Past Physics Seminar Calendar: 2000-2001

Suruj Seunarine (University of Kansas): The RICE Experiment

Date: Thursday, August 31, 2000
Location: HP 4351

Time: 11:00 am

The RICE experiment is for the radio-wave detection of neutrinos and is situated near the South Pole.

Contact person: Pat Kalyniak

Bryce Bates (Carleton): Investigation of Lensed Fiber and Laser Diode Alignment within Laser Modules

Date: Monday, September 11, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: The project investigated the fail modes present with the alignment of the laser diode and hemicylindrically lensed fiber in laser modules. The investigation looked at the fiber metallization and how fail modes could be correlated to metallization defects or contamination. Additionally, a novel method of non-destructively determining whether a power drop fail mode was due to misalignment of the fiber and laser diode within sealed modules was studied. It attempted to reproduce the coupling curves obtained by measuring the power coupled into a lensed fiber from a laser diode by putting light through the fiber and using the laser diode as either a photodiode or a gain cavity in conjunction with the monitor photodiode.

Contact person: Steve Godfrey

George M. Daskalov (NRC - IRS/INMS): Discrete Ordinates Photon Transport Calculations for Brachytherapy Treatment Planning Applications

Date: Monday, September 18, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: A fundamental aspect of any clinical treatment planning system is the basic dose calculation algorithm. The foundation and implementation of the Discrete Ordinates Method (DOM) as a basic dose algorithm will be discussed. A detailed dosimetric analysis of I-125 6702 type seed will be presented, demonstrating the accuracy of DOM and its potential as a brachytherapy treatment planning tool.

Contact person: Paul Johns

Dipak Basu (Carleton University): Solar Neutrinos, Solar Activity, Solar Diameter and Solar Wind

Date: Monday, October 2, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: Nuclear reactions in the core of the Sun generate neutrinos. However, Earth-based detectors held in caverns deep underground record only about a third of the neutrinos predicted by theory. This has been one of the most serious puzzles for solar physicists. As such, any relationship between solar neutrinos and any other phenomena associated with the Sun should be looked for if they can throw some light on the problem. The aim of the talk is to bring to the attention of the workers in the field inter-relationships between diverse solar phenomena as indicated in the title.

Contact person: Paul Johns

Gabriel Lam (Ottawa Regional Cancer Centre): The Biophysical Study of Radiation Tolerance Doses of Normal Tissue in Cancer Radiotherapy

Date: Monday, October 16, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: The radiation tolerance doses of normal tissues play the central role in the process of therapeutic dose prescription in cancer radiotherapy. This is because the total radiation dose that can be safely delivered to a tumour for a successful treatment is usually limited by the tolerances of surrounding normal tissues rather than by the tumour itself. The uncertainties of these tissue tolerances doses (>10%) are much higher than those of physical doses (2-3%). In order to significantly improve the cure rate of cancer, it is obvious that medical physicists should also devote some effort to help to reduce the uncertainties in tolerance doses. However, tissue tolerance doses are derived from clinical observations on patients, so traditionally such studies appear to be beyond the realm of physicists. Nevertheless, since these empirical data need to be interpreted and examined analytically, physicists can play an essential role in the important process of therapeutic

dose prescription, without having to take part in direct clinical observations. For instance, with suitable analysis of the present tolerance dose estimates, it is possible to predict tolerance doses for situations that the clinicians do not yet have collected data. In addition, such analysis can also help to provide an understanding of the mechanism of normal tissue damage. In this talk, a review of the current studies in radiation tolerance doses by medical physicists will be presented.

Contact person: Paul Johns

Robert Kearney (McGill University): Methods for the Identification of Nonlinear Biomedical Systems and their Application to Human Ankle Stiffness

Date: Monday, November 13, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: The first part of the seminar will review a number of model structures and estimation methods that have been proposed as general tools for the identification of nonlinear biomedical systems. I will show how the different approaches are related using the Wiener-Bose model as a common conceptual framework. In the second part of the talk I will describe how we have used these methods to characterize the dynamic stiffness of the human ankle. I will show how nonlinear identification makes it possible to separate the mechanical contributions of the stretch reflex from those due to intrinsic mechanisms. I will conclude with a description of recent investigations into the nature and origin of the abnormal muscle tone in spinal cord injured patients.

Contact person: Bog Jarosz

Alan Shotter (TRIUMF): Radioactive Beams and Nuclear Astrophysics: Past and Future Experimental Challenges

Date: Tuesday, November 14, 2000
Location: HP 4351

Time: 1:30 ** Non-standard time **

Abstract: The energy source that drives many explosive astrophysical processes often originates from reactions between short lived nuclei that are either extremely proton or neutron rich. Generally very little is known about such reactions. Accelerator facilities that produce beams of such unstable nuclei enable some of these reactions to be studied. Some past experiences in this field of study will be outlined, and some future challenges identified.

Contact person: John Armitage

OCIP Seminar: Alan Astbury (TRIUMF): Cancer and Cosmic Rays

Date: Wednesday, November 15, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: Conventional wisdom on the carcinogenic effects of ionizing radiation predicts that only a small percentage of deaths from cancer can be attributed to cosmic rays. The intensity pattern of the hadronic component of cosmic rays at sea level is not geographically uniform. There are suggestive correlations with death rates from cancer. A close examination of some US states over the period 1947 - 1997 shows a coherent and systematic time variation in the crude death rate from malignant neoplasms. A very simple model for cancer relates this time variation to that measured in terrestrial cosmic ray neutron monitors. The model would imply an altitude dependence in the death rates; this is not found observationally. However evidence will be presented which at least challenges the conventional wisdom. The situation may perhaps only be resolved by experiments on exposure of cells to hadronic radiation.

Contact person: Paul Johns

Nikolai Romanenko (Carleton University): Search for Lepton Flavour Violation and Exotic Charged Higgs Particles at the Next Linear Collider

Date: Monday, November 20, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: A series of interesting questions concerning the origin and nature of possible neutrino masses can be studied at electron-electron and electron-positron options of the next linear collider. In the case of Majorana neutrino masses one would expect the observation of lepton number violation and of exotic charged Higgs particle states. This case is closely related with the existence of Left-Right electroweak gauge symmetry. In particular, I will present the detailed study of the processes: e- , e- --> 4 quark jets (in the Left-Right model); e- , e- --> muon, neutrino + 2 quark jets; e- , e+ --> charged triplet Higgs + something (in the triplet Higgs model).

Contact person: Stephen Godfrey

Annie Hsu (Queen's University): Magnetic Barkhausen Noise From Magnetized Pipeline Steel

Date: Friday, November 24, 2000
Location: HP 3269

Time: 1:30 pm ** Non-standard time and location **

Abstract: The Magnetic Flux Leakage (MFL) technique is used to determine nondestructively the maximum allowable operating pressure of steel pipelines for oil and gas. This method involves magnetically saturating the pipe wall and measuring the leakage flux near the pipe wall surface with Hall probes or induction coils. The goal of the nondestructive testing (NDT) industry is to estimate the losses in the pipe wall to better than 5% precision. Pipelines are essentially pressure vessels that operate up to 70% of their yield strength. The magnitude of leakage flux depends on several parameters including the magnetic anisotropy of pipeline steel which is stress dependent.

Magnetic Barkhausen Noise (MBN), the irreversible motion of 180-degree walls, is sensitive to residual and applied stress in a ferromagnetic material, such as steel. Thus MBN has been proposed as a viable nondestructive evaluation technique for monitoring magnetic anisotropy and inhomogeneity in magnetic materials. MBN occurs at the greatest rate of change in magnetization, essentially where B ~ 0 Tesla. This is not the same condition under which MFL is performed on pipeline steel when it is almost magnetically saturated.

MBN signals from magnetized (~1.6 T) electric resistance welded pipeline steel were acquired and will be presented and discussed. A coercive field or pinning model was developed for the MBN anisotropy data acquired from the magnetized but unstressed steel pipe that has proven to yield the magnetic easy axis of the sample prior to magnetization. The possibility of using MBN as a viable NDT technique combined with MFL will also be discussed.

Contact person: Giles Santyr

Paul Jessop (McMaster University): Silicon-Based Optoelectronics

Date: Monday, November 27, 2000
Location: HP 4351

Time: 2:00 pm ** Non-standard time **

** This seminar is jointly sponsored by the Dept. of Physics and the Dept. of Electronics **

Abstract: Silicon is unquestionably the dominant material in microelectronic device technology. However, in optoelectronics active devices are most often made from III-V semiconductors and passive devices from glasses. As a result, the fabrication technologies used for optoelectronics tend to be incompatible with the very well established silicon integrated circuit fabrication technologies. The great attraction of using silicon to make optoelectronic devices is the possibility of adopting

standard silicon processing techniques and thereby reducing fabrication costs. This talk will describe two different approaches to silicon-based optoelectronics that have been investigated recently at McMaster University and the National Research Council. The first of these involves the use of strained SiGe layers grown on silicon substrates for optical waveguides. In this material system, the requirements for low dislocation densities in the strained layers and relatively thick layers to support optical waveguiding are in conflict with each other. Nevertheless, this has been shown to be a viable approach to making devices such as wavelength demultiplexers. The second approach makes use of silicon-on-insulator (SOI) wafers, which are now a commercially available product. With this material, thicker waveguides are possible, with mode diameters well matched to those of optical fibers. Arrayed waveguide grating demultiplexers have been fabricated using SOI, and work is ongoing to integrate SOI waveguides with SiGe photodetectors.

Contact person: John Armitage

Elizabeth Simmons (Boston University): New Electroweak Interactions for the Third Generation

Date: Monday, December 4, 2000
Location: HP 4351

Time: 3:30 pm

Abstract: In order to explain the dynamical origin of the wide range of masses observed for the elementary fermions, it has been suggested that the third generation fermions may have different electroweak interactions than those in the first and second generations. This talk will begin by exploring some of the motivations for models with extended SU(2) or U(1) gauge groups. I will then discuss several experimental signatures of the new gauge interactions that can be exploited in experiments at LEP II and the Tevatron.

** This seminar is made possible by a grant from the Women Speakers Program of the American Physical Society. **

Contact person: Stephen Godfrey

OCIP Fall Student Seminar Afternoon

Date: Monday, December 11, 2000
Location: Carleton University, Senate Chambers, Robertson Hall 6th floor.

Time: 1:00 - 5:00 pm

Details are posted at www.ocip.carleton.ca under Calendar of Events.

OCIP Christmas Symposium

Date: Monday, December 18, 2000
Location: Carleton University, Senate Chambers, Robertson Hall 6th floor.

Time: 9:00 am - 12:30 pm, followed by lunch.

Details are posted at www.ocip.carleton.ca under Calendar of Events.

OCIP Seminar: Judith Herzfeld (Brandeis University): Entropically Driven Order: From Liquid Crystals to Cell Biology

Date: Monday, January 15, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: Organisms are highly compact. In particular, protein densities in cells are typically within a factor of two of the densities commonly found in protein crystals. This extreme crowding has profound consequences for the organization of cellular components. To characterize these consequences, an approach has been developed that combines a scaled particle treatment of excluded volume with a phenomenological model of macromolecular self-assembly and either a mean field approximation or an avoidance model for soft interactions. The results compare well with observations of lyotropic liquid crystals and yield new insights into aspects of normal and pathological cell biology.

** This seminar is made possible by a grant from the Women Speakers Program of the American Physical Society. **

Contact person: Paul Johns

Peter Krieger (Carleton): Searches for New Physics Using Photonics Final States at LEP2

Date: Thursday, January 18, 2001
Location: HP4351

Time: 3:30

Abstract:

** This seminar is sponsored by IPP **

Contact person: Bob Carnegie

Alain Bellerive (Chicago): Tests of the Electroweak Gauge Theory at LEP2

Date: Tuesday, January 30, 2001
Location: HP4351

Time: 3:30

Abstract: The high luminosity delivered by LEP after the increase of the e+e- collision energy means that LEP2 is now providing substantial data samples with which to make complementary tests of the Standard Model to those of LEP1. Based on the analysis of about 710 pb-1 of data recorded at centre-of-mass energies between 172 GeV and 210 GeV with the OPAL detector at LEP, several measurements and comparisons with the Standard Model expectations are described. In particular, results on the cross-section for WW production and the partial decay width RcW = Gamma(W -> c X) / Gamma(W -> hadrons). These results are used to determine the CKM matrix element |Vcs| and to review the existing constraints on |Vcs| from D semileptonic decays, neutrino beam experiments, and the LEP Collaborations. Emphasis is also given on the search for flavour-changing-neutral-current (FCNC) in single top production at LEP2 energies and on the determination of limits for new physics. Future prospects for more precise experimental information on |Vcs| and FCNC will be discussed.

** This seminar is sponsored by IPP **

Contact person: Bob Carnegie

Pierre Savard (Toronto): Top Quark Physics at the Tevatron

Date: Wednesday, January 31, 2001
Location: HP4351

Time: 3:30

Abstract:

** This seminar is sponsored by IPP **

Contact person: Bob Carnegie

Fraser Duncan (Queen's University): The Sudbury Neutrino Observatory's First Year

Date: Thursday, February 1, 2001
Location: HP4351

Time: 3:30

Abstract: The Sudbury Neutrino Observatory is a heavy water Cherenkov detector designed to measure the neutrino flux from the nuclear fusion reactions in the sun. Located 6800 feet below ground level in INCO's Creighton mine near Sudbury Ontario, SNO consists of 1000 tonnes of heavy water, on loan from Atomic Energy of Canada Limited, contained within a 12m diameter acrylic vessel and viewed by 9600 photomuliplers. The motivation for the SNO experiment comes from the Solar Neutrino Problem which is the observation that the experimental measurement of the electron neutrino flux from the sun is in the range of 0.3 to 0.6 that predicted by theoretical solar models. One explanation for the deficit is that the electron neutrinos produced by the sun oscillate into muon or tau neutrinos and are undetected by the current generation of solar neutrino experiments which are only sensitive to electron neutrinos. SNO is unique in that it will be able to make separate measurements of both the electron neutrino flux and the total neutrino flux from the sun and will thus provide strong constraints on neutrino oscillations and other possible explanation for the solar neutrino problem.

SNO has now been fully operational for a year. In addition to taking solar neutrino data in the "pure D2O" phase, the past year has seen the detector undergo extensive calibration of it's optical and energy response. The status of the project will be presented along with a discussion of the physics that is expected from the experiment.

Contact person: John Armitage

Jim Hill (KEK): Long--Baseline Neutrino Experimentation: "The Other Mixing Matrix"

Date: Monday, February 5, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: Since the discovery of the neutrino in the early 1950's the understanding of the neutral lepton sector in elementary particle physics has changed greatly. Much of the current experimental activity in the field is now concentrated on study of the phenomenon of oscillations as suggested by solar and cosmic ray (atmospheric) observations. A future is mapped out to study the full mixing matrix as deeply as that of the quark sector. A nearly full description of one current experiment is presented along with notes on history and future prospects of the field.

Contact person: John Armitage

Peter Shanahan (FNAL):Experimental Status and Future Prospects for Matter-Antimatter Asymmetry Measurements in the Kaon System

Date: Monday, February 12, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: All flavor changing quark transitions, including those that violate matter-antimatter symmetry (CP symmetry), are described in the Standard Model by a unitary mixing matrix of just 4 independent parameters. Recent measurements of the direct CP violation parameter epsilon'/epsilon show conclusively that certain kaon decay amplitudes are not matter-antimatter symmetric, bolstering the Standard Model explanation that all CP violation in the quark sector is due to the imaginary parameter eta in the CKM quark mixing matrix. This talk will address the experimental issues in the measurement of epsilon'/epsilon at the KTeV experiment at Fermilab, and the theoretical issues involved in relating this important parameter to those of the CKM matrix. The expected impact of future ultra-rare kaon decay studies on over-constraining the CKM model of quark mixing, in combination with results from the B sector, will also be discussed.

Contact person: John Armitage

Kirsten Sachs (Carleton University, OPAL at CERN): Precision tests of the Standard Model at LEP2

Date: Monday, March 5, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: LEP was finally shut down on November 2nd, 2000 after 12 years of running. The first years were dedicated to a precision measurement of the Z resonance. After 1995 the beam energy was increased year by year providing data to study properties of the W and to search directly for new particles. Though no major discovery was made at LEP the impact of the results changed our view of particle physics. The ultimate precision of the measured cross-sections and angular distributions, which can only be reached at an e+e- machine, enable us to obtain indirect constraints on physics beyond the Standard Model. An overview of the results achieved, concentrating on the high-energy data, will be given in this talk.

Contact person: Hans Mes

Richard Hemingway (Carleton University and IPP): LEP is dead ... long live the Standard Model of Particle Physics

Date: Monday, March 19, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: The Large Electron Positron collider (LEP) at CERN, Geneva, Switzerland was constructed during the 1980's to allow precision measurements that would confront the Standard Model of particle physics. After 12 years of successful operation (1989-2000) LEP has now been shutdown and will be replaced by a powerful proton-proton machine, the Large Hadron Collider (LHC). The results from LEP are truely outstanding and have confirmed the Standard Model to a high degree of accuracy. Only the Higgs particle remains to be found. The talk will focus on some of the major physics results of the LEP program.

Contact person: Hans Mes

CAP Lecture: Amanda Peet (University of Toronto): String Theory and Black Holes

Date: Monday, March 26, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: The twin pillars of twentieth century physics, Quantum Mechanics and General Relativity, turn out to be fundamentally incompatible. This problem does not bother us in our everyday life because the paradoxes it raises become noticeable experimentally only at very high energies or very short distance scales. Such extreme physics happens either well inside black holes or is out of reach of our current accelerators ("atom-smashers"). The fix for the incompatibility problem turns out to be to replace fundamental point particles by fundamental tiny vibrating strings. The resulting theory is called String Theory, and it gives a truly unified description of all known forces in nature: gravitation, strong and weak nuclear, and electromagnetism. In this talk I will give an introduction to string theory, black holes, and unification. Time permitting, I will discuss some of the exciting new results that have come out of String Theory research over the last six years, prospects for experimental testing of the theory, and spin-offs useful for mathematics and particle physics.

** This seminar is sponsored by the Canadian Association of Physicists **

*** Undergraduate students are especially encouraged to attend ***

Contact person: Paul Johns

Xiaoyi Bao (University of Ottawa): Gamma-induced attenuation in normal single mode and multimode, Ge-doped and P-doped optical fibers: A fiber optic dosimeter for low dose levels

Date: Monday, April 2, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: Ge-doped, P-doped, normal single mode (SM) and multimode (MM) optical fibers were exposed to Cobalt-60 gamma radiation at dose rates of 0.5 to 3 Gy/min, typical radiotherapy dose rate. A CCD based fiber optic spectrometer was used to measure the real time absorption spectra of these fibers in the visible region. Experimental results have shown that P-doped fiber is the most radiation-sensitive of the fiber tested.

Contact person: Paul Johns

Mike Roney (University of Victoria): Probing the Unbalanced Universe: New CP Asymmetry measurements

Date: Monday, April 9, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: All evidence currently points to a universe composed of matter particles: protons, neutrons and electrons, rather than their antimatter counterparts: antiprotons, antineutrons and positrons. Yet matter and antimatter should have been produced in equal abundance at the Big Bang. Therein lies one of the outstanding puzzles confronting the physicist at the turn of the 21st century: Why does the universe now consist only of matter? Why is the universe unbalanced? One of the conditions for such an imbalance is the phenomenon of 'CP violation' and its study will yield key pieces to the puzzle. In this colloquium, we'll examine this phenomenon in the weak interaction and how new experimental tools are probing it. This winter's results from the recently commissioned BaBar Experiment at the Stanford Linear Accelerator Center will be highlighted.

Contact person: Dean Karlen

Stephen Godfrey (Carleton University): Using the hadronic content of the photon to search for new physics

Date: Friday, May 4, 2001
Location: HP 2445

Time: 3:00 pm

Abstract: Measuring the hadronic content of the photon has been promoted as a clean test of QCD. However, the photon can also be regarded as a broadband quark-gluon beam which may have an important role to play in the search for physics beyond the standard model at future high energy e+e- colliders. I will begin with a short discussion of photon structure functions and parton luminosities. I will then survey searches for new physics using the hadronic content of the photon, starting with Leptoquark searches and identification as has been exploited by the LEP collaborations. I will then describe how resolved photon contributions can contribute to our knowledge of the Higgs sector in gamma-gamma collisions. This is followed by W' searches in e-gamma collisions. I will finish with some comments on other possibilities for this approach.

OCIP Spring Student Seminar Morning

Date: Thursday, May 17, 2001
Location: University of Ottawa, MacDonald Hall, Room 146.

Time: 9:00 a.m. - 12:30 pm

Details are posted at www.ocip.carleton.ca under Calendar of Events.

Brian Rutt (Robarts Research Institute, London Ont.) : Developments in Diffusion and Vascular MRI at the Robarts Research Institute

Date: Tuesday, May 29, 2001
Location: Steacie 103

Time: 3:30 pm ** Non-standard day and location **

Abstract: It is well known that angiogenesis plays a large role in tumour growth and metastasis. Pathological examination of breast tumours has also shown that the density and distribution of microvessels is different in benign and malignant tumours. For these and other reasons, there has been rapid development in the area of anti-angiogenic pharmaceuticals. A need has arisen for a non-invasive, high resolution method that can measure the characteristics of the microvasculature in tumours. Contrast enhanced perfusion MRI is used most commonly to assess tumour vasculature. In the mid 1980's, Le Bihan introduced the Intra-Voxel, Incoherent Motion (IVIM) method as a means of characterising microvascular flow and volume without contrast agents. The premise of the IVIM method is that the blood flow through microvessels can be modeled as a pseudo-diffusion process. The diffusion decay curve contains contributions from water in the tissue as well as the microvasculature and therefore, is at least bi-exponential. My group has hypothesized that IVIM imaging will provide new information about angiogenesis and other pathophysiological parameters of breast tumours, and will allow monitoring of treatment with anti-angiogenic pharmaceuticals. Both contrast-bolus perfusion methods and new concepts in diffusion MRI, including extensions of Le Bihan's original IVIM method, will be discussed.

Contact person: Paul Johns

David Sinclair (Carleton): The Solar Neutrino Problem Solved

Date: Friday, June 22, 2001
Location: Minto Centre, Bell Theatre.

Time: 2:30 pm

Abstract: The first results from the Sudbury Neutrino Observatory have been announced and point to the solution to the long standing Solar Neutrino Problem. The results have important implications for our understanding of elementary particles, of energy production in the Sun, and Cosmology. This talk will explain the significance of the results and highlight Carleton's role in this exciting development.

*** Special Lecture ***

Contact person: Peter Watson

Isabel Trigger (CERN): Searches for Supersymmetric Particles at LEP

Date: Monday, June 25, 2001
Location: HP 4351

Time: 3:30 pm

Abstract: Searches for Supersymmetric Particles at LEP with the emphasis on R-parity conserving, MSSM searches.

Contact person: John Armitage