

Past Physics Seminar Calendar: 2003-2004

Carleton Physics Faculty : Two Minute Seminars

Monday, September 15, 2003

Location: HP4351

Time: 330PM

Abstract: To help introduce new and continuing graduate students to the department for the first seminar of the year we will have "Two minute seminars". All faculty, adjunct faculty, and research associates are invited to give a two minute seminar to introduce themselves, their area of research and specific projects they are working on. In the interests of finishing in the allotted hour, at most one transparency will be tolerated.

Contact Person : Steve Godfrey

Paul Johns (Carleton University): Scattered X Rays as a Diagnostic Tool for Medicine

Monday September 29, 2003

Location: HP 4351

Time: 3:30 pm

Abstract: All medical x-ray imaging today utilizes the primary photons transmitted through the patient without interaction to the detector. Up to 90% of the x-ray quanta approaching the image receptor, however, have been coherently or incoherently scattered, and this radiation can also be used to form an image. Thus, scattered radiation could be no longer just a nuisance to be suppressed but an additional source of information. Our lab has published the first basic analysis of scatter imaging. For some tasks, such as brain imaging, use of scattered x rays is predicted to be more dose efficient than use of primary radiation. The model has been verified by experiment. Our current work is focussed on measuring the differential cross sections or form factors for scattering, and on the design of practical collimation schemes.

Contact Person: Giles Santyr

Alain Bellerive (Carleton): Solar Neutrino Experiments

Monday October 6, 2003

Location: HP 4351

Time: 3:30 pm

Abstract: The Sudbury Neutrino Observatory (SNO) has been collecting data in the pure heavy water phase between November 1999 and May 2001 and in the salt phase since June 2001. This presentation will provide an overview of the constraints on neutrino mixing parameters with the SNO data. The latest results from the salt phase of SNO will be presented. An emphasis will be given to the global solar neutrino analysis in terms of matter-enhanced oscillation of two active flavors. Implication of the SNO results will be discussed.

Contact Person: Richard Hemingway

Thomas J. Glynn (National University of Ireland, Galway): Laser material

processing of advanced materials

Friday October 10, 2003

Location: Seminar Room HP 5115

Time: 11:00 am

Professor Glynn will describe the micromachining of silicon using both nanosecond and femtosecond lasers and in particular some interesting techniques that were developed to characterize the debris generation associated with this process (real-time process monitoring using nanosecond cameras, etc.). These in turn lead to the development of methods to minimize the debris.

The work is sponsored by two separate multinational companies in Ireland who are trying to implement laser processing steps in their fabrication processes. The NUI is also engaged in laser process development on behalf of the big medical device companies in Ireland.

This overview will be interesting to any group working in laser applications and to photonics workers generally.

Contact Person: John Armitage

I. Giomataris (DAPNIA-SACLAY): Detector development and new neutrino experiments

Monday, October 27, 2003

Location: HP4351

Time: 330PM

Abstract: The principle of the operation and basic properties of the new gaseous detector MICROMEGAS will be overviewed. The device combines high accuracy, high rate capability, simplicity and robustness. Various applications in different rate environments from 10-6/s to 10⁹/s will be reported.

Results of the new CERN solar axion search experiment CAST will be presented.

The combination of such precise gaseous detectors with large TPCs is well adapted to low background applications : rare decays, neutrino physics and dark matter detection with recoil direction measurement.

Special emphasis will be devoted to the new, neutrino oscillation oscillation, NOSTOS proposal. The experiment will measure low energy neutrinos by using a strong tritium source and a spherical gaseous drift chamber. The sensitivity of measuring the mixing angle θ_{13} and other important parameters of the weak interaction will be reported.

Contact Person: Madhu Dixit

John Schreiner (Kingston Regional Cancer Centre and Queen's University): Gel Dosimetry - Historical Perspectives and Current State

Monday, November 3, 2003

Location: HP4351

Time: 3:30 pm

Abstract: The use of radiation sensitive gels for dosimetry measurements was first suggested in the 1950s. However, gel dosimeters did not come into wide clinical use because of difficulties in evaluating the dose information. In the 1980s interest in gel dosimeters was revived because of the ability provided by magnetic resonance imaging to display dose information in three dimensions. In this talk I will review the development of gel dosimetry from the early days and discuss the potential for routine direct three dimensional radiation dosimetry with gels. I will review the fundamentals of the major gel dosimeter systems including Fricke (ferrous sulphate) gels and polymer gels and will discuss recent developments of new gel dosimeters. The various probes for measuring the dose information stored in irradiated gels will also be presented.

Contact person: Giles Santyr

Elena Aprile (Columbia): The XENON Dark Matter Experiment

Monday, November 11, 2003

Location: HP4351

Time: 330PM

Abstract: Direct detection of dark-matter Weakly Interacting Massive Particles (WIMPs) with sensitive detectors, shielded from cosmic rays in a deep underground laboratory, offers the hope of studying the dark matter properties in detail, shedding light on particle physics beyond the Standard Model. Event rates as low as of 1 event/100 kg/day necessarily point to massive experiments with extremely low background levels. Among the possible detector materials suited for a WIMP search, liquid xenon (LXe) is well recognized as an optimum choice to satisfy the requirements of 1 tonne-target mass with superior background discrimination, at a reasonable cost and complexity. These arguments led us to propose the XENON experiment with a 1-tonne LXe active target, distributed in an array of ten independent time projection chambers (TPCs) operated in dual phase (liquid/gas). The sensitivity goal of the 1-tonne scale experiment is $\sim 10\text{-}46\text{ cm}^2$, about a factor 100 beyond that projected by the CDMS II experiment in Soudan. This is achieved through a combination of large active self-shielding target, event localization in 3-D, low threshold ($\sim 16\text{ keV}$ recoil energy), with additional background discrimination ($>99.5\%$) using the simultaneous detection of ionization and scintillation signals produced in pure LXe by a WIMP recoil. I will review the status of the XENON R&D and the plan to have the 1st TPC module, with a fiducial mass in excess of 100 kg, operational within 2007.

Contact person: David Sinclair

Steve Godfrey (Carleton/DESY/TRIUMF/CSSM): Around the World with Physics (Weather Wine and Kangaroos)

Monday, November 24, 2003

Location: HP4351

Time: 330PM

Contact person: Richard Hemingway

Georges Azuelos (TRIUMF/U. de Montreal): Exotic Physics with ATLAS

Monday, December 1, 2003

Location: HP4351

Time: 330PM

Abstract: Thanks to the high collision energy and luminosity available at the Large Hadron Collider, at CERN, it will be possible to

probe various theories beyond the Standard Model. After a brief introduction to the general programme of exotic physics with the ATLAS detector, I shall discuss in particular how the collaboration will test two relatively new ideas: the existence of extra spatial dimensions and the scenario of electroweak symmetry breaking known as "little Higgs".

Contact Person: Steve Godfrey

David Jaffray (PMH): Development of an on-line imaging and planning system for image-guided radiation therapy

Monday, January 05, 2004

Location: HP4351

Time: 330PM

Abstract: Advances in the fidelity of dose conformation and in the characterization of disease and normal structures are driving the development of treatment approaches that permit a dramatic reduction in the geometric uncertainty in radiation field placement. A novel imaging system based upon cone-beam computed tomography principles has been integrated with a conventional accelerator to permit on-line imaging of soft-tissue targets in the treatment context. Full utilization of this novel tool requires tight integration of the imaging and treatment device through an on-line planning facility. Such a system has been constructed and is being characterized for both geometric corrections for target positioning and the exploration of on-line planning approaches that capitalize on the re-programmability of modern medical linear accelerators.

Contact Person: Dave Rogers

Shouhua Zhu (Carleton): Thinking about the CKM mechanism

Monday, January 12, 2004

Location: HP4351

Time: 330PM

Abstract: The recent BaBar and Belle (known as B-factories) $\sin(2\beta)$ measurements for $B \rightarrow \Phi K$ -short and $B \rightarrow J/\Psi K$ -short showed possible deviation from the prediction by the Cabbibo-Kobayashi-Maskawa (CKM) mechanism in the Standard Model (SM) of the High Energy Physics. Moreover the more crucial issue for CKM mechanism is that it can't account for the matter-antimatter asymmetry in the Universe, which is the strongest motivation for searching other new CP-violation. In this talk, three topics will be reviewed: (1) CKM mechanism in the SM; (2) Experimental tests of CKM mechanism and possible explanations for the deviations of $\sin(2\beta)$ measurements; (3) CKM and baryogenesis.

Contact Person: Steve Godfrey

Louis-Andre Hamel (U de Montréal): CZT detector development for gamma-ray spectroscopy and imaging

Monday, January 19, 2004

Location: HP4351

Time: 330PM

Abstract: CdZnTe (CZT) is a heavy semiconductor that is used for gamma-ray detection. The seminar will present the material and electronic properties of CdZnTe (CZT) that are of specific interest for gamma-ray detection. Among its advantages are high absorption

coefficients while its major drawbacks are poor hole transport properties. In this seminar, I will present our continuing efforts to develop a CZT device for gamma-ray imaging with 1 mm resolution, good efficiency and good energy resolution in the 100 keV - 2 MeV range. Measurements with present devices will be presented along with some new ideas. A specific application in astrophysics will be presented and other possible applications will be shortly discussed.

Contact Person: Paul Johns

David Boal (Simon Fraser) OCIP Talk: Nature's building code: the Bauhaus school of cell design

Thursday February 5, 2004

Location: University of Ottawa

Time: 2:30 PM

Abstract: Fossilized remains of cells date back at least 3.5 billion years, suggesting that Nature's building code is highly robust and based on only a few structural elements. A two-dimensional fluid membrane regulates the cell's contents, its fluidity facilitating growth and division. Reinforcing this membrane with a tension-bearing network permits large cells to operate at elevated osmotic pressure. Internal rigidity may arise from a linked collection of rods, whose extension by polymerization provides a simple mechanism of force generation. This talk deals with cellular construction and design: the guidelines of twentieth century architecture "form follows function" and "less is more" as applied to cells - living, fossilized, synthetic, and even extra-terrestrial.

Vicky Kaspi (McGill) CAP Lecture: Diversity in Young Neutron Stars

Monday, March 22, 2004

Location: HP4351

Time: 330PM

Abstract: Since the discovery of pulsars in the late 1960's, it has been assumed that the pulsar at the center of the Crab Nebula is an excellent representative of young neutron stars. However, growing evidence from a variety of observations suggests that the standard picture is fundamentally flawed: the Crab pulsar and others like it may in fact be just one manifestation of a far more diverse young neutron star population than has been appreciated. In this talk, I will describe both the traditional point of view, as well as present the latest evidence, from radio and X-ray observations, for this unexpected diversity in young neutron stars.

Contact Person: Steve Godfrey

Jim Cline (McGill): String Cosmology: physics from 10^{-36} to 10^{30} m

Monday, April 5, 2004

Location: HP4351

Time: 330PM

Abstract: The dark energy density of the universe and other cosmological parameters have been determined more precisely by recent measurements of the cosmic microwave background, distant supernovae, and the large scale structure of the universe, making this an exciting time for cosmology. I will review these observations, pointing out aspects of the data which might suggest exotic new physics, and discuss the possible relevance of string theory for understanding or being tested by the data.

Contact Person: Steve Godfrey