

Past Physics Seminar Calendar: 2006-2007

Phys 6901 talk: The cosmic neutrino background

**Gordana Tescic
Carleton U.**

Location: Herzberg 4351

Date: 2006-09-05

Time: 15:30-16:30

Abstract:

This talk is part of a Phys 6901 (special topics) project.

Contact: Peter Watson

Status: CONFIRMED

[Printable Version](#)

MRI of cancer in humans and small animal models

**Martin Lepage
Universite de Sherbrooke**

Location: Herzberg 5115

Date: 2006-09-11

Time: 10:00-11:00

Abstract:

Magnetic resonance imaging is a useful tool in the non-invasive detection and characterization of cancer in humans and small animal models. At the Universite de Sherbrooke, projects aim at developing novel MRI contrast agents that would provide information on the activity of enzymes that play a role in the metastatic process. In parallel, other projects aim at improving certain MRI protocols, such as dynamic contrast-enhanced MRI. We use DCE-MRI to monitor the effects of chemotherapy and radiotherapy in both humans and animal models. Finally, MRI is used to characterize the osmotic disruption and pharmacological manipulation of the blood-brain barrier.

Contact: Paul Johns

Status: CONFIRMED

[Printable Version](#)

Discussion of TRIUMF/OPCOM affairs

Particle Physics group Carleton U.

Location: Herzberg 4351

Date: 2006-09-12

Time: 16:00-17:00

Abstract:

Meeting for Carleton Particle Physics group to discuss a few items on the agenda for the upcoming OPCOM meeting scheduled for Sept 25.

Contact: Manuella Vincter

Status: CONFIRMED

[Printable Version](#)

"Two minute seminars"

Faculty and Postdocs Carleton U.

Location: Herzberg 4351

Date: 2006-09-26

Time: 16:00-17:00

Abstract:

Every year we hold a special seminar to introduce ourselves to any new people in the department. Everyone gets two minutes to describe who they are and what they do. New faculty members, RAs and grad students are especially invited!

Each faculty member and postdoc should be prepared to give a two-minute presentation.

Contact: Manuella Vincter

Status: CONFIRMED

[Printable Version](#)

Studies of the Highest Energy Cosmic Ray Air Showers with the Pierre Auger Observatory Hybrid Detector

Bei Cai

University of Minnesota (now at Queen's University)

Location: 4351 Herzberg

Date: 2006-10-03
Time: 16:00-17:00
Abstract:

Studies of the highest energy cosmic rays (the cosmic particles with energies above $1E19$ eV) have been going on for years. However, the origin of the particles are still not known. The Pierre Auger Observatory is a project that aims to determine the energy spectrum, arrival directions, and composition of these highest energy particles. It measures the extensive air showers generated by the collisions of the cosmic rays with the atmosphere. It uses a surface detector array that measures the shower particles arriving on the ground and fluorescence telescopes measuring the longitudinal shower development. In the talk I will describe how this hybrid detector works and show some preliminary results on the energy spectrum, anisotropy, and the photon fraction of the composition.

Contact: Alain Bellerive

Status: CONFIRMED
[Printable Version](#)

Axion searches in the CAST experiment at CERN

Berta Beltran Lizarraga
CERN (now at Queen's University)

Location: 4351 Herzberg

Date: 2006-10-10
Time: 16:00-17:00
Abstract:

Hypothetical axion particles with a two-photon interaction would be produced in the Sun by the Primakoff process. In a laboratory magnetic field they would be transformed into x-rays with energies of a few KeV. The CAST experiment is using a decommissioned LHC magnet as an axion telescope in order to search for these axion-like particles. The analysis of the data taken during 2003 and 2004 has shown no signal above the background, thus implying an upper limit to the axion photon coupling, the best experimental result up to date, which goes beyond the astrophysical limit set by the globular clusters.

Contact: Alain Bellerive

Status: CONFIRMED
[Printable Version](#)

***** OCIP Seminar *****

Probing the Opposite Ends of Time with the Cosmic Microwave Background

Matt Dobbs
McGill University

Location: 4351 Herzberg

Date: 2006-10-17

Time: 16:00-17:00

Abstract:

The next generation of Cosmic Microwave Background (CMB) experiments will open a new window on the universe. By making precision measurements of the CMB polarization on large angular scales, we may see the signature of inflation carried by gravity waves. Through measurements of temperature anisotropy on small angular scales, we can discover distant galaxy clusters, constraining dark energy by providing a measure the universe's expansion history. These advances are made possible by new technology. I'll discuss the next generation of CMB experiments that employ recent advances in detector, readout, and cryogenic technology. These experiments are reaching the field now.

Contact: Alain Bellerive

Status: CONFIRMED

[Printable Version](#)

Plasma instabilities in Quantum Chromodynamics

Guy Moore
McGill

Location: 4351 Herzberg

Date: 2006-10-24

Time: 16:00-17:00

Abstract:

Ordinary plasmas, under inhomogeneous nonequilibrium conditions, rather generically display plasma instabilities. In particular, the Weibel (filamentary) instability leads to the rapid development of strong magnetic fields in a plasma. Quantum chromodynamics, the theory of the strong interactions which bind together the constituents of protons and neutrons, is structurally similar to electrodynamics. Does it also display plasma instabilities? I discuss this question in the context of heavy ion collisions, such as those conducted at RHIC. QCD should display plasma instabilities at weak coupling (possibly relevant in heavy ion collisions), but the additional complications of the theory mean that their behavior is very different than in conventional electrodynamics. I explore and discuss these similarities and differences.

Contact: Heather Logan

Additionally! Available at 3:30pm, GASP is hosting a pre-talk gathering with coffee and snacks (donuts or cookies). Please come out early and take the opportunity to socialize with your peers. A small donation of \$1.50 would be appreciated. All proceeds go to the Physics grad student association, who will be offering more functions and gatherings starting this year. For those of you attending from Carleton, please bring your own mug! I hope you all enjoy!

Status: CONFIRMED

[Printable Version](#)

Particle physics seminar

Multi-Step Grand Unification -- From Model Building to Pheno

Juergen Reuter Carleton University

Location: Herzberg 5115

Date: 2006-11-10

Time: 11:30-12:30

Abstract:

Grand Unification is a beautiful theoretical idea aiming at explaining the three gauge forces of the Standard Model from one single gauge group. Supersymmetry usually stabilizes the two different breaking scales of these models. Besides the correct incorporation of the neutrino masses, the longevity of the proton and the incorporation of the flavour structure of the SM are the major problems of GUTs. I explain the origin of these difficulties and one possible outcome.

Contact: Heather Logan

Status: CONFIRMED

[Printable Version](#)

Physics Graduate Studies Information Session

Location: Herzberg 4351

Date: 2006-11-14

Time: 15:45-17:15

Abstract:

This session is intended for 3rd and 4th year students. 4th-years can use this to get information on the grad program and meet prospective supervisors. 3rd-years can get a head start on thinking about grad school, and also get ideas on research areas for their 4th-year Honours projects (4909) and also potential NSERC USRA summer research topics.

The session will consist of:

- Overview of grad studies in physics including general description of research, funding, and application procedure
- Tours of some research labs
- Return to Herzberg 4351 for coffee and cookies and to chat with prospective supervisors.

Contact: Steve Godfrey

Status: CONFIRMED

[Printable Version](#)

Flavour changing neutral currents in top quark decay and single top production at LHC/ILC

Ismail Turan Concordia U.

Location: Herzberg 5115

Date: 2006-11-17

Time: 11:30-12:30

Abstract:

I review the flavor structure of the standard model (SM) and the minimal supersymmetric standard model (MSSM). Then I present an analysis of the two- and three-body rare decay channels $t \rightarrow c V$ ($V = \gamma, g, Z$), $t \rightarrow c h$, $t \rightarrow c q \bar{q}$, $t \rightarrow c l + l$, and $t \rightarrow c g g$, in the SM and the MSSM. As a single production channel, I mainly concentrate on $gg \rightarrow t \bar{c} + X$ at LHC and $e^+e^- \rightarrow t \bar{c}$ at the ILC in the MSSM, and compare with other channels such as $cg \rightarrow t$, $cg \rightarrow tV$ ($V = \gamma, g, Z$), and $cg \rightarrow th$ including precision electroweak measurements as well as the experimental data on B_s - B_s -bar mixing and $b \rightarrow s \gamma$.

Contact: Heather Logan

Status: CONFIRMED

[Printable Version](#)

***** OCIP Seminar *****

The quandary of the quark

Prof. Christine Davies University of Glasgow

Location: Tory 208

Date: 2006-11-24

Time: 12:00-13:00

Abstract:

99.9% of the visible material in the universe is made of quarks and yet we know surprisingly little about them. For example, the mass of the electron is known to a tiny fraction of a percent; that of the up or down quarks has a factor of two uncertainty. The reason for the difficulty is that quarks are never seen as free particles, but are inextricably bound together by the strong force that in turn holds the atomic nucleus together. The strong force is the mightiest of Nature's fundamental forces and the hardest to crack, but recent theoretical advances have meant that we are at last getting to grips with it. I will describe how the properties of the quark are now being revealed, and the implications that this will have for our understanding of the physics of fundamental particles.

Professor Davies will meet with undergraduates over coffee and cookies from 11:00 to 12:00, directly before the talk, in the Physics Department lounge (in the INCO wing). All are welcome!

Contact: Heather Logan

Status: CONFIRMED

[Printable Version](#)

Probing primordial inflation at LHC

Rouzbeh Allahverdi
Perimeter Institute

Location: Herzberg 4351

Date: 2006-11-28

Time: 16:00-17:00

Abstract:

There is accumulating evidence that the universe has undergone a period of superluminal expansion, called inflation, at the earliest moments of its life. Despite experimental confirmation of the main idea, a natural embedding of inflation within theories of particle physics is still lacking. In this talk I will give a brief review of inflation and its predictions. Then I will report on recent progress in realizing inflation within the most popular extension of the standard model of particle physics, the minimal supersymmetric standard model (MSSM). I suggest that supersymmetric partners of leptons and quarks may have driven a period of inflation and thereby generated seeds for the formation of galaxies. Successful inflation along this line sets a lower bound of 340 GeV on the mass of scalar quarks and leptons, which is well within the energy reach of LHC. This provides the first example where inflation can be directly probed at colliders.

Contact: Heather Logan

*Pre-seminar **coffee and cookies** starting at 3:30 p.m. in Herzberg 4351, courtesy of GASP. Carleton folks, please bring your own coffee mug. A small donation of \$1.50 would be appreciated; all proceeds go to the Physics grad student association.*

Status: CONFIRMED

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OCIP Fall Graduate Student Seminars

Location: University of Ottawa, Colonel By Building, Room C03

Date: 2006-12-08

Time: 13:30-17:00

Abstract:

Program:

1:30 p.m. Jean-Paul Prevost (U of O) "Theoretical studies of the first-row transition metals: emphasis on thermal expansion"

2:00 p.m. Elsayed Ali (Carleton) "Efficiency improvements of x-ray simulations in EGSnrc user-codes using Bremsstrahlung Cross Section Enhancement (BCSE)"

2:30 p.m. Simon Frederick (U of O) "Single Photon Source for Fibre-Based Quantum Cryptography : an InAs/InP Quantum Dot in a Microcavity "

3:00 p.m. *Break with refreshments*

3:30 p.m. Tyler Dumouchel (Carleton) "Initial Performance Evaluation Results with the LabPET Animal Scanner"

4:00 p.m. Jeffery Bond (U of O) "Chemical vapour deposition growth and characterization of single and multi-walled carbon nanotubes"

4:30 p.m. Kenji Myint (Carleton) "Treatment dose errors resulting from the use of diagnostic CT images for treatment planning"

Contact: Steve Godfrey

Status: CONFIRMED

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Translating physics knowledge into useful concepts for radiation therapy

**Luc Beaulieu
Laval University
Medical Physics**

Location: Herzberg 4351

Date: 2006-12-12

Time: 15:00-16:00

Abstract:

Radiation therapy uses ionizing radiations to kill tumour cells. In order to be successful such irradiation must target selectively the cancer over the healthy tissues. The end result often impinges on the small difference between cancer and normal cells. This in turn translates into a high degree of precision in the physics characterization of the whole treatment process. Thus the involvement of medical physicists. Detailed knowledge and precise measurements of the characteristics of beams and radioactive sources, their modelling in the treatment planning system, intimate knowledge of the limitations of the model and regular measurements for compliance (QA process) are the bread and butter of physicists in a radiation therapy department. Also an important part of their work is the development of new radiation detectors, dose optimization algorithms and new treatments and imaging techniques. Two such developments going on in our department will be discussed: the use of scintillation optical fibers as radiation detectors and a new clinical dose calculation approach for brachytherapy.

Contact: Dave Rogers

Status: CONFIRMED

[Printable Version](#)

OCIP Christmas Symposium

Location: at Carleton

Talks: Robertson Hall, 6th floor, Senate Chamber

Lunch: Robertson Hall, 6th floor, Alumni Board Room

Date: 2006-12-15

Time: 09:00-14:30

Abstract:

Program:

9:00 Jim Harden (U of O), "Computational Modelling of the Endothelial Glycocalyx"

9:30 Kevin Graham (Carleton), "Search for Dark Matter with DEAP"

10:00 Chris Willott (U of O), "The Search for the First Stars"

10:30 *Break with refreshments*

11:00 Tong Xu (Carleton), "Dual-Energy X-ray Imaging and its Medical Applications"

11:30 Andrzej Czajkowski (U of O), "Experiments with Optical Frequency Standards"

12:00 Richard Hemingway (Carleton), "50 Years of Physics... a personal retrospective view"

12:30 *Lunch*

Contact: Steve Godfrey

Status: CONFIRMED

[Printable Version](#)

Gamma-Ray Spectroscopy at TRIUMF-ISAC

Carl Svensson
University of Guelph

Location: 4351 Herzberg

Date: 2007-01-16

Time: 16:00-17:00

Abstract:

The Isotope Separator and Accelerator (ISAC) facility located at the TRIUMF laboratory in Vancouver, Canada, is one of the world's most advanced radioactive ion beam facilities. ISAC produces unprecedented quantities of rare isotopes and delivers them to a variety of experimental groups in the form of high-quality, low-energy ion beams. These unique ion beams support a diverse program that includes nuclear astrophysics, nuclear structure, fundamental particle physics, and condensed matter research. A major upgrade to the ISAC facility, ISAC-II, is now coming online and will extend both the range of radioactive nuclei that can be accelerated and the maximum energy of the accelerated beams.

Following an overview of the ISAC facility, this presentation will focus on the gamma-ray spectroscopy program at ISAC. Recent experiments include a study of the role of halo neutrons in the beta decay of the exotic nucleus ${}^8\text{Li}$ and high-precision superallowed Fermi beta decay measurements that refine our knowledge of V_{ud} , the up-down element of

the Cabibbo-Kobayashi-Maskawa (CKM) quark-mixing matrix. A program to search for time-reversal violation through precision measurements of atomic electric dipole moments at ISAC will be discussed. The presentation will conclude with an introduction to ISAC-II and one of its key experimental facilities - the TRIUMF-ISAC Gamma-Ray Escape Suppressed Spectrometer (TIGRESS).

Contact: Alain Bellerive

Pre-seminar coffee and cookies starting at 3:30 p.m. in Herzberg 4351, courtesy of GASP. Carleton folks, please bring your own coffee mug. A small donation of \$1.50 would be appreciated; all proceeds go to the Physics grad student association.

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The Top Mass at CDF and the Final Preparation for ATLAS

Jean-Francois Arguin

Lawrence Berkeley National Laboratory

Location: 4351 Herzberg

Date: 2007-01-22

Time: 11:00-12:00

Abstract:

The measurement of the top quark mass is one of the flagship measurement to be performed at the Collider Detector at Fermilab (CDF). Indeed, a precise determination of this fundamental parameter of the Standard Model can be used to predict the Higgs boson mass that still eludes detection to date. I will present a precise measurement of the top mass that uses hadronic W boson decays to constrain the main systematic uncertainty of the measurement: the jet energy scale. The attention of the hadron collider physics community is gradually shifting toward CERN where the first proton-proton collisions of the Large Hadron Collider (LHC) are expected in 2007. Intense activities are taking place to prepare the LHC experiments, like ATLAS, for the first period of data taking. I will present two examples of such activities in ATLAS: the final preparation of the pixel detector and the development of the data streaming model.

Contact: Alain Bellerive

Status: CONFIRMED

[Printable Version](#)

Evidence for single top production at the D0 experiment

Yann Coadou

Simon Fraser University

Location: 1154 Herzberg

Date: 2007-01-24

Time: 14:15-15:15

Abstract:

Top quarks were first observed in $t\bar{t}$ pair production in 1995. Ever since, the Tevatron experiments have been looking for the electroweak production of single top quarks, also predicted by the standard model. Single top quark events can be used to study the Wtb coupling, to measure the magnitude of the CKM matrix element V_{tb} without assuming only three quark generations, or as a source of polarized top quarks. I will present the first evidence for the production of single top quarks with the D0 detector at the Fermilab Tevatron proton-antiproton collider. Individual top quarks are expected to be produced in association with bottom quarks through the exchange of a W boson (tb channel), or via the W-gluon fusion process (tqb channel). After applying selection criteria to the data, the signal-to-background ratio is improved with an algorithm to identify jets originating from a b quark. On the remaining data, several multivariate techniques are used for both production channels. I will describe the background model and analysis techniques. The most sensitive analysis, using boosted decision trees, gives a cross section $\sigma(pp\bar{p} \rightarrow tb + X, tqb + X) = 4.9 \pm 1.4$ pb with a significance of 3.4 standard deviations. The cross section measurement is used to directly determine for the first time the CKM matrix element V_{tb} without requiring 3 families of quarks or CKM matrix unitarity.

Contact: Alain Bellerive

Status: CONFIRMED

[Printable Version](#)

An Untriggered Search for High Energy Neutrinos from Gamma Ray Bursts with AMANDA-II

Brennan Hughey
University of Wisconsin-Madison

Location: 4351 Herzberg

Date: 2007-01-30

Time: 15:00-16:00

Abstract:

High energy neutrino telescopes seek to address a number of unanswered questions in astrophysics, including the sources of the highest energy cosmic rays. We will discuss results of an untriggered "rolling" search for neutrinos from gamma ray bursts or other transients using the Antarctic Muon and Neutrino Detector Array (AMANDA). We will also present an overview of other scientific results from AMANDA and a summary of the current status of AMANDA's successor, IceCube.

Status: CONFIRMED

[Printable Version](#)

The Latest from MiniBooNE

Hirohisa Tanaka
Princeton University

Location: 4351 Herzberg

Date: 2007-02-06

Time: 16:15-17:15

Abstract:

The Mini Booster Neutrino Experiment (MiniBooNE) at Fermilab is searching for the neutrino oscillations indicated by the LSND experiment. Confirmation of this mode of oscillation would indicate a break from the Standard Model of particle physics. Such new physics could take the form of heretofore unseen sterile neutrinos or exotic forms of symmetry breaking that would dramatically change the landscape of particle physics. MiniBooNE finished data-taking in neutrino mode in 2005 and is now taking data with a primarily anti-neutrino beam. Analysis of the neutrino data is in its final stages with results expected soon.

Contact: Alain Bellerive

Pre-seminar coffee and cookies starting at 3:45 p.m. in Herzberg 4351, courtesy of GASP. Carleton folks, please bring your own coffee mug. A small donation of \$1.50 would be appreciated; all proceeds go to the Physics grad student association.

Status: CONFIRMED

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Underground Science at SNOLAB and Progress towards a Search for Neutrino-less Double Beta decay in ^{136}Xe

David Sinclair
Carleton University

Location: Herzberg 4351

Date: 2007-02-13

Time: 16:00-17:00

Abstract:

This talk will outline the facilities being developed for underground science at SNOLAB. This facility builds on the scientific and technical success of SNO to tackle problems in areas such as low energy solar neutrinos, geo-neutrinos, dark matter searches, and searches for double beta decay. The talk will then report on progress towards a search for neutrino-less double beta decay in ^{136}Xe by the EXO collaboration using either a liquid or gaseous detector. In xenon one has the prospect of controlling the background by laser tagging of the ^{136}Ba daughter and progress towards realizing this critical feature will be presented.

Contact: David Rogers

Pre-seminar coffee and cookies starting at 3:30 p.m. in Herzberg 4351, courtesy of GASP. Carleton folks, please bring your own coffee mug. A small donation of \$1.50 would be appreciated; all proceeds go to the Physics grad student association.

Status: CONFIRMED

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Quantifying Cardiac Contractions using Single Photon Emission

Tomography

Richard Wassenaar

Nuclear Medicine, Ottawa Hospital

Location HP4351

Date: 2007-02-27

Time: 16:00-17:00

Abstract:

It is estimated that approximately 30 000 to 40 000 Canadians with advanced congestive heart failure suffer from intra-ventricular conduction delay; that is, the left and right ventricles are beating out of synch (dyssynchronous) in relation to each other. Cardiac Resynchronization Therapy (CRT) uses a sophisticated pacemaker to pace the atrium and ventricles in an effort to resynchronize hearts suffering from this dyssynchrony. CRT has shown promise at improving quality of life but currently suffers from an 18% to 56% non-responder rate. This represents a large number of patients in Canada undergoing major surgery to implant the pacemaker, who ultimately will not benefit. What is needed is an accurate method of quantifying cardiac dyssynchrony. Phase analysis of single photon emission tomography (SPECT) Blood Pool imaging has the potential to do just this. SPECT blood pool imaging provides high contrast, cine images of the beating heart. Fitting of the data in these images to physiological models can provide quantitative assessment of dyssynchrony. In my research talk, I will review the current methods of planar nuclear medicine phase analysis, and present work done in our lab. I will then move into SPECT phase analysis, which holds more potential as a means of measuring cardiac contractions, focusing on the work we have started in our lab.

Contact: Dave Rogers

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Status: CONFIRMED

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The top quark: a "charged" topic

Veronique Boisvert

University of Rochester

Location: 4351 Herzberg

Date: 2007-02-28

Time: 11:30-12:30

Abstract:

Since the top quark's discovery in 1995, there have been several measurements of the top quark's mass and pair production cross section. Due to this quark's special role in electroweak symmetry breaking, properties such as its charge should also be measured. I will give a brief introduction about the top quark in the context of high energy physics and

present the first CDF measurement of the top quark's charge using its decay products from a sample of $\sim 1 \text{ fb}^{-1}$ of data collected with the CDFII detector at Fermilab's Tevatron collider. The standard model predicts the top quark charge to be $+2/3$ but alternative theories allow a fourth generation exotic quark with a charge of $-4/3$. The CDF data provides more insight into the true nature of the top quark and its impact on the standard model.

Contact: Alain Bellerive

Status: CONFIRMED

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OCIP Seminar

The importance of treating living cells as states of matter and some suggestions on how to proceed

Andrew Ridsdale
Ottawa Health Research Institute

Location: Herzberg 4351

Date: 2007-03-06

Time: 16:00-17:00

Abstract:

There have been a number of suggestions that principles growing from work on the mesoscopic organization of matter may be particularly important to advance understanding of the nature of living cells (for example: <http://www.pnas.org/cgi/content/full/97/1/32>). This talk will: 1) Discuss some of the problems with some currently applied modes of explanation in cellular biology. 2) Offer suggestions about candidate general physical principles dealing with directional energy flow that may apply to the mesoscopic organization of cells. 3) Present some experimental phenomenology and suggest measurement approaches which are likely to be amongst the most useful. 4) Give an overview of a multimodal optical microscopy system developed at the Ottawa Health Research Institute which enables such experimental approaches.

Contact: Dave Rogers

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Status: CONFIRMED

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*** OCIP Seminar ***

Neutrinos in the Sun and Supernovae

A. B. Balantekin
University of Wisconsin-Madison

Location: University Centre 282

note unusual room

Date: 2007-03-09

Time: 11:30-12:30

Abstract:

After briefly reviewing the recent status of neutrino parameters I will discuss the role of neutrinos in the Sun and core-collapse supernovae. In particular I will discuss neutrino signatures of new physics beyond both the Standard Model of particle physics and the Standard Solar Model. I will also discuss the role of neutrinos in the dynamics of and element formation in the core-collapse supernovae.

Contact: Heather Logan

Status: CONFIRMED

[Printable Version](#)

Signatures of preheating in the microwave sky

Neil Barnaby

McGill University

Location: Herzberg 4351

Date: 2007-03-13

Time: 16:00-17:00

Abstract:

The accelerated expansion of the universe at early times - inflation - has become a cornerstone of modern cosmology. In addition to resolving many of the conceptual problems of the big bang model, inflation also has received spectacular support from recent observations of the Cosmic Microwave Background (CMB). After reviewing the successes of inflationary cosmology I will describe the transition from inflation to the big bang, known as reheating. In many models of inflation reheating is a highly nonperturbative process in which quantum fluctuations grow exponentially. Focusing on hybrid inflation (a particularly well motivated model of inflation) I will show that reheating can leave its imprint on the CMB either through distortion of the spectrum or else through large nongaussian signatures. Finally, I will discuss the implications for certain string theory and supergravity models of inflation.

Contact: Heather Logan

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Status: CONFIRMED

[Printable Version](#)

**Is there a role for simple devices in modern radiation therapy?
Cobalt 60 and Optical CT**

L. John Schreiner
Cancer Centre Southeastern Ontario
Kingston, Ontario

Location: Herzberg 4351

Date: 2007-03-20

Time: 16:00-17:00

Abstract:

At the Cancer Centre for Southeastern Ontario we have been investigating the potential for adaptive image guided radiation therapy using Cobalt 60 tomotherapy. The impetus for cobalt tomotherapy is based on i) the strong service of Co 60 in radiation therapy devices throughout the world and ii) Co-60 radiation being especially well suited to the rotational intensity modulated radiation techniques provided by tomotherapy. In this talk, the delivery of complex 3D dose distributions with Co 60 based tomotherapy will be reviewed. Cobalt megavoltage CT (MVCT) imaging for radiation therapy image guidance will also be discussed. Practical features such as dose rate, source activity and imaging dose will be addressed. The implications for a clinical device will be discussed. Finally, I will also present a new imaging system for gel dosimetry to show that this technique is ready for clinical implementation.

Contact: Dave Rogers

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*****Annual CAP Lecture*****

Quantum Computation - Or How to Take Advantage of Quantum Strangeness

Alexandre Blais
Departement de Physique
Universite de Sherbrooke

Location: Azrieli Theatre 101

Date: 2007-03-23

Time: 11:30-12:30

Abstract:

Quantum computers would take advantage of the "most bizarre aspects of quantum mechanics" (superposition of states and entanglement) in order to, in principle, perform calculations exponentially faster than any classical computer could. The experimental realization of such a quantum computer is however an enormous challenge. Assuming no knowledge of

quantum mechanics, I will present some of the fundamental ideas of quantum information. I will also discuss how these ideas could be realized experimentally.

Contact: Paul Johns

Status: CONFIRMED

[Printable Version](#)

String theory and QCD

Rowan Thomson

Perimeter Institute and University of Waterloo

Location: Herzberg 4351

Date: 2007-03-27

Time: 16:00-17:00

Abstract:

The rich phenomenology of the hadronic world is described by Quantum Chromodynamics (QCD), a gauge theory of quarks and gluons. At low energies, QCD is strongly coupled and standard field theory techniques are inapplicable. However, string theory provides an alternate description of strongly coupled gauge theories through the gauge/gravity duality. After introducing this duality, I will discuss some recent progress towards using string theory to understand strongly coupled gauge theories such as QCD.

Contact: Heather Logan

Pre-seminar coffee and cookies starting at 3:30 p.m. in Herzberg 4351, courtesy of GASP. Carleton folks, please bring your own coffee mug. A small donation of \$1.50 would be appreciated; all proceeds go to the Physics grad student association.

Status: CONFIRMED

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Recursive Methods for Scattering Amplitudes

Paolo Benincasa

University of Western Ontario

Location: Herzberg 4351

Date: 2007-04-03

Time: 16:00-17:00

Abstract:

In the last three years, a lot of progress has been made in developing simpler technologies to compute scattering amplitudes at both tree and loops level. In particular it has been shown that n-point amplitudes can be factorized into smaller amplitudes. After having reviewed the CSW rules, which allow one to expand n-pt amplitudes into MHV

diagrams, we will show how to obtain nice recursive relations using only the power of complex analysis. We will discuss such recursive relations and their implications for gauge and gravity theories.

Contact: Heather Logan

Status: CONFIRMED

[Printable Version](#)

Integrating CT into Nuclear Medicine Imaging

Glenn Wells

Ottawa Heart Institute

Location HP4351

Date: 2007-04-10

Time: 16:00-17:00

Abstract:

Nuclear medicine imaging reconstructs the distribution of radioactively-labelled tracers that are injected into the body. Because the distribution depends on the metabolism of the tracer, this technique provides information about how well different organs and biological systems in the body are functioning. In contrast, the CT signal is based on the density and extent of patient tissues, thus providing information about anatomical structure. The complementary nature of these two imaging methods has led to their recent combination into a camera that provides anatomy and function in a single imaging session. Initial use of the combined scanners has been primarily to provide an anatomical context for the localization of nuclear medicine functional data. However, the potential exists for much tighter integration of the information. This talk will focus on the integration of CT data into the reconstruction of nuclear medicine images. Using results from animal experiments and computer simulations, I will discuss the complication of respiratory motion in the attenuation correction of nuclear medicine images and how 4D-CT can provide a solution and reduce motion artefacts. I will also discuss how CT structural information may be incorporated as an anatomical prior into the image reconstruction to regularize noise and improve image quality.

Contact: Dave Rogers

Status: CONFIRMED

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Towards improved event generators

Peter Skands

Fermilab

Location: 4351 Herzberg

Date: 2007-05-11

Time: 11:30-12:30

Abstract:

Several improved approaches to Monte Carlo event generators have appeared relative to the LEP state of the art. For

obvious reasons, most of these developments focus on issues specific to hadron collisions, such as initial state radiation and the underlying event. I will try to give a broad overview, at a hopefully fairly pedestrian level, of the many recent advances in this field, with an eye to the future as well.

Contact: Heather Logan

Status: CONFIRMED

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Classical Computed Tomography. What's New?

Rolf Clackdoyle
Laboratoire Hubert Curien
Universite Jean Monnet
Saint Etienne
France

Location HP 4351

Date: 2007-06-25

Time: 15:00-16:00

Abstract:

The theory of classical (two-dimensional) image reconstruction from projections was thought to have been completely understood 30 years ago, when CT scanners were starting to appear in hospitals world-wide. The basic concepts apply not only to x-ray scanners, but also to positron emission tomography (PET) and single photon emission computed tomography (SPECT). The reconstruction algorithm known as "filtered backprojection" has enjoyed three decades as the reconstruction method-of-choice in the medical imaging community and also for industrial applications. It was always understood that tomography was an "all or nothing" game. Either all ray-sums (line-integrals of the relevant physical parameter) in the plane are known in which case that particular cross section of the patient can be accurately reconstructed; or some ray-sums are not measured (if the detector is too small for example), and NONE of the cross-section can be reliably recovered. It only became clear in about 2002 that this view is too pessimistic. In some cases, a subset of the cross-section of interest can be reconstructed even if some ray-sums are not available. One important consequence is the potential to spare dose to sensitive organs, while still accurately reconstructing the organ of interest. This talk will review tomographic principles, and will tell the story of why it looks like an "all or nothing" proposition, but isn't.

Contact: Dave Rogers

Status: CONFIRMED

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Microwave Imaging: Breast Cancer Detection and Thermal Imaging in Conjunction with Focused Ultrasound Therapy

Paul M. Meaney, Associate Professor of Engineering

Thayer School of Engineering Dartmouth College

Location: Herzberg 4351

Date: 2007-07-26

Time: 15:30-16:30

Abstract:

Our research group has been developing a microwave imaging system for detecting breast cancer and monitoring thermal therapy. In both of these situations, we exploit significant information embedded in the dielectric properties of the tissue. For the breast imaging case, there is significant contrast in the dielectric properties between normal and malignant tissue. By being able to reconstruct property images of the breast, we have been able to detect quite small tumors with our device. In this presentation I will describe our imaging system and show some early results from our on-going clinical trials.

With respect to the thermal imaging effort, we exploit the fact that the tissue dielectric properties vary considerably with temperature, such that a sequence of microwave tomographic images can provide valuable feedback information about the thermal distributions within a treatment zone. We previously demonstrated proof of concept for this system in both phantom and animal experiments where the temperatures of the heated regions were artificially controlled by inserting tubes with heated saline. One of the more pressing challenges has been integration of the microwave system with a viable therapy device. In this study we demonstrate a scanned focused ultrasound system that can generate desired heating patterns in conjunction with our microwave imaging system. The 3-Point Steering (3PS) system translates simple, computer-controlled vertical positioning into full 3D motion of the beam focus without interfering with the microwave imaging apparatus. We performed several complex imaging experiments that clearly demonstrate both the beam steering and thermal imaging capabilities.

Contact: Tong Xu

Status: CONFIRMED

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