

# Ottawa Carleton Institute for Physics

## L'Institut de physique d'Ottawa

### Carleton

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## 2002 Newsletter

The year 2002 was a very active year for the Institute and its 62 members across the areas of research, teaching, and service to the community. The total number of graduate students increased to 76 during the year.

Richard Hodgson was the Director of the Institute for 2002. Gerald Oakham became the Associate Director. Two new members joined the Institute in 2002. Thomas Brabec is a regular professor, and is a theorist in the area of ultrashort laser physics. He arrives from Vienna as a Tier I Canada Research Chair in Ultrafast Photonics. Stephan Mihailov becomes an adjunct professor in the area of electrophotonics. Also, Xiaoyi Bao was awarded a Tier I Canada Research Chair in Fiber Optics and Photonics.

The SNO project continued to make headlines. Most noteworthy is the publication of "Direct Evidence for Neutrino Flavor Transformation from Neutral-Current Interactions in the Sudbury Neutrino Observatory" The SNO Collaboration, Phys. Rev. Lett. volume 89, No. 1, 011301 (2002). The impact of this discovery can be gauged both from the worldwide coverage of the news and by the decision of the American Institute of Physics and by the Science Magazine to choose the SNO result as one of the top two breakthroughs of the year 2002.

In June of 2002 the first of two calorimeter detector modules built by the Carleton ATLAS group were shipped to CERN Geneva. These modules were assembled in the Herzberg physics buildings using parts from Russia, China and many intricate copper components machined by Carleton's Science and Technology center. The Carleton modules will form part of the ATLAS calorimeter system that will measure the energy flow of particles produced by the collision of protons in the middle of the detector. The ATLAS detector is located on the Large Hadron Collider ring at CERN Geneva. The LHC produces proton collisions with a center of mass energy of 14 TeV at high luminosity. This combination of energy and luminosity will allow the exploration of a new regime of fundamental reactions and will hopefully elucidate the origin of particle masses.

Pawel Hawrylak was the recipient of the 2002 CAP Brockhouse Medal for outstanding contribution to Condensed Matter Physics. He was also appointed Associate Editor of the Canadian Journal of Physics.

Andre Longtin received the Faculty of Science Researcher of the Year Award, and Serge Desgreniers received the Faculty of Science Teacher of the Year Award.

Béla Joós became the Vice-President Elect of the CAP in June 2002, and has been nominated for the presidency for 2003. Marie D'lorio completed her term as Past President of the CAP in June 2002.

A sampling of how members of the Institute provided service to their national and international research communities and to their university community included the following:

Pawel Hawrylak was a IUPAP C8 (Semiconductors) Commission Member, as well as a Member of the Program Committee for the International Conference "Quantum Dots 2002", Tokyo, Japan, 2002 and a Member of the International Advisory Committee for the International Conference on High Magnetic Fields in Semiconductors Oxford, UK, 2002

Gary Slater became Vice Dean of the Faculty of Graduate and Postdoctoral Studies for a three-year term. He became a member of the Scientific Advisory Committee, Institut sur les Matériaux et Systèmes Intelligents (IMSI), at the Université de Sherbrooke. He was a Guest Editor for a special issue of the journal "Electrophoresis" entitled "Fundamental Studies in Separation Science". He became Member of the Board of Trustees for the High Performance Computing Virtual Laboratory (HPCVL) (U of Ottawa, Carleton, Queen's and RMC). Finally, he became Member of the Steering Committee for Condensed Matter Physics in the Reallocation Process of NSERC.

Richard Hodgson continued as the Secretary-Treasurer of CAP. Bela Joos was also appointed to GSC 28 of NSERC for three years. Andre Longtin served as a Member of the International Scientific Committee for the International Conference on Fluctuations and Noise, Washington, DC, 2001.

Clive Greenstock served as an Editor for the Health Physics journal in 2002. He also served as an invited reviewer for the NSERC Industrial Research Assistance Program (IRAP), and the University-Industry Research Partners Program. Further, he was the AECL-CAF liaison and Base Petawawa Team Leader during the Provincial Nuclear Emergency Exercise in 2002. Finally, he served as chief judge, Renfrew County Regional Science Fair, Pembroke, April 2002, and as a scientific adviser for the Canada-wide Science Fair, Calgary AB, May 2002.

M.Sc. student Graham Ferrier received the prize for "the most innovative paper" prize at the Intelligent Sensor and Innovative Structures (ISIS) Canada Annual Conference in Winnipeg (May 2002). Michel Gauthier won one of the three Lumonics awards for the best student presentation at the Annual Congress of the Canadian Association of Physicists, Québec City in June.

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.

Andre Longtin, Interim Director (replacing Richard Hodgson for Jan.-June 2003)

Gerald Oakham, Associate Director

## 2002 OCIP Seminar Series

### SPRING GRADUATE STUDENT SEMINAR DAY

University of Ottawa – 17 May 2002

9:00 a.m. - Maurice Chacron;  
Correlation Improved Signal Detection in Neurons.

9:30 a.m. - Guillaume Belanger;  
Models of Extra Dimensions and their Signals in  
the ATLAS Detector.

10:00 a.m. - Michel Gauthier;  
A Lattice Model for Gel Electrophoresis.

10:30 a.m. - Coffee Break

11:00 a.m. - Serguei Katsev;  
Pattern Formation in the Genesis of Natural Minerals.

11:30 a.m. - Marco Carlone;  
Radiobiological Parameter Estimation for a Predictive  
Tumor Control Model for Prostate Cancer.

12:00 - Jamie Ramsey;  
A Look at the Optical Properties of InGaAsN.

### FALL GRADUATE STUDENT SEMINAR DAY

University of Ottawa, December 3, 2002

9:30- Elena Olariu: "Monte Carlo studies of the Magnetic  
Resonance diffusion decay"

10:00 - Xiaodong Zeng: "Characterization and Application of  
Brillouin Scattering Based Distributed Fiber Optic Sensor"

10:30 BREAK: MacDonald 148 ☺ coffee will be served

11:00- Marcelo Valdes: "Tree level processes in QED in the LF;  
formulation of electro-weak theory in LF"

11:30- Simona Crisan: "Equilibrium dynamics of random linear  
polymers"

12:00 - Darren Grant: "Salt phase signal extraction at the Sudbury  
Neutrino Observatory"

OCIP Christmas Symposium – Carleton  
University – Friday, December 20, 2002

- 9:00 - John Armitage      Photonics, biophotonics and all that
- 9:30 - Liang Chen      Polarization mode dispersion and Polarization dependent loss in single mode fiber communication network
- 10:00 - Madhu Dixit      A time projection chamber for physics at the next  $e^+e^-$  collider.
- 10:30 – 11:00 am      Coffee Break
- 11:00 - Thomas Brabec      Strong laser field physics – from attochemistry to nuclear spectroscopy
- 11:30 – David Sinclair      SNO Project – Past, present and future
- 12:00 - Ivan L'Heureux      Muddy Dynamics: Modelling the evolution of lake sediments.

## 2002 Departmental Seminars

Name:	Institute	Title	Date	
Mark Chen	Queen's University	Neutrino Astrophysics with Liquid Scintillators	Jan.7, 2002	C
Ronald D. Settles	MPI, Munich	e+e- Linear Collider: Status of Machine/Physics/Detector Studies	Jan.14, 2002	C
Grant Nixon	MDS Nordion	A Survey of Applied Radiation Physics at MDS Nordion	Jan.21, 2002	C
Ranpal Dosanjh	Cambridge, UK	Direct CP violation measurement at NA48	Jan.28, 2002	C
CAP – Seminar: Andrew Kerr and John Schreiner	Kingston Regional Cancer Center	Medical Physics and Cancer: RAidation Delivery and Dose Measurement in Three Dimensions	Thursday, February 7, 2002	O
Dr. Martin E. Fermann	Chief Technical Officer, Fiber Products, Boston Laser Inc. Norwood Massachusetts	Fiber Lasers and Other Methods of Coherent Light Generation.	Friday, February 8, 2002	O
David London	U. Montreal	CP Violation in the B System: Present and Future	Feb. 11, 2002	C
Donald Plewes	University of Toronto	Micro-Scale Motion Imaging with MRI and MRI Elastography	Feb.25, 2002	C
Randy Lewis	U. Regina	Phenomenology from Lattice QCD	March 4, 2002	C
Jonathan R. Ellis	CERN	Beyond the Standard Model	March 15, 2002	C
Raymond Laflamme	Waterloo	Quantum Computing Carleton CAP Lecture for Undergraduate students	March 18, 2002	C
Lothar Lilge	U. Toronto	Biophotonics for biotechnology	March 25, 2002	C
John Katsaras	Steacie Institute for Molecular Sciences, NRC	Physics, Biomaterials and Neutrons	Thursday, April 11, 2002	O
Dr. Stephan J. Mihailov	Communications Research Centre	Recent research in the optical communications and electrohphotonics group at the communications research centre.	Thursday, April 18, 2002	O

Maxim S. Pschenichnikov	Dept. Chemistry, University of Groningen, The Netherlands	Ultrafast Liquid State Dynamics: The case of electron in water	Friday, May 10, 2002	O
Albrecht Wagner	U. Hamburg (Director of DESY)	TESLA	May 21, 2002	NRC
Kirsten Sachs	Carleton U	Electroweak Physics at LEP2 - an overview	October 21, 2002	C
Jeffrey L. Hutter	Dept. Physics and Astronomy University of Western Ontario	Controlling Crystallization Kinetics at the Molecular Level	Sept. 26 <sup>th</sup> , 2002	O
James R. Rustad	William R. Wiley Environmental Molecular Sciences Laboratory, Richland, Washington	Molecular simulation of chemical processes at oxide-water interfaces.	Oct. 24, 2002	O
Andy Adler	SITE, U. Ottawa	Electrical Impedance Tomography- Image Reconstruction and Applications	October 28, 2002	C
Frédéric Ghogomu	PDF Candidate to the LSSE Group: D. Rancourt	Simulating Reactive Transport in Discretely-Fractured Media	Oct. 31, 2002	O
Marc Pepin	Smart & Biggar, 900-55 Metcalfe Street Ottawa, On.	Intellectual Property and Patents	Nov. 7, 2002	O
Stephen Mihailov	CRC, Ottawa	Recent Research in the Optical Communications and Electrophotonics Group at the Communications Research Centre	Nov.18, 2002	C
Gary Slater	Physics Dept. U. of Ottawa	The Pseudo-Sciences in the 21 <sup>st</sup> Century: the Social Responsibility of the Scientists	Nov. 21, 2002	O
Paul Finnie	Institute for Microstructural Sciences, NRC, Montreal Rd., Ottawa, On.	The growth of semiconductor materials on the Nanometer Scale	Nov. 28, 2002	O
W.O. Rogers	Institute for National Measurement Standards – NRC, Ottawa	Radiation Transport by Monte Carlo- From High Energy Physics to the Clinic	Nov.28, 2002	C

## Publications in Refereed Journals and Book Series in 2002

Author(s)	Title	Publication
X. Zeng, <b>X. Bao</b> , C. Chhoa, T. Bremner, A. Brown, M. DeMerchant	Strain measurement in a concrete beam using the Brillouin scattering base distributed fibers sensor with single mode fibres imbedded in GFRP rod and bonded to steel reinforcing bars	Applied Optics, 41, No. 27, 5105-5114 (2002).
<b>X. Bao</b> , C. Huang, X. Zeng, A. Arcand and P. Sullivan	The strain and temperature monitoring of the composite with a Brillouin scattering based distributed fibre sensor	Optics Engineering, Vo. 41, No. 7, 1496-1501 (2002).
N. Milosevic, V. P. Krainov, and <b>T. Brabec</b>	Semiclassical Dirac theory of tunnel ionization	PRL 89, 193001 (2002)
N. Milosevic, V. P. Krainov, and <b>T. Brabec</b>	Relativistic theory of tunnel ionization	J. Phys. B 35, 3515 (2002)
M. Kitzler, N. Milosevic, A. Scrinzi, and <b>T. Brabec</b>	Quantum theory of attosecond pulse measurement by laser dressed photoionization	Phys. Rev. Lett. 88, 173904 (2002)
N. Milosevic, A. Scrinzi, and <b>T. Brabec</b>	Ab initio numerical characterization of high harmonic attosecond pulses	Phys. Rev. Lett. 88, 093905 (2002)
A. Scrinzi and <b>T. Brabec</b>	Theory of attosecond pulse characterization	Laser Physics 12, 377 (2002)
A. Shen, E.M. Griswold, G. Hillier, L. Dang, A. Kuhl, R. Arès, D.Clark, and <b>I.D. Calder</b>	Determination of Structural Parameters in Heterojunction Bipolar Transistors by X-ray Diffraction with (002) Reflection	J. Vac. Sci. Technol. A 20, 1011 (2002)
D. Ban, E.H. Sargent, St.J. Dixon-Warren, <b>I.D. Calder</b> , A.J. SpringThorpe, R. Dworschak, G. Este, and J.K. White	Direct Imaging of the Depletion Region of an InP p-n Junction Under Bias Using Scanning Voltage Microscopy	Appl. Phys. Lett. 81, 5057 (2002)
D. Ban, E.H. Sargent, St J. Dixon-Warren, <b>I.D. Calder</b> , T. Grevatt, G. Knight, and J.K. White	Two-Dimensional Transverse Cross-Section Nanopotentiometry of Actively-Driven Buried-Heterostructure Multiple-Quantum-Well Lasers	J. Vac. Sci Technol. B 20, 2401 (2002)
R.P. Lu, K.L. Kavanagh,	Scanning Spreading Microscopy Current	J. Vac. Sci Technol. B 20,



St.J. Dixon-Warren, A.J. SpringThorpe, R. Streater, and <b>I.D. Calder</b>	Transport Studies on Doped III-V Semiconductors	1682 (2002).
D. Waddy, <b>L. Chen and X. Bao</b>	State of polarization bias in aerial fibres	Electronics Lett. 38, 1086-1087 (2002).
D. Waddy, <b>L. Chen and X. Bao</b>	Theoretical and experimental study of the dynamics of the polarization mode dispersion	IEEE Photonics. Lett.14, 468-470 (2002).
<b>Stephen J. Mihailov</b> , Robert B. Walker, Trevor J. Stocki, Humin Ding and <b>Liang Chen</b>	UV-induced polarization dependent loss (PDL) in tilted fiber Bragg gratings: application of a PDL equalizer	IEE Proc.-Optoelectronics, vol. 149 pp.211-216 (2002)
P. Lu, <b>L. Chen, X. Bao</b>	System outage probability due to the combined effect of PMD and PDL	IEEE J. Lightwave Technol. 20, No.10, 1805-1808 (2002)
Federico A. Gorelli , Lorenzo Ulivi , Mario Santoro , Michael Hanfland, <b>Serge Desgreniers</b>	X-ray Diffraction of Oxygen Under Pressure in a Neon Medium	High Pressure Research <b>22</b> , 13 (2002).
C. Ni. Allen, P. J. Poole, P. Marshall, J. Fraser, <b>S. Raymond, and S. Fafard</b>	InAs self-assembled quantum-dot lasers grown on (100) InP	Appl. Phys. Lett. 80, 3629 (2002).
B.J.Riel, K.Hinzer, S.Moisa, J.Fraser, <b>P.Finnie, P.Piercy, S.Fafard</b> , Z.R.Wasilewski	InAs/GaAs(1 0 0)self-assembled quantum dots:arsenic pressure and capping effects	Journal of Crystal Growth 236 145-154 (2002).
<b>E. Fortin</b> , A.Merizzi, P.J. Leblanc	Optical Probing of an exciton condensate	Nonlinear Optics 29, 211-217 [2002]
L.Kulyuk, E. Bucher, L. Charron, <b>E. Fortin</b> , A. Nateprov, O. Shenker	Bound exciton luminescence of intercalated layer compounds	Nonlinear Optics 29, 501-506 [2002].
<b>S. Godfrey, P. Kalyniak</b> , and N. Romanenko	Discovery Potential for doubly charged Higgs bosons in $e^+e^-$ collisions at LEP	Phys.Lett. <u>B545</u> , 361-366, 2002
<b>S. Godfrey, P. Kalyniak</b> , and N. Romanenko	Signatures of doubly charged Higgs bosons in $e\gamma$ collisions	Phys. Rev. <u>D65</u> , 033009, 2002
Jordan Kyriakidis, M. Piro-Ladriere, M.	Voltage-tunable singlet-triplet transition in	Phys. Rev. B 66, 035320

- Ciorga, A. S. Sachrajda, lateral quantum dots (2002).  
and **P. Hawrylak**
- M. Ciorga, M. Pioro-Ladriere, P. Zawadzki, Tunable Negative Differential Resistance J.Appl.Phys.(2002)  
**P. Hawrylak**, A. S. controlled by Spin Blockade in Single  
Sachrajda Electron Transistors
- M. Ciorga, A. Collapse of the Spin-Singlet Phase in Phys. Rev. Lett. 88, 256804  
Wensauer, M. Pioro- Quantum Dots (2002)  
Ladriere, M.  
Korkusinski, J.  
Kyriakidis, A. S.  
Sachrajda, **P. Hawrylak**
- M. Bayer, G. Ortner, O. Fine structure of neutral and charged Phys. Rev. B 65, 195315  
Stem, A. Kuther, A. A. excitons in self-assembled InGaAs/AlGaAs (2002).  
Gorbunov, A. Forchel, quantum dots  
**P. Hawrylak**, **S. Fafard**,  
and K. Hinzer, T. L.  
Reinecke and S. N.  
Walck, J. P. Reithmaier,  
F. Klopff, and F.  
Schafer
- J. Urdanivia, F. Iikawa, Quenching of the exciton-spin relaxation Phys. Rev. B 65, 115336  
M. Z. Maialle, J. A. via exchange interaction in GaAs/Al[sub (2002)  
Brum, **P. Hawrylak**, and x]Ga[sub 1 - x]As quantum wells  
Z. Wasilewski ,
- M.Korkusinski, Negatively charged exciton on a quantum Physica Status Solidi 234 ,  
**P.Hawrylak**,M.Bayer ring 273 ( 2002)
- R.J. Leclair and **P.C. Optimum Momentum Transfer Arguments Medical Physics 29, 2881-  
Johns** for X-Ray Forward Scatter Imaging 2890 (2002)
- Zicong Zhou and **Béla Fluctuation formulae for the elastic Phys. Rev. B 66, 054101-(1-  
Joós** constants of an arbitrary system 7)(2002)
- Katsev,S.and Autocatalytic model of oscillatory zoning in Phys. Rev. E 66: 066206  
**L'Heureux, I.** experimentally grown (Ba,Sr)SO<sub>4</sub> solid (2002).  
solution.
- L'Heureux, I.** and A model of oscillatory zoning in solutions Geochim. Cosmochim Acta  
Jamtveit, B. grown from aqueous solutions: application 66: 417-429 (2002)  
to the (Ba,Sr)SO<sub>4</sub> system,
- A. Longtin** Phase locking and resonances for **Fluctuations and Noise  
Letters 2**, 183-211 (2002)  
stochastic excitable systems (invited review paper)
- Lindner, B., Maximizing spike train coherence and **Phys. Rev. E. 66**, 031916.

Schimansky-Geier, L. and <b>A. Longtin</b>	incoherence in the leaky integrate-and-fire model	(2002)
<b>Longtin, A.</b> , Doiron, B. and Bulsara, A.R.	Noise-induced divisive inhibition in simple neuron models	<b>Biosystems 67</b> , 147-156 (2002)
Laing, C. and <b>Longtin, A.</b>	A two-variable delay-differential model of somatic-dendritic interactions in bursting neurons	<b>Bull. Math. Biol.</b> 64/5, 829-860. (2002)
Laing, C., Doiron, B., <b>Longtin, A.</b> and Maler, L.	Ghostbursting: The effects of dendrites on spike patterns.	<b>Neurocomputing 44-46</b> , 127-132 (2002)
Redmond, B., Leblanc, V.G. and <b>Longtin, A.</b>	Bifurcation analysis of a class of first-order nonlinear delay-differential equations with reflectional symmetry	<b>Physica D 166</b> , 131-146 (2002)
Engbert, R., <b>Longtin, A.</b> and Kliegl, R.	A dynamical model of saccade generation in reading based on spatially distributed lexical processing	<b>Vision Res. 42</b> , 621-636.(2002)
Doiron, B., Laing, C.R., <b>Longtin, A.</b> and Maler, L	Ghostbursting: A novel neuronal burst mechanism	<b>J. Comput. Neurosci. 12</b> , 5-25. (2002)
Qutob, S. and <b>Ng, C.E.</b>	Comparison of apoptotic, necrotic and clonogenic cell deaths and inhibition of cell growth following camptothecin and X-radiation treatments in a human melanoma and a human fibroblast cell line	Cancer Chemother. Pharmacol., 49: 167-175, 2002
<b>Ng, C.E.</b> , Qutob, S., Pavliv, M., Lamarche, P., Mao, J.P. and <b>Raaphorst, G.P.</b>	Hsp 27 is better associated with the expression of thermotolerance in human pancreatic tumor cell lines than hsp 70, p53 or p21/waf1/cip1.	J. Therm. Biol., 27: 47-54, 2002
A. Cai and <b>P. Piercy</b>	Morphology of the rutile (110) surface after low sputter dose and annealing	Phys. Rev. B 66, 115414 (2002)
B.J. Riel, K. Hinzer, S. Moisa, J. Fraser, <b>P. Finnie, P. Piercy, S. Fafard, Z.R. Wasilewski,</b>	InAs/GaAs(100) self-assembled quantum dots: arsenic pressure and capping effects	J. Crystal Growth 236, 145 (2002)
<b>Raaphorst, G.P., Ng, C.E.</b> and Yang, D.P.	Comparison of response to hyperthermia, radiation and cisplatin in parental and polymerase $\beta$ knockout cells.	Int. J. Hypertherm., 15: 33-39, 2002
Owen, D.G., J. McNamee, <b>G.P. Raaphorst</b> and <b>Ng, C.E.</b>	Potentiation of low dose rate irradiation by camptothecin is related to an increase in the level of DNA double strand breaks	Rad. Res., 157: 149-157, 2002.
<b>G.P. Raaphorst, S.</b>	Skin fibroblasts in vitro radiosensitivity can	Rad. Therapy and Onc. 64:

Malone, G. Alsbeih, L. Souhani, E. Szumacher and A. Girard	predict for late complications following AVM radiosurgery	153-156, 2002
W.K. Myint and <b>G.P. Raaphorst</b>	Examining the non-homologous repair process in cisplatin and radiation treatments.	Int. J. Rad. Biol. 78: 417-424, 2002
H.E. Abbot Howley and <b>G.P. Raaphorst</b>	Comparison of repair and rejoining fidelity between two idogenic human ovarian carcinoma cell lines	Int. J. Rad. Biol. 78(12): 1095-1102, 2002.
Lang S., I.L. Moudrakovski, C.I. Ratcliffe, J.R. Ripmeester and G.E. Santyr	Increasing the Spin-Lattice Relaxation Time of Hyperpolarized Xenon Ice at 4.2K	App. Phys. Lett. <b>80</b> , 886 (2002).
<b>G. W. Slater</b> , F. Tessier, S. Guillouzic, L. C. McCormick, M. G. Gauthier, J.-F. Mercier, M. Kenward, Y. Gratton	Theory of DNA Electrophoresis: Recent Developments (~1999-2002½),	Electrophoresis 23, 3791-3816. (2002)
M. G. Gauthier, <b>G. W. Slater</b>	An Exactly Solvable Ogston Model of Gel Electrophoresis IX: Generalizing the lattice model to treat high field intensities	J. Chem. Phys. 117, 6745-6756
<b>G. W. Slater</b>	A theoretical study of an empirical function for the mobility of DNA fragments in sieving matrices.	Electrophoresis, 23, 1410-1416
F. Tessier, <b>G. W. Slater</b>	Strategies for the separation of polyelectrolytes based on non-linear dynamics and entropic ratchets in a simple microfluidic device	Applied Physics A 75, 285-291
W. N. Vreeland, <b>G. W. Slater</b> , A. E. Barron	Profiling Solid-Phase Synthesis Products by Free-Solution Conjugate Capillary Electrophoresis.	Bioconjugate Chemistry, 13, 663-670.
S. Guillouzic, L. C. McCormick, <b>G. W. Slater</b>	Electrophoresis in the presence of gradients I: Viscosity gradients.	Electrophoresis, 23, 1822-1832.
F. Tessier, <b>G. W. Slater</b>	Electrophoretic separation of long polyelectrolytes in submolecular-size constrictions: a Monte Carlo study	Macromolecules, 35, 4791-4800.
G. I. Nixon and <b>G. W. Slater</b>	Saturation and entropic trapping of monodisperse polymers in porous media.	J. Chem. Phys., 117, 4042-4046
<b>Z.M. Stadnik</b> , O. Rapp, V. Srinivas, J. Saida, and A. Inoue		J. Phys. Condens. Matter 14, 6883-6896 (2002)

<b>Y.P. Varshni</b>	Binding energy of a hydrogenic impurity in a 2D circular quantum dot	Superlattices Microstruct. 30, 253-259 (2001)
<b>Y.P. Varshni</b>	Excited states of 2D-excitons in quantum wells	Can. J. Phys. 80, 781-786 (2002).
<b>Y. P. Varshni</b>	Scaling Relation for the Energy Levels of a Hydrogen Atom at High Pressures	Z. Naturforsch. 57a, 915-918 (2002)
<b>R.L.Williams,</b> G.C.Aers, J.Lefebvre, P.J.Poole, and D.Chithrani	Quantum dot site-deletion using in situ prepared nano-templates.	Physica E,13, 1200 (2002) .
J.Lefebvre, P.J.Poole, J.Fraser, G.C.Aers, D.Chithrani and <b>R.L.Williams</b>	Self-assembled InAs quantum dots on InP nano-templates	J. Cryst. Growth,234, 391 (2002).
J.A. Gupta, Z.R. Wasilewski, B.J. Riel, J. Ramsey, G.C. Aers, <b>R.L. Williams,</b> G.I. Sproule, A. Perovic, D.D. Perovic, T. Garanzotis and A.J. SpringThorpe	Compositional Control in Molecular Beam Epitaxy Growth of GaN <sub>y</sub> As <sub>1-y</sub> on GaAs (001) Using an Ar/N <sub>2</sub> Plasma	J. Cryst. Growth 242, 141-154 (2002).
J.-Y.Duboz, J.A. Gupta, Z.R. Wasilewski, J. Ramsey, <b>R.L. Williams,</b> G.C. Aers, B.J. Riel and G.I. Sproule	Band-gap energy of In <sub>x</sub> Ga <sub>1-x</sub> NyAs <sub>1-y</sub> as a function of N content	PRB 66, 85313 (2002).
J.Lefebvre, P.J.Poole, G.C.Aers, D.Chithrani and <b>R.L.Williams</b>	Tunable emission from InAs quantum dots on InP nanotemplates	J. Vac. Sci. Technol B,20, (2002) .
C. Possanzini, L. Ponomarenko, D. de Lang, A. de Visser, S. M. Olsthoorn, R. Fletcher, Y. Feng, P. T. Coleridge, <b>R.L.</b> <b>Williams,</b> J. C. Maan	Scaling behaviour of metal-insulator transitions in a Si/SiGe two dimensional hole gas	Physica E12 600 (2002).

## SNO PUBLICATIONS

**Carleton Members:** A.Bellerive, C.K.Hargrove, R.J.Hemingway,  
D.Sinclair X.Dai, F.Dalnoki-Veress, R.Dosanjh,  
D.Waller D.Grant, E.Rollin, O.Simard, G.Tesic  
C.Mifflin

"Direct Evidence for Neutrino Flavor Transformation from Neutral-Current Interactions in the Sudbury Neutrino Observatory"  
The SNO Collaboration, Phys. Rev. Lett. volume 89, No. 1, 011301 (2002).

"Measurement of Day and Night Neutrino Energy Spectra at SNO and Constraints on Neutrino Mixing Parameters"  
The SNO Collaboration, Phys. Rev. Lett. volume 89, No. 1, 011302 (2002).

## OPAL PUBLICATIONS

**Carleton members:** R.K. Carnegie, M.S. Dixit, M. Donkers, P.G.  
Estabrooks, R.J. Hemingway, T. Junk, D. Karlen, P.  
Krieger, M.J. Losty, H. Mes, F.G. Oakham, K. Sachs,  
S. Towers, D. Waller, J. White

Charged particle multiplicities in heavy and light quark initiated events above the Z0 peak  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B550 (2002) 33-46

Measurement of the b quark forward-backward asymmetry around the Z0 peak using an inclusive tag  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B546 (2002) 29-47

Search for Scalar Top and Scalar Bottom quarks at LEP  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B 545 (2002) 272-284

Measurement of neutral-current four-fermion production at LEP2  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B 544 (2002) 259-273

Search for associated production of massive states decaying into two photons in e+e- annihilation at  $\sqrt{s}=88-209$  GeV  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B544 (2002) 44-56

Search for charged excited leptons in e+e- collisions at  $\sqrt{s}=183-209$  GeV  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B544 (2002) 57-72

Measurement of the charm structure function  $F_{2,c}$  of the photon at LEP  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B539 (2002) 13-24

Measurement of the hadronic photon structure function  $F_2^\gamma$  at LEP2  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B 533 (2002) 207-222

Search for leptoquarks in electron-photon scattering at  $\sqrt{s_{ee}}$   
up to 209 GeV at LEP  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B 526 (2002) 233-246

Search for doubly charged Higgs bosons with the OPAL detector at LEP  
OPAL Collaboration, G. Abbiendi et al.  
Phys. Lett. B 526 (2002) 221-232

Search for Yukawa production of a light neutral Higgs boson at LEP  
OPAL Collaboration, G. Abbiendi et al.  
Eur. Phys. J. C23 (2002) 397-407

Particle multiplicity of unbiased gluon jets from  $e^+e^-$  3-jet events  
OPAL Collaboration, G. Abbiendi et al.  
Eur. Phys. J. C23 (2002) 597-613

Measurement of the hadronic cross-section for the scattering of two  
virtual photons at LEP  
OPAL Collaboration, G. Abbiendi et al.  
Eur. Phys. J. C24 (2002) 17-31

Measurement of  $Z/\gamma^*$  production in Compton scattering of  
quasi-real photons  
OPAL Collaboration, G. Abbiendi et al.  
Eur. Phys. J. C24 (2002) 1-15

Search for single leptoquark and squark production in electron-photon  
scattering at  $\sqrt{s_{ee}}=189$  GeV at LEP  
OPAL Collaboration, G. Abbiendi et al.  
Eur. Phys. J. C23 (2002) 1-11

Investigation of the decay of orbitally excited B mesons and first  
measurement of the branching ratio  $BR(B_{J^*} \rightarrow B^* \pi(X))$   
OPAL Collaboration, G. Abbiendi et al.  
Eur. Phys. J. C23 (2002) 437-454

Comparison of deep inelastic electron-photon scattering data with the  
Herwig and Photjet Monte Carlo models  
OPAL Collaboration, G. Abbiendi et al.  
Eur. Phys. J. C23 (2002) 201-223

## Publications in Refereed Conference Proceedings in 2002

Author(s)	Title	Conference/Publication
<b>X. Bao</b> , Anthony Brown, Jeff Smith	Temperature and strain measurements using the power, line-width, shape and frequency shift of the Brillouin loss spectrum with a distributed fiber sensor and their field applications	Proc. SPIE Vol. 4920, p. 311-322, Advanced Sensor Systems and Applications (2002).
<b>X. Bao</b>	Distributed temperature and strain sensing for civil structural applications	invited talk, 1st World Congress on Biomimetics and Artificial Muscles, Dec. 9-11 (2002), Albuquerque, USA
X. Zeng, <b>X. Bao</b> , G. Ferrier, Q. Yu and G. Wu	Long term health monitoring of a nuclear reactor structure with a distributed Brillouin sensor	1st World Congress on Biomimetics and Artificial Muscles, Dec. 9-11 (2002), Albuquerque, USA
X. Zeng, Y. Yu, G. Ferrier and <b>X. Bao</b>	Strain and temperature monitoring of a concrete structure of nuclear reactor using a distributed Brillouin sensor	1st International Workshop on Structural Health Monitoring of Innovative Civil Engineering Structures, September 19-20 (2002), Winnipeg, Canada., pp.207-216.
Z. Liu, G. Ferrier, <b>X. Bao</b> , X. Zeng, Q. Yu, K.A. Kim	Brillouin Scattering Based Distributed Fiber Optic Temperature Sensing for Fire Detection	7th International Symposium on Fire Safety Science, Worcester, Massachusetts, USA, June 16-21 (2002)
K. Al-Qadi, D. Waddy, <b>L. Chen</b> , <b>X. Bao</b>	Simultaneous optical spectral loss and chromatic dispersion measurements of chirped fiber Bragg grating using phase shift technique	International Conference on Applications of Photonic Technology 2002. Proceeding of SPIE, Vo. 4833, p.1033-1037
<b>L. Chen</b> , DS Waddy, <b>X. Bao</b>	The Dynamics of Polarization Mode Dispersion in Field Fibers	Invited Talk, International Conference on Applications of Photonic Technology 2002. Proceeding of SPIE, Vo. 4833, p.1093-1096.
O. Chen, P. Lu, <b>L. Chen</b> and <b>X. Bao</b>	Automated Measurements of PMD and PDL over Fiber Bragg Grating's Reflection Wavelength	International Conference on Applications of Photonic Technology 2002. Proceeding of SPIE, Vo. 4833, p.1017-1020.



P. Lu, <b>L. Chen</b> and <b>X. Bao</b>	Comparison of the Combined Effect of PMD and PDL on 10 and 40 Gbits/second Systems	International Conference On Applications of Photonic Technology 2002. Proceeding of SPIE, Vo. 4833, p.1084-1088.
P. Lu, <b>L. Chen</b> and <b>X. Bao</b>	A New Waveplate Model of CharacteringtheSystem Impact Due to PMD	International Conference on Applications of Photonic Technology 2002. Proceeding of SPIE, Vo. 4833, p.1089-1092.
D. Waddy, <b>L. Chen</b> and <b>X. Bao</b>	A novel dynamical polarization mode dispersion emulator	International Conference on Applications of PhotonicTechnology 2002. Proceeding of SPIE, Vo. 4833, p.1080-1083.
D. Waddy, <b>L. Chen</b> and <b>X. Bao</b>	On dynamic field fiber polarization mode dispersion measurements	International Conference on Applications of Photonic Technology 2002. Proceeding of SPIE, Vo. 4833, p.1116-1120.
D. Waddy, <b>L. Chen</b> and <b>X. Bao</b>	On the dynamics of polarizationmode dispersion	OFC'2002(OpticalFibre Communication Technical), page 451-452.
J. S. Loveday, R. J. Nelmes, D. Klug, J. Tse, and <b>S. Desgreniers</b>	Structural Systematics in Clathrate Hydrates under Pressure	Physics and Chemistry of Ice Conference 2002. Can. J. Phys.
C. Ni. Allen, P. J. Poole, P. Marshall, <b>S. Raymond</b> , and <b>S. Fafard</b>		Microelectronics Journal, <i>in press</i>
H.C.Liu, J.-Y.Duboz, R.Dudek, Z.R.Wasilewski, <b>S.Fafard</b> , <b>P.Finnie</b>	Quantum dot infrared photodetectors	Physica E 17, 631–633 (2003).
<b>P.Hawrylak</b> , M.Korkusinski, <b>S.Fafard</b> , R.Dudek, H.C.Liu	Photo-current spectroscopy of modulation doped InAs self-assembled quantum dots	Physica E 13 246 –250 (2002).
M. Bayer, G. Ortner, A. Forchel, <b>P. Hawrylak</b> and <b>S. Fafard</b>	Fine structure of excitons: a sensitive tool for probing the symmetry of self-assembled quantum dots	Physica E,13 , 123 ( 2002)
M. Korkusinski, <b>P. Hawrylak</b> , M. Bayer, G. Ortner, A. Forchel, <b>S. Fafard</b> and Z. Wasilewski	Entangled states of electron-hole complex in a single InAs/GaAs coupled quantum dot molecule	Physica E 13, 610 (2002).

<b>P. Hawrylak</b> , F. J. Teran, M. Potemski and G. Karczewski	Band-gap renormalization and photoluminescence from an interacting two-dimensional electron gas in a magnetic field	Physica E 12, 495 ( 2002).
M. Bayer, G. Ortner, A. Larionov, V. Timofeev, A. Forchel, <b>P. Hawrylak</b> , K. Hinzer, M. Korkusinski, <b>S. Fafard</b> and Z. Wasilewski	Entangled exciton states in quantum dot molecules	Physica E: 12,900( 2002).
<b>R.J.W. Hodgson</b>	Particle Swarm Optimization Applied to the Atomic Cluster Optimization Problem	Proceedings of the Genetic and Evolutionary Computation Conference, GECCO 2002, New York, 9-13 July 2002. Morgan Kaufmann, pp.68-73.
<b>P.C. Johns</b> , J. Dubeau, D.G. Gobbi, M. Li, and <b>M.S. Dixit</b>	Photon-Counting Detectors for Digital Radiography and X-Ray Computed Tomography	Opto-Canada: SPIE Regional Meeting on Optoelectronics, Photonics, and Imaging, SPIE TD01, 367-369 (Ottawa, 10 May 2002)
<b>P.C. Johns</b> , R.J. Leclair, and M.P. Wismayer	Medical X-Ray Imaging with Scattered Photons	Opto-Canada: SPIE Regional Meeting on Optoelectronics, Photonics, and Imaging, SPIE TD01, 355-357 (Ottawa, 9 May 2002)
M.B. Chertok et al including <b>S. Godfrey</b> and <b>P. Kalyniak</b>	Report of the Subgroup on Alternative Models and New Ideas. Contributed to APS / DPF / DPB Summer Study on the Future of Particle Physics (Snowmass 2001), Snowmass, Colorado, 30 Jun - 21 Jul 2001	SNOWMASS-2001-P345, Jan 2002, 10pp
Mayda M. Velasco et al including <b>S. Godfrey</b> and <b>P. Kalyniak</b>	Photon photon and electron photon colliders with energies below a TeV	SNOWMASS-2001-E3005, Jan 2002, 29pp
Middleton, J.W., Chacron, M.J., Lindner, B. and <b>Longtin, A</b>	Correlated noise and memory effects in neural firing statistics	AIP Proceedings 665, "Unsolved Problems on Noise IV" Washington, DC, Sept. 2002, pp.183-190

## Other Conference Presentations and Posters in 2002

Author(s)	Title	Conference
G. Ferrier, X. Zeng, Q. Yu, S. Afshar, and <b>X. Bao</b>	Field tests with distributed sensing	ISIS Annual Meeting, Winnipeg, May 1-3, 2002.
<b>X. Bao</b>	Strain sensing on concrete structures with Brillouin sensor	ISIS Annual Meeting, Winnipeg, May 1-3, 2002
<b>X. Bao</b>	"PMD and PDL in optical transmission system".	Ottawa Photonics Research Alliance) Workshop , April 24 2002
<b>A. Bellerive</b>	The SNO collaboration	CUPC2002, Dalhousie U.
<b>A. Bellerive</b>	The SNO collaboration	2nd SNOLAB Workshop, Ottawa, Ontario, November 21-22 2002
<b>T. Brabec</b>	Many body strong laser field processes	Gordon conference for multiphoton processes, (invited) Tilton July 2002
<b>T. Brabec</b>	Attosecond photonics	Optical Society of America Annual Meeting, (invited), Orlando Sept. 2002.
<b>T. Brabec</b>	Strong laser field physics	Workshop on Quantum Control, (invited) Montreal Oct. 2002
<b>R. Carnegie</b>	Progress towards a Future e+e- Linear Collider	CAP conference, Quebec City, June 2002
<b>L. Chen</b>	The Dynamics of Polarization Mode Dispersion in Field Fibers	International Conference on Applications of Photonic Technology 2002 (Invited)
<b>L. Chen</b>	Polarization Mode Dispersion and Polarization Dependent Loss in Single Mode Fiber Communication Networks	Canadian Mathematical Society Winter Meeting 2002 (Invited)
<b>S. Desgreniers</b> , D.D. Klug,, <b>J.S. Tse</b> , and John Loveday	Crystalline Structures of Dense Ar, Kr, and Xe Hydrates	CLS Users Meeting, Saskatoon, SK. November 2002
J. S. Loveday, R. J. Nelmes, M. Guthrie, D. Klug, <b>J. Tse</b> , and S. <b>Desgreniers</b>	High-pressure structural systematics in clathrate hydrates	EHPRG, Glasgow, Scotland, Sept. 2002.
J. S. Loveday, R. J. Nelmes, M. Guthrie, D. Klug, <b>J. Tse</b> , and S.	New Structural Systematics in type-I and type-II clathrate hydrates at	Gordon Research Conference "Research at High Pressure",

<b>Desgreniers</b>	high pressures	Meriden, NH, USA , June 2002
<b>S. Desgreniers</b> , J. S. Loveday, D. Klug, and <b>J. Tse</b>	Structural Phase Transition in Dense Xenon Hydrates	Invited poster, Gordon Research Conference "Research at High Pressure", Meriden, NH, USA , June 2002
<b>S. Desgreniers</b> , J. S. Loveday, D. Klug, and <b>J. Tse</b>	Structural Phase Transition in Dense Krypton, Argon, and Xenon Hydrates	CHES Users Meeting, June 2002
<b>S. Desgreniers</b> , R. Flacau , I. Lepage , <b>J. Tse</b> , D. Klug	High Pressure Studies of Si Clathrates	CLS Users Meeting. Saskatoon, November 2002
<b>P. Hawrylak</b>	invited talk NATO Advanced Research Workshop on Theory of Phenomena in High Magnetic Fields,	LesHouches, France, March 2002
<b>P. Hawrylak</b>	Magneto-optics of inhomogeneous electron gas	key speaker NATO Advanced Research Workshop, St.Petersburg, Russia, June 2002.
<b>P. Hawrylak</b>	Quantum Dots	Brockhouse plenary lecture Canadian Association of Physicists Congress, Quebec City, June 2002.
<b>P. Hawrylak</b>	Spin of electronic droplets in quantum dots	invited talk Rashba Symposium on Frontiers in Spintronics Cambridge, MA, June 2002
<b>P. Hawrylak</b>	Excitonic artificial atoms for single photon sources	invited talk 5'th International Conference on Excitonic Processes in Condensed Matter Darwin, Australia, July 2002
<b>P. Hawrylak</b>	Manipulating charge and spin of single electrons and polarisation of single photons in quantum dots	invited talk, ONR Workshop on Multifunctional Materials, Pucon, Chile, October 2002.
<b>P.C. Johns</b> , M.P. Wismayer, and R.J. Leclair	The Need for Cross Section Data for Medical X-Ray Scatter Imaging	5th AnnualUsers' Meeting of the Canadian Light Source, Saskatoon, Saskatchewan , Nov. 2002
<b>P.C. Johns</b>	Analysis of Dual-Energy Imaging using Energy-Scoring Photon Counters	44th annual Conf.Am. Assoc. Physicists in Medicine, and Canadian Organization of Medical

		Physicists, Montreal, July 2002
Michael Plischke and <b>Joós, Béla</b>	Effect of solvent on structure and rheology near the gel point	APS Meeting, Indianapolis IN, March 2002
Fournier L. and <b>Joós, B.</b>	Peptide driven kinetics of the rupture of lipid bilayer membranes	CAP Congress, Quebec City, Physics in Canada, 58 (no. 3), p. 95 (2002)
<b>A. Longtin</b>	Learning neural computing from electric fish	BIOCOMP2002: Topics in Biomathematics and Related Computational Problems, Intern. Conf. to be held in Vietri sul Mare, Italy, June 2002 (invited talk)
<b>A. Longtin</b>	Correlation and feedback in neural networks of the weakly electric fish.	European Society of Math. And Theor. Biology Annual Meeting, Session on Nonlinear methods in neural modelling, Milan, Italy, July 2002 (invited talk)
<b>A. Longtin</b>	Deterministic and stochastic neural modeling. (5 classes).	Lecturer, European Soc. for Math. and Theor. Biology, Summer School on Mathematical Physiology, Urbino, Italy, July 2002.
<b>A. Longtin</b>	Stochastic dynamics of biological information processing: reading and task allocation.	Canadian Mathematical Society Annual Meeting, Ottawa, Dec.2002 (invited talk)
M. Chacron, B. Doiron, L. Maler, <b>A. Longtin</b> and J. Bastian	Receptive field mediated shift in neuronal encoding	Gordon Research Conf. On Neural information theory, June 2002
J. Benda, M. St-Hilaire, A. Herz and <b>A. Longtin</b>	Effect of noise on the encoding properties of two fundamental types of neurons.	Computational Neurosciences Meeting, Chicago, July.
M. Chacron, B. Doiron, L. Maler, <b>A. Longtin</b> , J. Bastian	The non-classical receptive field mediates a shift in coding from low to high frequency stimuli.	Society for Neurosciences Annual Meeting, New Orleans.
B. Doiron, M. Chacron, L. Maler, <b>A. Longtin</b> , J. Bastian	Inhibitory feedback required for discrimination of prey and communication stimuli in weakly electric fish.	Society for Neurosciences Annual Meeting, New Orleans.
C. Laing and <b>A. Longtin</b>	A two-variable delay-differential model of bursting dynamics.	Fourth Intern. Conf. On Dynamical Systems and Differential Equations, to be held in Wilmington, NC, May 2002
B. Doiron, C. Laing, L. Maler and <b>A. Longtin</b>	Dynamics of a novel bursting mechanism.	SIAM Life Sciences Meeting, Boston, March 2002.
C. Laing and <b>A. Longtin</b>	Noise-induced stabilization of bumps in nets of excitable cells.	SIAM Life Sciences Meeting, Boston, March 2002.
M. Chacron, L. Maler and	Intrinsic interspike interval	SIAM Life Sciences Meeting,

<b>A. Longtin</b>	correlations increase information transfer in neurons.	Boston, March 2002.
Li, Y. J., Banerjee, S., Franks, D. J., Wilkins, R. C., Stewart, D.J., <b>Ng, C.E.</b> and Goel, R	Cisplatin cytotoxicity in MDCK cells	93rd Annual Meeting of the American Association for Cancer Research, San Francisco, CA, 2002.
<b>Ng, C.E.</b> , Multani, A.S., Pathak, S., Kendal, W.S. and Qutob, S.S.	Isolation and characterization of clones with non-overlapping radiation and drug responses from a human colorectal tumor cell line	49 <sup>th</sup> Annual Radiation Research Society Meeting, Reno, NV, 2002
Qutob, S.S., Liu, Q.Y., Walker, P.R. and <b>Ng, C.E.</b>	DNA microarray studies of radiation-resistant and radiation-sensitive human colorectal cancer clones	49th Annual Radiation Research Society Meeting, Reno, NV, 2002.
Niedbala, M., <b>Ng, C.E.</b> and <b>Raaphorst, G.P.</b>	Evaluation of the response of two isogenic breast carcinoma cell lines to combined hyperthermia and pulsed dose-rate X-radiation	of 49th Annual Radiation Research Society Meeting, Reno, NV, 2002.
A. Cai and <b>P. Piercy</b>	Morphology of the rutile (110) surface after low sputter dose and annealing	Surface Canada Conference, Ottawa, 2002.
<b>P. Raaphorst</b>	Adaptive responses to radiation and drugs. Implications in radiotherapy	Sherbrooke University, Sherbrooke, Quebec. 5 <sup>ieme</sup> Colloque en sciences des radiations. October 2002.
P. Raaphorst	Adaptive responses to radiation and drugs. Implications in radiotherapy and industry	MacMaster University, Hamilton, Ontario. Radiation Health Physics Workshop. November 2002.
G.P. Raaphorst, K. Myint, L. Lifang and <b>C.E. Ng.</b>	The evaluation of recombinational repair process in response to cisplatin and/or radiation.	Radiat. Res. 49 <sup>th</sup> Conference, Reno, Nevada pg. 155 P26-271, 2002.
M.C. Carlone, <b>D. Wilkins</b> and <b>G.P. Raaphorst</b>	The use of dose response studies in the determination of the $\alpha/\beta$ ratio for prostate cancer	Radiat. Res. 49 <sup>th</sup> Conference, Reno, Nevada, pg. 177, P37-365, 2002.
M.C. Carlone, <b>D.E. Wilkins, G.P. Raaphorst</b>	Radiobiological parameter estimation for a predictive tumour control model for early state prostate carcinoma	American Association of Physicists in Medicine Annual Meeting, Montreal, Quebec, 2002.
M.C. Carlone, <b>D.E. Wilkins, G.P. Raaphorst</b>	Radiobiological parameter estimation for a predictive tumour control model for early stage prostate carcinoma	11 <sup>th</sup> International Brachytherapy Conference, Santa Fe, New Mexico, June 2002.
<b>D.G. Rancourt</b>	Mössbauer spectroscopy of mud: Towards modeling complex environmental processes	Mössbauer spectroscopy of mud: Towards modeling complex environmental processes. Invited Plenary Lecture (1 of 8), LACAME-02, Panama City,

<b>D.G. Rancourt</b>	RecoilTM: Its development, its structure, and examples of its use.	September 22-27, 2002. (Latin American Conference on the Applications of the Mössbauer Effect) Invited Plenary Talk (1of 8), LACAME-02, Panama City, September 22-27, 2002
K. Lagarec and <b>D.G. Rancourt</b>	Mössbauer spectroscopy provides a definitive solution to the Invar problem.	Selected oral, LACAME-02, Panama City, September 22-27, 2002.
<b>D.G. Rancourt</b> , P.H.J. Mercier, E.J. Evans, M. Grodzicki, A.A.T. Shabani, and A.E. Lalonde.	Resolving the hydrogen-loss and vacancy reactions in the oxidation of Fe-bearing layer silicates.	Poster, LACAME-02, Panama City, September 22-27, 2002.
<b>D.G. Rancourt</b> , M.-Z. Dang, P.-J. Thibault, S. Bonneville, T. Behrends, P. Van Cappellen.	Hematite ( -Fe <sub>2</sub> O <sub>3</sub> ): A complex oxyhydroxide system inspiring sustained fascination among Mössbauer spectroscopists.	Poster, LACAME-02, Panama City, September 22-27, 2002.
<b>D.G. Rancourt</b> , N. Sabourin, M.-Z. Dang, C. van der Zee, D. Roberts and P.-J. Thibault.	Recoil Mössbauer spectral analysis software applied to complex natural samples	Poster, LACAME-02, Panama City, September 22-27, 2002.
Simionescu R., A.R. Cross, <b>G.E. Santyr</b> , S. Lang, I. Moudrakowski, J.A. Ripmeester and C. Ratcliffe,	Laser Polarizing System for Hyperpolarized Xenon (H-Xe) MR Imaging of the Lungs	Opto 2002 Conference (SPIE), Ottawa, 2002.
Wallace J.C., A.R. Cross, <b>G.E. Santyr</b> , D. McPhee and J. Cheetham	Pharmacokinetics of Hyperpolarized <sup>129</sup> Xe in a Perfluorocarbon Emulsion Injected in a Hollow-Fibre Capillary Model of a Breast Tumor	Intl. Society of Magnetic Resonance in Medicine, Honolulu 2002.
Cron G.O., J.C. Wallace, W.D. Stevens, T. Fortin, B.A. Pappas, R.C. Wilkins, F. Kelcz and <b>G.E. Santyr</b>	A Comparison of T <sub>2</sub> *-weighted Magnitude and Phase Imaging Techniques for Measuring the Arterial Input Function in the Rat Aorta following Intravenous Injection of Gd Contrast Agent	Intl. Society of Magnetic Resonance in Medicine, Honolulu 2002.
Wallace J.C., A.R. Cross and <b>G.E. Santyr</b>	MR Imaging of a Injectible Perfluorocarbon Emulsion Carrying Hyperpolarized Xenon for Monitoring Breast Tumour Blood Flow	AAPM/COMP Meeting, Montreal 2002.
Simionescu R. A.R. Cross and <b>G.E. Santyr</b>	Measurement of Lung Volume Using Hyperpolarized Xenon Magnetic Resonance Imaging	AAPM/COMP Meeting, Montreal 2002.
Parra-Robles J.M., A. R. Cross and <b>G.E. Santyr</b>	, Low Field MR Imaging Using Hyperpolarized Xenon	AAPM/COMP Meeting, Montreal 2002.

<b>D. Sinclair</b>	The International Facility for Underground Science	Invited talk, International Conference on Dark Matter, York, UK September 2002
<b>D. Sinclair</b>	The Sudbury neutrino Observatory	Symposium on the Tenth Anniversary of the LVD, November 2002, Gran Sasso, Italy
<b>D. Sinclair</b>	The International Facility for Underground Science	Invited Talk, Conference on Rare Event Detection with Time Projection Chambers, Paris December 2002.
<b>G. W. Slater</b>	Electrophoresis of Composite (charged-uncharged) Molecules: From Gels to Free-Flow	<b>Invited talk</b> at the 19th Annual Meeting of The American Institute of Chemical Engineers (Joint with The Electrophoresis Society), Indianapolis, 3-8 November
B. Buchholz, A. E. Barron, M. Kenward, <b>G. W. Slater</b> , J. Zahn	Preparing Monodisperse High Polymers Via Chain Scission in Transient Extensional Flow	Oral presentation at the 19th Annual Meeting of The American Institute of Chemical Engineers (Joint with The Electrophoresis Society), Indianapolis, 3-8 Nov
<b>G. W. Slater</b>	Nonlinear dynamics, entropy and microfluidics	<b>Invited talk</b> at the Annual Congress of the Canadian Association of Physicists, Québec City, June
S. Guillouzic, <b>G. W. Slater</b>	Entropy-driven polymer translocation in the presence of hydrodynamic interactions	Oral presentation at the Annual Congress of the Canadian Association of Physicists, Québec City, June
M. G. Gauthier, <b>G. W. Slater</b>	Calcul exact de la mobilité pour des systèmes avec des conditions frontières périodiques en présence d'un champ externe	Oral presentation at the Annual Congress of the Canadian Association of Physicists, Québec City, June.
F. Tessier, <b>G. W. Slater</b>	Separation of long polyelectrolytes in a microfluidic channel with constrictions : a Monte-Carlo study	<b>Invited Talk</b> at the Nanotech 2002 – ICCN – MSM Congress, Porto Rico, April 22-25.
<b>G. W. Slater</b> , L. C. McCormick, S. Guillouzic	Viscosity gradients and their effect on capillary electrophoresis resolution	Oral presentation at the March Meeting of the American Physical Society, Indianapolis.
M. Kenward, <b>G. W. Slater</b>	Molecular dynamics simulations of polymer collisions	Oral presentation at the March Meeting of the American Physical Society, Indianapolis.
L. C. McCormick, <b>G. W. Slater</b> , B. Tinland	Experimental investigation of the Ogston model for electrophoresis using calibrated matrices	Poster presentation at the March Meeting of the American Physical Society, Indianapolis.



<b>M. G. Gauthier, G. W. Slater</b>	A lattice model of the Ogston regime of gel electrophoresis: generalization to treat high electric field intensities	Poster presentation at the March Meeting of the American Physical Society, Indianapolis.
<b>R. Williams</b>	Directed Self-Assembly of Quantum Dot Nanostructures	Invited Presentation at the Canadian Institute for Advanced Research meeting on Nanoelectronics, Banff, Alberta, November (2002)

## Other Presentations in 2002

<b>Speaker(s)</b>	<b>Title</b>	<b>Location</b>
<b>X. Bao</b>	Fibre optic sensing and communications	Centre for Research in Photonics at U of Ottawa, June 7, 2002
<b>X. Bao</b>	Optical fibres and fibre lasers for biophotonics applications	Ottawa Photonics Research Alliance, June 13, 2002
<b>X. Bao</b>	Fibre Raman Amplifiers	Intelligent Photonics Control Company, July 4, 2002
<b>X. Bao</b>	Transient effects in fibre Raman amplifier	Intelligent Photonics Control Company, July 24, 2002
<b>X. Bao</b>	Fundamentals of Fiber Lasers	Intelligent Photonics Control Company, Nov. 1, 2002
<b>L. Chen</b>	Polarization Mode Dispersion and Polarization Dependent Loss in Single Mode Fiber Communication Networks	OCIP Christmas Symposium 2002
<b>S. Fafard</b>	Les Nanostructures Semiconductrices et leur rôles dans le Futur de la Photonique	Université de Sherbrooke, June 2002,
<b>C.L. Greenstock</b>	Performance Measures used in Radiation Protection and the Development of a Radiation Index	Site Safety & Health Committee, Chalk River Laboratories, January 21, 2002
<b>C.L. Greenstock</b>	Radiation Protection Issues Concerning Food in the Controlled Area 2	CANDU Technical Development Group, Chalk River Laboratories, December 07, 2002.
<b>C.L. Greenstock</b>	Tritiated Water and Airborne Hazards, Instrumentation for their Detection and Risk Estimation.	Chalk River Laboratories, May 2002
<b>P. Hawrylak</b>		Vienna University of Technology, Vienna, Austria (2002)
<b>P. Hawrylak</b>		Autonoma Universidad de Madrid, Madrid, Spain (2002)
<b>P. Hawrylak</b>		University of Waterloo, Waterloo, Canada (2002)(colloquium);

<b>P. Hawrylak</b>		Pontifica University de Santiago de Chile, Chile (2002)(colloquium)
<b>R. Hemingway</b>	LEP is dead .. long live the standard model of particle physics	26 Mar 2002 , Colloquium, York U.
<b>R. Hemingway</b>	Particle Physics: large Machines and great success	27 Nov 2002 , Seminar to Sigma-Xi, NRC
<b>P. Johns</b>	Radiologic Quality Assurance and the Role of the Physicist	Medical Physics Group, Centre hospitalier de l'Université de Montréal, Dec. 2002
<b>P. Johns</b>	Dual-Energy Radiography	Dept. of Physics and Astronomy, Laurentian University, Dec. 2002
<b>P. Johns</b>	The Medical X-Ray Scatter Imaging	Dept. of Medical Physics, Saskatoon Cancer Centre, Nov. 2002
<b>P. Johns</b>	Medical X-Ray Imaging with Scattered Photons	Université de Montréal, Jan. 2002
<b>A. Longtin</b>	Modelisation de l'activite neuronale electrosensorielle.	INSERM, Groupe de Biologie Theorique, Paris, July 2002.
<b>P. Raaphorst</b>	Research in Radiation Oncology	Ottawa Regional Cancer Centre May 2002
<b>P. Raaphorst</b>	Research in Medical Physics at the Ottawa Regional Cancer Centre	Radiation Oncology/Physics, Princess Margaret Hospital, September 2002.
<b>D. Sinclair</b>	The International Facility for Underground Science	TRIUMF, September 2002
<b>D. Sinclair</b>	Latest Results from SNO	OCICP Christmas Symposium, December 2002

## Technical Reports (unpublished) in 2002

C.L. Greenstock	Food Pass Procedure for Use in a Controlled Area 2	Chalk River Laboratories Publication CW-12-02, 2002
C.L. Greenstock	Authorization for Food Consumption in Controlled Area 2 Lunch Rooms	CRL Publication WM08.04.01, 2002.
C.L. Greenstock	Authorization for Food Consumption in a Controlled Area 2 for Medical Reasons	CRL Publication WM08.04.02, 2002.
C.L. Greenstock	Radiation Protection Program Review for 2002	AECL Report RadP-01900-QAPR-002, 2002.
C.L. Greenstock	Personnel and Equipment Monitoring for Tritium Contamination	AECL Report BSP-4203, 2002.

## Members of the Institute in 2002

J.C. Armitage	Instrumentation / Photonics	C
Xiaoyi Bao	Fiber Optics	O
Thomas Brabec	Photonics	O
A. Bellerive	Experimental High Energy Physics	C
Ian Calder	Semiconductor Physics	O- Adjunct
Ian Cameron	Medical Physics	C-Adjunct
R.K. Carnegie	Experimental Particle Physics	C
Sylvain Charbonneau	Semiconductor Physics	O-Adjunct
Liang Chen	Photonics	O
R.L. Clarke	Medical Physics	C-Adjunct
Joanna Cygler	Medical Physics	C-Adjunct
Robert deKemp	Medical Physics	C-Adjunct
Serge Desgreniers	High Pressure Physics	O
Marie D'Iorio	Semiconductor Physics	O-Adjunct
Madhu Dixit	Experimental Particle 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 Particle Physics	C
R.J.W. Hodgson	Condensed Matter Theory	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 Particle Physics	C
G. Lam	Medical Physics	C-Adjunct
Gilles Lamarche	Low Temperature Physics	O-Adjunct
M.A.R. LeBlanc	Superconductivity	O
Ivan L'Heureux	Non-linear Dynamics	O
B.A. Logan	Nuclear Physics	O
André Longtin	Nonlinear Dynamics, Biological Physics	O
Barry McKee	Medical Physics	C-Adjunct
H.J.A.F. Mes	Experimental Particle Physics	C-Adjunct
Stephan Mikhailov	Electrophotonics	O-Adjunct
R. Munger	Medical Physics	O-Adjunct
Cheng Ng	Medical Physics	C-Adjunct
Tony Noble	Experimental Particle Physics	C-Adjunct
F.G. Oakham	Experimental Particle Physics	C
Peter Piercy	Surface Physics	O
G.P. Raaphorst	Medical Physics	C-Adjunct
D.G. Rancourt	Earth and Planetary Materials	O
Sylvain Raymond	Experimental Condensed Matter	O-Adjunct
D.W.O. Rogers	Medical Physics	C-Adjunct
Giles Santyr	Medical Physics	C
Ken Shortt	Medical Physics	C-Adjunct
W.D. Sinclair	Solar Neutrino Physics	C
G.W. Slater	Polymer Physics	O
A.K.S. Song	Condensed Matter Theory	O
Z.M. Stadnik	Experimental Condensed Matter	O
M.K. Sundaresan	Theoretical Particle Physics	C
John Tse	Computational Physics	O-Adjunct
Y.P. Varshni	Theoretical Solid State, Astrophysics	O

T. Waker	Medical Physics	C-Adjunct
P.J.S. Watson	Theoretical Particle Physics	C
Robyn Williams	Semiconductor Physics	O-Adjunct
R. Wilkins	Medical Physics	C-Adjunct
D. Wilkins	Medical Physics	C-Adjunct)
J.C. Woolley	Semiconductor Physics	O

## Graduate Students at the Institute in 2002

<b>Student</b>	<b>Registered</b>	<b>Supervisor(s)</b>	<b>Completed</b>
Abdeen, Nishard	(C) MSc Sep-02	Santyr	
Allen, Claudine	(O) PhD Jan-01	Fafard, Raymond	
Al-Qadi, Khalid	(O) PhD Sep-01	Bao	
Awirothananon, Sunida	(O) Ph.D. Sept-02	Fafard, Raymond	
Belanger, Guillaume	(C) MSc Sep-00	Oakham	Completed M.Sc.
Boileau, Justin	(O) MSc May-99	Slater	
Buckley, Lesley	(C) PhD Sep-01	Rogers	
Bueti, Diego	(O) MSc Sep-00	Longtin	
Carlone, Marco	(C) PhD Sep-00	Raaphorst	
Chacron, Maurice	(O) PhD Jan-00	Longtin	
Charron, Luc	(O) M.Sc. Sept -02	Fortin	
Chen, Ou	(O) MSc Sep-01	Bao	
Crisan, Simona	(O) MSc Sep-00	Slater	
Dalnoki-Veress, Ferenc	(C) PhD Sep-95	Hargrove	Completed Ph.D.
Doiron, Brent	(O) PhD May-01	Longtin	
Donkers, Michael	(C) PhD Sep-97	Hemingway	
Evans, James	(O) PhD May-01	Rancourt	
Ferrier, Graham	(O) MSc Sep-00	Bao	
Flacau, Roxana	(O) MSc Sep-01	Desgreniers	
Fournier, Luc	(O) MSc Sep-00	Joós	submitted
Gao, Zhanrong	(C) PhD Sep-01	Gerig	
Ghasroddashti, Esmaeel	(C) PhD Jan-02	Gerig	
Gauthier, Michel	(O) MSc Jan-01	Slater	
Gherase, Mihai	(C) PhD Sep-01	Santyr	
Girard, Jean-François	(O) MSc Sep-01	Williams	
Gorjanc, Timothy	(O) PhD Jan-99	D'lorio	



Grant, Darren	(C) PhD Sep-98	Noble	
Gratton, Yannick	(O) MSc Jan-02	Slater	
Hasan, Ziaul (Mohammed)	(C) MSc Sep-01	Johns	
Hnatovsky, Kyrylo	(O) PhD Sept-02	Brabec	
Hubert, Sylvain	(O) PhD Sep-96	Slater	
Jelveh, Salomeh	(C) MSc Sep-99	Jarosz	Completed
Katsev, Sergei	(O) PhD May-99	L'Heureux	Completed
Kenward, Martin	(O) PhD May-01	Slater	
Knight, Gary	(O) PhD Sep-00	Hodgson, Smy	
Korkusinski, Marek	(O) PhD Sep-01	Hawrylak	
Larsson, Carey	(C) PhD Jan-02	DeKemp	
Leblanc, Pierre	(O) MSc Sep-01	Fortin	
Leblanc, Serge	(O) MSc Sept-02	Bao	
Martinez, Jose	(C) PhD Sep-01	Jarosz	
McCormick, Laurette	(O) PhD May-01	Slater	
Mercier, Jean-Francois	(O) PhD May-99	Slater	
Mercier, Patrick	(O) PhD Sep-96	Rancourt	
Middleton, Jason	(O) PhD Sep-01	Longtin	
Mullins, Dana	(C) MSc Sep-01	Ng	
Myint, Kenji	(C) PhD Sep-01	Raaphorst	
Nezamzadeh, Marzieh	(C) PhD Jan-02	Cameron	
Niedbala, Malgorzata	(C) PhD Jan-99	Raaphorst	
Nisar, Mohammad	(C) MSc Sep-02	Johns	
Nixon, Grant	(O) PhD Sep-94	Slater	
Nkongchu, Ken	(C) PhD Sep-01	Santyr	
Olariu, Elena	(C) MSc Sep-00	Cameron	
Parra Robles, Juan	(C) PhD Jan-00	Santyr	
Prévost, Jean-Paul	(O) PhD Jan-01	Rancourt	
Ramsey, Jamie	(O) MSc Sep-00	Williams	
Rezeq, Moh'd	(O) PhD May-99	LeBlanc	

Riel, Bruno	(O) PhD Sep-97	Piercy	Completed July02
Simard, Oliver	(C) MSc Sep-02	SNO	
Schram, Malachi	(C) PhD Sep-02	Oakham	
Tesic, Gordana	(C) MSc Sep-02	SNO	
Tessier, Frederic	(O) PhD Sep-99	Slater	
Truica, Sorina	(C) PhD Sep-02	Cameron	
Turmel, Pierre	(C) MSc Sep-02	SNO	
Valdes, Marcelo	(C) MSc Sep-97	Sundaresan	
Waldron, Derek	(O) MSc Sept-02	Hodgson	
Walker, Robert	(O) MSc Sep-01	Bao	
Waller, David	(C) PhD Sep-97	Karlen	
Wang, Pu	(O) MSc Jan-01	Stadnik	
Wassenaar, Richard	(C) MSc Sep-99	deKemp	
White, Stephen	(C) MSc Sep-02	Santyr	
Wind, Andrew	(C) MSc Sep-02	McKee	
Yamasaki, Kristy	(O) MSc Sep-02	Hodgson	
Yu, Qinrong	(O) PhD Jan-01	Chen, Bao	
Zeng, Xiaodeng	(O) MSc Sep-00	Bao	

## Research Associates at the Institute in 2002

<b>Name</b>	<b>Period</b>	<b>Supervisor(s) or Group</b>
Jan Benda	February 2002 – present	Longtin
Greg Cron	January 2002 – present	G. Santyr
Albert Cross	January 2002 – present	G. Santyr
Xiongxin Dai	November 2002 – present	SNO group
Mei-Zhen Dang	2000 -	D. Rancourt
Ranpal Dosanjh	January 2002 – present	SNO group
Kate Frame	August 2002 – Dec.2002	SNO group
Hadjifaradji, S	2002	Chen / Bao
Mohsen Khakzad	September 2000 -	G. Oakham (ATLAS)
Sergei Katsev	May 2002 – present	L'Heureux
Peter Krieger	Sept.98- April 2002	G. Oakham (ATLAS)
Leonid Kulyuk	May 2001	E. Fortin
Carlo Laing	August 2000 – Sept. 2002	A. Longtin
Ilan Levine	June 1997 –Aug.2002	D. Sinclair
Benjamin Lindner	March 2002 – present	A. Longtin
Dongfeng Liu	November 2001 – December 2002	X. Bao
Darryl Roberts	September 2001 -	D. Rancourt
Nikolai Romanenko	October 2000 – Oct. 2002	S. Godfrey and P. Kalyniak
Kirsten Sachs	April 2000 – present	OPAL/LC Carleton
N. Starinski	Oct.2000 – present	D. Sinclair
Shahraam Afshar Vahid	October 2001 – September 2002	X. Bao / L. Chen
Claar van der Zee	October 2001 -	D. Rancourt
David Waddy	May 2001 – April 2002	X. Bao, L. Chen

Julia Wallace

G. Wu

Shouhua Zhu

August 2001 – July 2002

November 2002 – present

G. Santyr

X. Bao

S. Godfrey and P. Kalyniak

## Funding in 2002

Name	Source	Amount per year
X. Bao	NCE – ISIS	10,000
	NCE-CIPI	46,000
	NSERC operating	42,000
	Concrete Canada	3,800
	Photonics Research Ontario and CITO (with L. Chen)	100,000
	Ontario PREA	50,000
	NSERC Networks (with 11 others)	30,000
A. Bellerive	Sunrise Telecom (with Waddy and Chen)	20,000
	Canada Research Chair	200,000
	Canada Research Chair	200,000
T. Brabec	Canada Research Chair	200,000
	Molecular Imaging - CIPI -	20,000
Ian Cameron	NSERC (with G. Santyr)	96,000
L. Chen	U Ottawa Fac. Dev. Fund	5,000
	U.Ottawa Industrial Partnership	5,465
	Univ. of Ottawa Fac. Science	5,000
	Univ. Ottawa start-up	20,000
	NSERC operating	17,000
	U. Ottawa Interfaculty Collab. (with Yao and Bao)	20,000
J.E. Cygler	ORCC Foundation	8,000
S. Desgreniers	NSERC operating	25,500
	NSERC Major Installation Grant (McKellar et al.)	310,000
M. Dixit with R.K. Carnegie, D. Karlen and H.Mes	NSERC operating	140,000
S. Fafard	NSERC operating	14,175
E. Fortin	NSERC operating	39,900
L. Gerig	ORCC Foundation	10,000

	ORCC Research Grant	25,000
	Siemens Industrial Research Grant	5,000
S. Godfrey	NSERC operating	44,000
R.J.W Hodgson	NSERC operating	5,800
B.J. Jarosz	NSERC operating	20,790
P.C. Johns	NSERC operating	19,300
	Carleton Internal CIHR Award	10,000
B. Joós	NSERC operating	30,000
P. Kalyniak	NSERC operating	33,000
D. Karlen	NSERC MFA	187,859
	NSERC IOF with Carnegie, Dixit, Godfrey, Kalyniak, Mes, Mattison	51,250
G. Lamarche	NSERC operating	6,930
I. L'Heureux	NSERC operating	25,000
A. Longtin	NSERC operating	28,350
	Ontario govt. PREA	36,000
	Canadian Institutes of Health (with L. Maler)	92,000
C.E. Ng	NCIC (PI)	125,000
	CIHR	89,000
	Aventis Inc.	95,000
G.P. Raaphorst	Astra Zenica (with S. Malone)	50,000
	Foundation Grant	25,000
D. Rancourt	NSERC operating	34,650
	NSERC SPG (with 7 co-applicants)	166,217
	CANMET	100,000
	NSERC (equipment)	15,379
G. Santyr	NSERC operating	25,000
	Canadian Breast Cancer Research Initiative	100,000
	ORDCF	25,000
G.W. Slater	NSERC operating	69,000
	Fonds France-Canada pour la recherche	10,000

	Manteia Predictive Medicine (Geneva)	15,000
	MMO-ORDCF-EMK	18,000
Z.M. Stadnik	NSERC operating	29,000
M.K. Sundaresan	NSERC operating	16,000
Y.P. Varshni	NSERC operating	10,000
ATLAS Collaboration: F.G. Oakham, M.S. Dixit	NSERC operating	216,300
	NSERC MIG	264,443
OPAL Collaboration: R.K. Carnegie, R.J Hemingway, D. Karlen, M.S. Dixit, C.K. Hargrove, M. Losty, H. Mes, F.G. Oakham	NSERC operating	281,916
SNO Collaboration: C.K. Hargrove, A. Noble, D. Sinclair, A. Bellerive, R. Hemingway	NSERC operating	380,000
F.G. Oakham, with A..Bellerive, M.S. Dixit, R.K. Carnegie C.K. Hargrove, R. J. Hemingway, H.Mes, D Sinclair	NSERC MFA	200,000
	<b>TOTAL for 2002</b>	<b>4,618,078</b>