des polymères, ACFAS, Ottawa.
<b>M. D'Iorio</b>	Fabrication and Characterisation of Blue Colour Organic Light Emitting Devices	CSC Annual Conference, Symposium on Electroluminescent Displays, Toronto.
J. Lam, Y. Tao, <b>M. D'Iorio</b> , T. C. Gorjanc, C. Py, A. Donat-Bouillud	Investigation of Doping Effects in Multilayer OLEDs	CAP Annual Congress, Fredericton.
J. Lam, <b>M. D'Iorio</b> , A. Donat-Bouillud, T. C. Gorjanc, C. Py, Y. Tao, J. Lu, A. R. Hlil, Y. Sun, A. S. Hay, J.-P. Dodelet, and I. Bedja	Performance of High Tg Hole Transport Materials in Organic Light Emitting Devices	Materials Research Society Fall Meeting, Boston.
R. Leon, S. Marcinkevicius, X. Liao, J. Zou, D. Cockayne, <b>S. Fafard</b>	Optical saturation and ensemble interactions in strained quantum dots	APS meeting, Atlanta
J. Wellman, T. George, R. Leon, <b>S. Fafard</b>	Formation and Microstructural Evolution of InGaAs/GaAs Quantum Dots	APS meeting, Atlanta
<b>S. Fafard</b> , Z.R. Wasilewski, C. Ni. Allen, D. Picard, M. Spanner, J.P. McCaffrey, P.G. Piva, E.M. Griswold	Self-Assembled quantum dots with well-defined adjustable electronic shells	MRS Spring 99, San Francisco
J. Wellman, T. George, R. Leon, <b>S. Fafard</b>	TEM study of InGaAs/GaAs structural Evolution near the Stranski-Krastanow transformation	MRS Spring 99, San Francisco
<b>S. Fafard</b>	Microspectroscopy of semiconductor devices	MRS Spring 99, San Francisco
<b>S. Fafard</b>	Points quantiques semiconducteur: croissance, propriétés et dispositifs	ACFAS, Ottawa
<b>S. Fafard</b>	Progress with Self-Assembled Quantum Dot Structures and	IUMRS-ICAM, Beijing

	Devices	
<b>S. Fafard</b>	Quantum dot laser diodes	OSA-ASLA, Santa Barbara
<b>S. Fafard</b>	Photon Detection with Quantum Dot Devices	SPIE, Denver
<b>S. Fafard, Z. R. Wasilewski, C. Ni. Allen, M. Spanner, J.P. McCaffrey, D. Picard, E.M. Griswold, K. Hinzer, C. Gould, A. Sachrajda, P. Hawrylak, R. Leon, S. Raymond, J.L. Merz, J. Lapointe, M. Bayer, A. SpringThorpe, Y. Fang, P.G. Piva</b>	Self-Assembled Quantum Dots with Sharp Adjustable Electronic Shells	EP2DS, Ottawa
<b>S. Fafard</b>	Nano-Optics: Self-Assembled Quantum Dots	Cerion/CSTC, Ottawa
<b>S. Fafard</b>	III-V self-assembled quantum dots	Workshop on Nanostructures, North American MBE conference, Banff
<b>E. Fortin, A. Mysyrowicz</b>	Bose-Einstein condensation of excitons	International conference on Luminescence, Osaka, Japan
M. Masse, <b>E. Fortin</b> , E. Benson	Excitonic superfluidity in Cu <sub>2</sub> O	CAP, Fredericton
M. Masse, <b>E. Fortin</b>	Superfluidite excitonique	ACFAS, Ottawa
<b>S. Godfrey</b>	Summary Talk on the Science	Hall D Workshop, Jefferson Laboratory, Newport News, Virginia
<b>S. Godfrey, P. Kalyniak, B. Kamal, A. Leike</b>	Discovery Limits for Extra Gauge Bosons in $e^+e^- \rightarrow \nu\nu\gamma$	The International Workshop on Physics and Detectors at the Linear Collider, Sitges, Spain
<b>C.L. Greenstock</b>	Health Effects and their Consequences for Radiation Protection	Personnel Enrichment Program, Health Physics Society, Philadelphia PA



<b>P. Hawrylak</b>	Spin and correlations in quantum dots	Recontres de Moriond, Les Arcs, France
<b>P. Hawrylak</b>	Correlated electrons and excitons in quantum dots	French-Polish workshop on "Excitons in confined systems" Warsaw, Poland
<b>P. Hawrylak</b>	Optical properties of quantum dots	NATO Advanced Research Workshop, Jaszowiec, Poland
<b>P. Hawrylak</b>	Quantum dots for Quantum Information Processing	Workshop on quantum dots for quantum computing, Naval Research Laboratory, Washington, DC
<b>P. Hawrylak</b>	Spin structure of artificial atoms	Workshop on "Magneto-electronic materials", CAPEM, Buffalo, NY
<b>P. Hawrylak</b>	Quantum Dots	XV Simposio Latino Americano en Fisica de Estado Solido, Cartagena de los Indias, Colombia
<b>B.J. Jarosz</b>	Interstitial Instrumentation for Therapeutic Ultrasonic Heating: Effects of the Blood Flow Velocity in Discrete Vessels	COMP Conference, Sherbrooke
D. Vernon, M. Plischke, <b>B. Joós</b>	Entropic Contribution to Rigidity Percolation	APS Centennial Meeting, Atlanta, GA
<b>I. L'Heureux</b>	Modèle de précipitation périodique dans la sphalérite rubanée du type de la vallée du Mississippi	ACFAS, Ottawa
<b>I. L'Heureux</b>	Model of Periodic Precipitation in Natural Sphalerite	Gordon Research Conference on Oscillations in Dynamical Instabilities in Chemical Systems, Lucca, Italy
Steve Guillouzic, <b>I. L'Heureux, A. Longtin</b>	Equations différentielles stochastiques à délai	ACFAS, Ottawa
Steve Guillouzic, <b>I. L'Heureux, A. Longtin</b>	Transition rates in stochastic delay differential equations	Stochastic and Chaotic Dynamics in the Lakes Meeting, Ambleside, UK
<b>B. Joos, Z. Zhou, M. Plischke, D. Vernon</b>	La simulation par dynamique moléculaire de matériaux entropiques près du seuil de rigidité	ACFAS, Ottawa
<b>B. Joos, M. Plischke, D. Vernon, Z. Zhou</b>	Le seuil de rigidité entropique	ACFAS, Ottawa

<b>A. Longtin</b>	Stochastic Dynamics and Pattern Formation in Biological Systems",	Asian Pacific Center for Theoretical Physics, Seoul, Korea.
M. St-Hilaire, <b>A. Longtin</b>	L'importance de la variabilité synaptique dans l'encodage d'information par les électrocepteurs de type-P.	ACFAS, Ottawa
M. St-Hilaire, <b>A. Longtin</b>	Synaptic unreliability enhances information transfer by p-unit electroreceptors	APS Centennial Meeting, Atlanta, Georgia
<b>C.E. Ng</b> , C. Payant, S.E. Cybulski, <b>G.P. Raaphorst</b>	Mechanisms of camptothecin induced cell death	International Congress of Rad. Res., Dublin, Ireland
G.P. Raaphorst	Interactions of Cisplatin, Radiation and Hyperthermia	International Congress of Radiation Research, Dublin, Ireland
G. Alsbeih, S. Malone, R. Gray, <b>G.P. Raaphorst</b>	SF2 of skin fibroblasts may identify patients at high risk for developing brain necrosis following AVM radiosurgery	International Congress of Radiation Research, Dublin, Ireland
<b>G.P. Raaphorst</b>	Interactions of mild hyperthermia, low dose rate irradiation and mild hyperthermia in glioma and ovarian ca cells	International Congress of Radiation Research, Dublin, Ireland
P.-J. Thibault, D. Mavrocordatos, <b>D.G. Rancourt</b> , D. Fortin, <b>G. Lamarche</b> .	Comparisons of biogenic and abiotic hydrous ferric oxides using Mössbauer spectroscopy	ICAME-99, Garmisch-Partenkirchen, Germany
P.-J. Thibault, K. Lagarec, <b>D.G. Rancourt</b> , <b>G. Lamarche</b> , D. Mavrocordatos, D. Fortin	Structure, Stoichiometry and Microstructure of Ferrihydrite	XIVth Int. Sympos. Environ. Biogeochem. Huntsville, Ontario
J. Farine, <b>D.Sinclair</b>	Status of SNO and future solar neutrino experiments.	International Europhysics Conference on High Energy Physics 99, Tampere, Finland.
P. Sevigny, <b>G. Santyr</b> , J. Wallace, S. Breeze, S. Lang, I. Moudrakovski, C. Ratcliffe, B. Simard, J. Ripmeester	Optimization of Gradient-Echo Imaging for Hyperpolarized Xenon Gas	APS Centennial Meeting, Atlanta, Georgia

G.J. Wilson, <b>G.E. Santyr</b> , M.E. Anderson and P.M. DeLuca	T <sub>2</sub> of <sup>129</sup> Xe in Rat Tissue Homogenates and Blood at 9.4 T	Intl. Society of Magnetic Resonance in Medicine, Philadelphia
G.O. Cron, J.C. Wallace, T. Fortin, W.D.Stevens, B.A. Pappas, F. Kelcz and <b>G.E. Santyr</b>	Non-Invasive Measurement of the Arterial Input Function for Quantitative Dynamic Contrast-Enhanced MR Imaging of Cancerous Lesions in the Rat	Intl. Society of Magnetic Resonance in Medicine, Philadelphia
P. Sevigny, <b>G. Santyr</b> , J. Wallace, S. Breeze, S. Lang, A. Cross, I. Moudrakovski, C. Ratcliffe, B. Simard and J. Ripmeester	A Study of Dissolved Hyperpolarized <sup>129</sup> Xenon for Injection Delivery	Canadian Organization for Medical Physics, Sherbrooke
G.O. Cron, J.C. Wallace, T. Fortin, W.D.Stevens, B.A. Pappas, F. Kelcz and <b>G.E. Santyr</b>	Non-Invasive Measurement of the Arterial Input Function for Quantitative Dynamic Contrast-Enhanced MR Imaging of Cancerous Lesions in the Rat	Canadian Organization for Medical Physics, Sherbrooke
S. Breeze, J. Ripmeester, C. Ratcliffe, I. Moudrakovski, S. Lang, <b>G. Santyr</b>	Surface Coatings for the Storage and Transportation of Hyperpolarized Xenon-129	82nd CSC Conference and Exhibition, Toronto.
<b>G. Santyr</b> , G. Wilson, P. Sevigny, J. Wallace, S. Lang, S. Breeze, M. Anderson, P. DeLuca, J. Ripmeester	Transverse Relaxation Times of <sup>129</sup> Xe in Rat Tissue Homogenates and Blood	Hyperpolarized Gases in Magnetic Resonance: Biomedical Investigations and Clinical Applications, Les Houches, France
J. Labrie, <b>G.W. Slater</b> , J.F. Mercier	Diffusion in Porous Systems with Binding: Exact Results	Annual Congress of the Canadian Association of Physicists, University of New Brunswick, Fredericton
<b>G.W. Slater</b>	Non-gel based DNA sequencing methods	Gordon Research Conference on Analytical Chemistry, New Hampshire
<b>G.W. Slater</b> , S. Hubert, M. Pépin, S. Barsky	Étude de la dynamique et de l'hydrodynamique des polymères avec l'aide de simulations par dynamique moléculaire	67ème Congrès Annuel de l'ACFAS, Ottawa
<b>G.W. Slater</b> , J.-F. Mercier, J. Labrie	Diffusion de protéines dans le plan de la biomembrane: modèles mathématiques et simulations Monte Carlo	67ème Congrès Annuel de l'ACFAS, Ottawa

J. Labrie, <b>G.W. Slater</b>	Diffusion interactive dans des systèmes poreux: résultats exacts	67ème Congrès Annuel de l'ACFAS, Ottawa
J.-F. Mercier, <b>G.W. Slater</b>	La diffusion de particules sur un réseau	67ème Congrès Annuel de l'ACFAS, Ottawa
S. Hubert, <b>G.W. Slater</b>	Dynamique moléculaire d'un polymère soumis à un flux	67ème Congrès Annuel de l'ACFAS, Ottawa
C. Desruisseaux, <b>G.W. Slater</b> , M. Fillion-Bergeron, H-Len, G-Drouin	De l'électrophorèse de piégeage à l'électrophorèse en solution libre	67ème Congrès Annuel de l'ACFAS, Ottawa
C. Desruisseaux, <b>G.W. Slater</b> and M. Fillion-Bergeron, Hongji Ren, G. Drouin	From Trapping Electrophoresis to End-Labeled Free Solution Electrophoresis	High Performance Capillary Electrophoresis conference, Palm Spring
Hongji Ren, G. Drouin, A.E. Karger, F. Oaks, S. Menchen, <b>G.W. Slater</b>	End-Labeled Free Solution Electrophoresis Method for DNA Sequencing	High Performance Capillary Electrophoresis conference, Palm Spring
T.B. Taylor, A.E. Karger, S. Bay, F. Oaks, H. Ren, G. Drouin, <b>G.W. Slater</b> , S. Menchen	PCR-Product Analysis in Microchannel Devices and Capillaries Using Sieving Polymer and End-Labeled Free-Flow (ELFSE) Electrophoresis	High Performance Capillary Electrophoresis conference, Palm Spring
J.G. Labrie, <b>G.W. Slater</b>	Diffusion in Porous Systems with Binding: Exact Results	March Meeting of the American Physical Society, Atlanta
J.-F. Mercier, <b>G.W. Slater</b>	A New Method to Find Exact Diffusion Coefficients for Lattice systems with Periodic Boundary Conditions	March Meeting of the American Physical Society, Atlanta
Sylvain J. Hubert, <b>G.W. Slater</b>	Molecular Dynamics Study of a Tethered Polymer Chain in a Flow	March Meeting of the American Physical Society, Atlanta
<b>G.W. Slater</b> , G.I. Nixon	Entropic Trapping at Finite Concentrations	March Meeting of the American Physical Society, Atlanta
<b>K.S. Song</b>	Dynamic Processes Induced by Electronic Excitation in Insulators	Int. Conf. of Low Temperature Chemistry, Nagoya Japan
<b>Z.M. Stadnik</b>	Spectroscopic Studies of the Structure of Quasicrystals	Workshop on Quasicrystal Structure Analysis, Stuttgart, Germany
<b>J.S. Tse</b>		IUCr Congress (Glasgow)
<b>J.S. Tse</b>	Plenary Lecture	Division of Materials Physics at APS (Minnesota)
<b>J.S. Tse</b>		Taiwan-Canada (NRC) workshop

		on computational materials science (Taiwan)
<b>J.S. Tse</b>		IUPAC Workshop on Nanotechnology (Hong Kong)
<b>J.S. Tse</b>		International High Pressure Conference (Hawaii)
<b>J.S. Tse</b>		International Conference on Computation Physics (Japan)
<b>J.S. Tse</b>	Plenary lecture	Workshop on Computational Materials Science (Hong Kong).

## Other Presentations in 1999

Speaker(s)	Title	Location
R.K. Carnegie	IPP Director report	IPP AGM, Fredericton
S. Charbonneau	Picosecond Time-Resolved CMOS Imaging	National Chiao-Tung University, Taiwan
S. Charbonneau	Advanced Photonics Components Integration	Electronicast meeting San Mateo, California
R.L. Clarke	Old Physics for New Medicine	Laurentian University
S. Desgreniers	En route vers le centre de la Terre et autres itinéraires intéressants	Univ. de Montréal
S. Desgreniers	En route vers le centre de la Terre et autres itinéraires intéressants	Univ. Laval
S. Desgreniers	On the Physical Properties of Dense Solid Oxygen	Lawrence Livermore National Laboratory, Livermore CA
S. Desgreniers	New Opportunities for X-ray Microdiffractometry Using Synchrotron Radiation	NRC Workshop on the Applications of Synchrotron Radiation
S. Desgreniers	Angle Resolved X-ray Diffraction: Studying Novel Structures under High Pressure	CHESS Users' Meeting, Cornell University, Ithaca. NY
M. D'lorio	Science Career Week	University of Ottawa
M. D'lorio	Organic Light Emitting Devices in the Limelight	Queen's University
M. D'lorio	Dispositifs électro-luminescents organiques	Université de Sherbrooke
S. Fafard	Croissance et propriétés des points quantiques semiconducteurs de ~20nm	INRS, Varennes
S. Fafard	Self-Assembled Quantum Dots	Jet Propulsion Lab, Pasadena CA
S. Fafard	Nanostructures and quantum level limitations	Canadian Science Writer Association, Ottawa
E. Fortin	La Science a l'envers: from solar cells to Bose-Einstein condensation	Researcher of the year conference, University of Ottawa
C.L. Greenstock	Radiation Safety Issues at AECL. WTC Upgrade Project contract and AECL personnel	Chalk River Laboratories

C.L. Greenstock	Potential Biodosimeters and their Applications. Medical	Physics Department, McGill University
P. Hawrylak	Colloquium	University of Georgia
P. Hawrylak	Colloquium	University of Miami
P. Hawrylak	Colloquium	University of British Columbia
P. Hawrylak	Semiconductor group seminar	University of Sheffield, Sheffield, UK
P. Hawrylak	Colloquium	Max-Planck Institute, Stuttgart,
P. Hawrylak	Colloquium	Ludwig-Maximilian University, Munich
P. Hawrylak	Colloquium	Technical University of Wroclaw
B.J. Jarosz	Interstitial Ultrasound Applicators for Cancer Thermal Therapy	Biomedical Engineering Dept., McGill
P.C. Johns	X-Ray Imaging with Scattered Photons	Ottawa Work Group for Imaging Research
P.C. Johns	Medical X-Ray Scatter Imaging: Model and Cross-Section Data	Workshop on "ULAX in Medical Diagnostics" at Stanford University, CA
I. L'Heureux	Thermal anomaly and flow pattern in fractured overpressured zones: a simple model	University of Oslo, Norway
D. Karlen	Canadian Network report	ESnet international meeting, Paris
D. Karlen	HEPnet/Canada report	IPP general meeting, Fredericton
D. Karlen	Status of Canadian Networks	International Committee on Future Accelerators, SCIC, Chicago
A. Longtin	Forced and autonomous stochastic resonance in excitable systems	Physics Dept., Chungbuk National University, Cheongju, Korea
A. Longtin	Chaos control and information storage in delayed feedback dynamics	Physics Dept., Potsdam University, Germany
A. Longtin	Chaos control and multistability in differential delay equations	Institut fur Physik, Humboldt Universitat Berlin
A. Longtin	Stochastic differential delay equations	Institut fur Physik, Humboldt Universitat Berlin
A. Longtin	Assessing linear and nonlinear correlations between interspike intervals	Institut fur Physik, Humboldt Universitat Berlin

A. Longtin	Synchronization of biological receptors with application to electric fish	Institut fur Physik, Humboldt Universitat Berlin
A. Longtin	Stochastic and deterministic resonances in excitable systems	Institut fur Physik, Humboldt Universitat Berlin
B. McKee	Use of Monte Carlo Simulations in Nuclear Medicine Imaging	Ottawa Work Group on Imaging Research
M. Chamberlain, <b>B. McKee</b>	Nuclear Medicine Communications: Some Impacts of Networks and the Internet	City-Wide Nuclear Medicine Rounds, Ottawa
G.P. Raaphorst	Interactions of hyperthermia radiation and cisplatin	Combined Oncology Rounds, March 1999.
G.P. Raaphorst	Induced radiation resistance may be a clinical problem	Radiation Oncology Rounds, January 1999
G.P. Raaphorst	Radiation safety in medicine	Nurses symposium and workshop.
G. Santyr	Recent Research in MR Imaging of the Breast	Breast Cancer Action, Ottawa, September 1999.
G. Santyr	Hyperpolarized Xenon: A Novel Contrast Agent for MR Imaging	Ottawa Medical Physics Institute , December
G.W. Slater	DNA Free-Flow Electrophoresis and Hydrodynamics in narrow Channels	Motorola Research Centre, Tempe Arizona
G.W. Slater	The physics of the electrophoretic separation of DNA-protein complexes: Towards an ultra-fast gel-free capillary sequencing system	Rowland Institute for Science
G.W. Slater	ELFSE: Progress and Prospects	Perkin-Elmer, Foster City, California
G.W. Slater	Recent Developments in DNA Electrophoresis	Visible Genetics Inc., Toronto
G.W. Slater	Entropy: The Mysterious Factor that Affects Flexible Polyatomic Molecules and Macromolecules	National Institute of Chemistry (Kemijski Institute), Ljubljana (Slovenia)



## Technical Reports (unpublished) in 1999

Author(s)	Report
Brian Park and <b>Iain Calder</b>	Reverse Engineered Structure of an Electro-Absorption Modulator Wafer Using Photoreflectance Modulation Spectroscopy (Nortel Networks 1999).
C.L. Greenstock	Storage of Radioactive Material. AECL Radiation Protection Manual RPM-8.2, 1999.
C.L. Greenstock	Surface Contamination Monitoring for Combined Electrolysis and Catalytic Exchange Upgrading and Detritiation. AECL Report BSP-4201, 1999.
C.L. Greenstock	Exit Monitoring for Personnel and Equipment for Tritium Contamination. AECL Report BSP-4202, 1999.
C.L. Greenstock	Response to Tritiated Heavy Water and Tritiated Electrolyte Spills. AECL Report BSP-4203, 1999.
C.L. Greenstock	Bioassay Requirements for Combined Electrolysis and Catalytic Exchange Upgrading and Detritiation. AECL Report BSP-4204, 1999.
C.L. Greenstock	Response to Tritium-in-Air Alarm during Combined Electrolysis and Catalytic Exchange Upgrading and Detritiation. AECL Report BSP-4205, 1999.
C.L. Greenstock	Overhoff Tritium-in-Air Monitor Operation and Maintenance Procedures. AECL Report BSP-4206, 1999.
C.L. Greenstock	Response to Airborne and Particulate Tritium during Combined Electrolysis and Catalytic Exchange Upgrading and Detritiation. AECL Report BSP-4207, 1999.
C.L. Greenstock	Protective Clothing Requirements for Combined Electrolysis and Catalytic Exchange Upgrading and Detritiation. AECL Report BSP-4208, 1999.

## Members of the Institute in 1999

J.C. Armitage	High Energy Physics, Instrumentation	(C)
Ian Calder	Experimental Condensed Matter	(O- Adjunct)
Ian Cameron	Medical Physics	(C-Adjunct)
R.K. Carnegie	Experimental High Energy Physics	(C)
Sylvain Charbonneau	Semiconductor Physics	(O-Adjunct)
R.L. Clarke	Medical Physics	(C-Adjunct)
Joanna Cygler	Medical Physics	(C-Adjunct)
Serge Desgreniers	High Pressure Physics	(O)
Marie D'Iorio	Condensed Matter	(O-Adjunct)
Madhu Dixit	Experimental High Energy Physics	(C-Adjunct)
K.W. Edwards	Experimental High Energy Physics	(C)
P.G. Estabrooks	Experimental High Energy Physics	(C-Adjunct)
Simon Fafard	Semiconductor Physics	(O-Adjunct)
Emery Fortin	Semiconductor Physics	(O)
L.H. Gerig	Medical Physics	(C-Adjunct)
Stephen Godfrey	Theoretical Particle Physics	(C)
C.L. Greenstock	Medical Physics	(C-Adjunct)
C.K. Hargrove	Experimental High Energy Physics	(C-Adjunct)
Pawel Hawrylak	Theoretical Condensed Matter	(O-Adjunct)
R.J. Hemingway	Experimental High Energy Physics	(C-Adjunct)
Brian Hird	Ion Physics	(O-Adjunct)
R.J.W. Hodgson	Theoretical Nuclear Physics	(O)
B.J. Jarosz	Medical Physics	(C)
P.C. Johns	Medical Physics	(C)
Béla Joós	Theoretical Condensed Matter	(O)
Pat Kalyniak	Theoretical Particle Physics	(C)
Dean Karlen	Experimental High Energy Physics	(C)

Gilles Lamarche	Low Temperature Physics	(O-Adjunct)
M.A.R. LeBlanc	Superconductivity	(O)
Ivan L'Heureux	Nonequilibrium Processes in Nonlinear Systems	(O)
B.A. Logan	Nuclear Physics	(O)
André Longtin	Nonlinear Dynamics, Biophysics	(O)
M.J. Losty	Experimental High Energy Physics	(C-Adjunct)
Paul Marmet	Atomic and Molecular Physics	(O-Adjunct)
Barry McKee	Medical Physics	(C-Adjunct)
H.J.A.F. Mes	Experimental High Energy Physics	(C-Adjunct)
Cheng Ng	Medical Physics	(C-Adjunct)
Tony Noble	Experimental High Energy Physics	(C-Adjunct)
F.G. Oakham	Experimental High Energy Physics	(C)
Peter Piercy	Condensed Matter Physics	(O)
G.P. Raaphorst	Medical Physics	(C-Adjunct)
D.G. Rancourt	Solid State Magnetism	(O)
D.W.O. Rogers	Medical Physics	(C-Adjunct)
William Romo	Theoretical Nuclear and Particle Physics	(C)
Giles Santyr	Medical Physics	(C)
W.D. Sinclair	Solar Neutrino Physics	(C)
G.W. Slater	Polymer Physics	(O)
A.K.S. Song	Theoretical Studies in Solid State	(O)
Z.M. Stadnik	Electronic Structure and Magnetism	(O)
M.K. Sundaresan	Theoretical Particle Physics	(C)
John Tse	Theoretical Material Sciences	(O-Adjunct)
Y.P. Varshni	Theoretical Solid State, Astrophysics	(O)
P.J.S. Watson	Theoretical Particle Physics	(C)
J.C. Woolley	Semiconductor Physics	(O)
A. Waker	Medical Physics	(C- Adjunct)

## Graduate Students at the Institute in 1999

<b>Student</b>	<b>Registered</b>	<b>Supervisor(s)</b>	<b>Completed</b>
Al-Qadi, Khalid	(O) MSc Jan-97	Stadnik	
Bates, Bryce	(C) MSc Sep-99	Godfrey	
Benson, Eric	(O) PhD Sep-95	Fortin	June 1999
Boileau, Justin	(O) MSc May-99	Slater	
Cai, Aiguo	(O) MSc May-98	Piercy	
Chacron, Maurice	(O) PhD Sep-98	Longtin	
Chouinard, Christian	(O) MSc Sep-97	Desgreniers	June 1999
Dalnoki-Veress, Ferenc	(C) PhD Sep-95	Hargrove	
Desruisseaux, C	(O) PhD Jan-95	Slater	December 1999
Donkers, Michael	(C) PhD Sep-97	Hemingway	
Evans, James	(O) MSc Sep-98	Rancourt, Tse	
Feagan, Carey	(C) MSc Sep-99	Ng	
Gao, Zhanrong	(C) MSc Sep-99	Gerig	
Gauthier, Yvan	(C) MSc Jan-98	Cameron	
Gorjanc, Timothy	(O) MSc Sep-97	D'Iorio	January 1999
	(O) PhD Jan-99	D'Iorio	
Grant, Darren	(C) PhD Sep-98	Noble	
Guillouzic, Steve	(O) PhD Jan-96	L'Heureux, Longtin	
Hadjifaradji, Saeed	(O) PhD Jan-92	Marchand	
Haysom, Joan	(O) PhD Sep-97	Charbonneau	
Hewitt, Tanya	(C) MSc Sep-96	McKee	April 1999
Hinzer, Karin	(O) PhD Sep-98	Charbonneau, Fafard	
Hubert, Sylvain	(O) PhD Sep-96	Slater	
Jelveh, Salomeh	(C) MSc Sep-99	Jarosz	

Kalach, Nina	(C) MSc Sep-99	Rogers	
Katsev, Sergei	(O) PhD May-99	L'Heureux	
Kizilian, Narine	(C) MSc Sep-97	Raaphorst	December 1999
Labrie, Josée	(O) MSc Sep-98	Slater	
Lagarec, Ken	(O) PhD Jan-96	Rancourt	
Lam, Jennifer	(O) PhD Sep-97	D'Iorio	
Leclair, Robert	(C) PhD Sep-94	Johns	
Li, Mei	(C) MSc Sep-98	Johns, Dixit	
Li, Ming Yu	(O) MSc Sep-96	Stadnik	
Masse, Mathieu	(O) MSc May-99	Slater	
McDonald, Mark	(C) MSc Sep-98	Santyr	
Mercier, Jean-Francois	(O) MSc Sep-97	Slater	May 1999
	(O) PhD May-99	Slater	
Mercier, Patrick	(O) PhD Sep-96	Rancourt	
Myint, Kenji	(C) MSc Sep-98	Raaphorst	
Nadeau, Charles	(O) PhD Sep-94	Marmet	January 1999
Niedbala, Malgorzata	(C) PhD Jan-99	Raaphorst	
Nixon, Grant	(O) PhD Sep-94	Slater	
Nkongchu, Ken	(C) MSc Sep-99	Santyr	
Owen, Daron	(C) MSc Sep-97	Ng	
Rezeq, Moh'd	(O) PhD May-99	LeBlanc	
Riel, Bruno	(O) PhD Sep-97	Piercy	
Sevigny, Pascale	(C) MSc Sep-97	Santyr	September 1999
Sheikh-Bagheri, Daryoush	(C) PhD Sep-93	Rogers	January 1999
Smith, Debbie	(C) MSc Sep-97	Raaphorst	
St-Hilaire, Martin	(O) MSc Jan-98	Longtin	
Tessier, Frederic	(O) PhD Sep-99	Slater	

Towers, Sherry	(C) PhD Sep-93	Karlen	
Valdes, Marcelo	(C) MSc Sep-97	Sundaresan	
Waller, David	(C) PhD Sep-97	Karlen	
Wang, Wei	(C) PhD Sep-98	Armitage	withdrew Sept. 99
Wassenaar, Richard	(C) MSc Sep-99	McKee	
Weimin, Hou	(O) PhD May-99	Desgreniers	
Wismayer, Matthew	(C) MSc Sep-99	Johns	
Zhou, Jian	(O) PhD Sep-97	Joós	withdrew Mar. 99

## Research Associates at the Institute in 1999

<b>Name</b>	<b>Period</b>	<b>Supervisor(s) or Group</b>
Steve Breeze		G. Santyr
Albert Cross		G. Santyr
Claude Desruisseaux	1999 -	G.W. Slater
Jacques Dubeau	January 1995 -	M.S. Dixit
Jacques Farine	January 1998 -	D. Sinclair
Chun-Rong Fu		K.S. Song
Pauline Gagnon	April 1996 – September 1999	OPAL/Carleton - CRPP
Tom Junk	April 1998 -	OPAL/Carleton
Basim Kamal	October 1998 -	S. Godfrey and P. Kalyniak
Peter Krieger		ATLAS/Carleton
Steve Lang		G. Santyr
Ilan Levine	June 1997 -	D. Sinclair
Marc Pépin	1998 -	G.W. Slater
Hongji Ren	1997 - 1999	G.W. Slater
Michal Shatkay	October 1992 - January 1999	D. Sinclair
Julia Wallace		G. Santyr
John White	May 1998 -	OPAL/Carleton
Hongyan Zhou	1997 -	G.W. Slater
Zicong Zhou	April 1999 – July 1999	B. Joós