Past Physics Seminar Calendar: 1994-1995

Jesse Ernst (CLEO) : Radiative Penguins at CLEO

Monday, October 17, 1994
Location: HP 4351
Time: 3:30

First proposed in 1975 as a possible explanation of the Delta(I)=1/2 rule in K meson decay, FCNC, and b->s,gamma in particular, has since been shown to have important implications for extensions to the Standard Model. While CLEO's 1993 observation of B->K*890,gamma demonstrated penguins' existence, the sensitivity of b->s,gamma to physics beyond the Standard Model is only realized with a fully inclusive measurement.

The CLEO collaboration has recently reported new results on several radiative penguin decays, including the first inclusive measurement of b->s,gamma. I will focus on this result, but will also discuss new upper limits on B->rho (omega),gamma, and B->K(K*)l+l-.

Contact Person: Dean Karlen

Vladimir Novikov (CalTech) : The San Onofre Neutrino Oscillation Experiment

Thursday, October 20, 1994
Location: SC 312
Time: 3:30

The talk will describe a detector for the study of neutrino oscillations with a sensitivity of 0.001 eV**2 for delta m**2 and of 0.1 for sin**2(2*theta). The detector is a segmented12 ton liquid scintillator. It will be installed at a distance of 750 m from the San Onofre reactors, at a depth of 25 mwe. Details of backgrounds are presented.

Contact Person: David Sinclair

Bob Tschirhart (Fermilab) : The search for direct CP violation in the Kaon system.

Monday, October 24, 1994
Location: HP 4351
Time: 3:30

The status and prospects for measuring direct CP violation through (epsilon'/epsilon) and rare kaon decays will be discussed, with particular emphasis on the new kaon physics initiative at Fermilab.

Contact Person: Dean Karlen

Dwayne Miller (U Rochester) : Energetics and Dynamics of Deterministic

Protein Motion: New Insights into Molecular Cooperativity

Monday, November 7, 1994
Location: HP 4351
Time: 3:30

Biological processes should be viewed to a certain degree as `chemistry in motion'. The protein moiety surrounding an activated process constitutes the solvent for the reaction. The protein solvent is a highly associated anisotropic environment for the reaction complex. The anisotropy of the protein complex leads to a highly directed energy transfer process from the reaction to specific motions which regulate the protein activity and is part of the basis for molecular cooperativity. One of the key differences in biological reactions relative to homogeneous chemical systems is the outstanding degree of correlation -- more than 10,000 degrees of freedom can be coupled to a highly specific structure coordinate. Understanding the mechanics of the energy transduction step from a stimulus (the reaction) to functionally important motions remains an important challenge in understanding protein dynamics. New techniques which holographically record protein motion and energy distribution from femtoseconds to milliseconds have determined that the motion is initially directed through collective modes in the protein. This mechanism is the most efficient mechanism possible for propagating the structure changes (ie. the atoms move collectively as a unit) which makes proteins extremely efficient `molecular machines'. This mechanism represents a new paradigm in understanding structure reactivity relationships in biological systems and will be put in context with conformational sampling models.

Contact Person: Peter Watson

H.H.J. Nesbitt Lecture : A.J. Wand (Illinois) : An NMR Spectroscopist's View of Protein Structure, Dynamics and Function

Monday, November 14, 1994
Location: SC 103
Time: 4:30

Contact Person: David Gardner (Dean of Science)

Mike Woods (SLAC) : Precise determination of the weak mixing angle from a measurement of the left-right cross-section asymmetry in e+e- -> Z0.

Monday, November 28, 1994
Location: HP 4351
Time: 3:30

In the 1993 SLC/SLD run, the SLD recorded 50K Z events produced by the collision of longitudinally polarized electrons on unpolarized positrons at a center-of-mass energy of 91.26 GeV. The luminosity-weighted average polarization of the SLC electron beam was (63.0+-1.1)%. We measure the left-right cross-section asymmetry in Z0 production, A_{LR}, to be 0.1628 +- 0.0071(stat) +- 0.0028(syst) which determines the effective weak mixing angle to be sin^2 \theta_W^{eff} = 0.2294 +- 0.0010 (1992/1993 data combined).

Contact Person: Dean Karlen

Graduate Student Fall Seminar Day

Friday, December 2, 1994
Location: Senate Chambers, Robertson Hall
Time: 1:30-5:00

Contact Person: Pat Kalyniak

Brian Wilson (Ontario Cancer Institute, Toronto) : Optical Spectroscopies In Vivo: A Biophysical Perspective.

Monday, December 5, 1994
Location: HP 4351
Time: 3:30

Optical absorption, fluorescence and Raman spectroscopy are being developed for in vitro tissue characterization and disease detection/diagnostics. Moving from the cuvette to the human body poses substantial problems requiring novel biophysical and technological solutions. The theoretical framework and practical implementation of these solutions will be set in the context of the ultimate biomedical or clinical applications.

Contact Person: Paul Johns

Peter Munro (LRCC and U Western Ontario) : Imaging Research at the London Regional Cancer Centre

Monday, January 16, 1995 Location: HP 4351
Time: 3:30

Most of the imaging research at the London Regional Cancer Centre has focused on the development of a portal imaging device for position verification in radiati on therapy. This research has: (i) examined the fundamental limitations of imaging with high energy x-ray beams; and, (ii) developed the hardware and software necessary to acquire and quantitatively evaluate portal images. Studies on the size of x-ray sources of medical linear accelerators, x-ray scatter in the patient at megavoltage energies, the mechanisms of energy deposition in x-ray detectors used in portal imaging, and the characteristics of novel transparent scintillalators have all contributed to improved portal image quality. These studies have also lead to solutions of other problems such as those encountered in accelerator commissioning and autoradiography. An overview of the portal imaging research at the London Regional Cancer Centre and some of the side benefits of this research will be presented.

Contact Person: Paul Johns

Cliff Burgess (McGill U) : The Effective Use of Precision Electroweak Measurements

Monday, January 23, 1995
Location: HP 4351
Time: 3:30

Precision electroweak measurements have become sufficiently accurate to seriously test the standard model, and to start to differentiate amongst the candidates for its successor. This has prompted a search for more efficient techniques for confronting theoretical models with the data, starting with the seminal work of Peskin and Takeuchi, and continuing with that of Altarelli and co-workers. In this seminar several extensions of these analyses are presented which permit their application to a much wider class of theories. A sprinkling of examples are discussed to illustrate the general formalism.

Contact Person: Dean Karlen

Zakhari Merebashvili (McGill U) : Heavy-Quark Production by Polarized and Unpolarized Photons in Next-to-Leading Order

Monday, February 6, 1995
Location: HP 4351
Time: 3:30

We obtain complete analytical results for the production of heavy-quark pairs by polarized and unpolarized photons in next-to-leading order. 2-, 3- and 2+3-jet cross sections for total photon spin Jz=0,+/-2 are presented for bb(g) production. The 2-jet cross sections are considered as a background to gamma gamma -> H* -> bb (standard model). Top production, not too far above threshold, is also considered for Jz=0,+/-2. For both b- and t-quark production, the higher order QCD corrections are found to be significant.

Contact Person: Dean Karlen

OCIP Seminar: Francis Halzen (U Wisconsin) : High Energy Neutrino Astronomy

Monday, February 13, 1995
Location: HP 4351
Time: 3:30

Just like photons, neutrinos are electrically neutral and not affected by galactic magnetic fields so that their measured trajectories point back to the sources in which they were created. Unlike high energy photons however, weakly-interacting neutrinos do carry information on cosmic sites and processes shielded from our view by more than a few hundred grams of intervening matter. The features of the high energy neutrino sky are a matter of speculation. We will argue however that a high energy neutrino telescope should have an effective area of order 1 square kilometer in order to detect neutrino emission from the most energetic cosmic processes involving pulsars, black holes, active galactic nuclei and the like. Such an instrument has unique capabilities in searching for dark matter. We will discuss the first data from a new generation of deep ocean/lake high energy neutrino telescopes. The deployment and early data from a telescope, using large volumes of polar ice as a low-noise particle detector sensing the Cherenkov light from neutrino-induced muons, will be described. Contact Person: Mike Doncheski

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David Anglin and Jian-lin Mu (NRC - HIA) : An Overview of the Ulysses Flyby of Jupiter

Monday, February 27, 1995

Location: HP 4351
Time: 3:30

In February 1992, the spacecraft Ulysses flew through the magnetosphere of Jupiter. We discuss in this overview the physical processes which determine the morphology and dynamics of Jupiter's magnetosphere, and the new results obtained with the instruments on Ulysses, especially the Canadian High Flux Telescope (HFT).

Contact Person: Dean Karlen

OCIP Seminar: Russell Redman (NRC - HIA) : Interplanetary Violence: Captures, Collisions and the Broken Bodies of the Minor Planets

Monday, March 6, 1995
Location: HP 4351
Time: 3:30

The minor planets of the solar system are the broken remains of a host of planetesimals which never had a chance to collect into a full planet. Since the formation of the solar system they have been crashing into each other, and sometimes into the major planets, with results that can be surprising and spectacular. The recent collision of Comet Shoemaker-Levy with Jupiter, the tiny moonlet Dactyl which has been found orbitting the asteroid Ida, and even the Moon orbitting the Earth, tell tales of catastophic violence which punctuate the larger story of the evolving solar system.

Contact Person: Dean Karlen

Pekka Sinervo (U Toronto) : Results from CDF

Monday, March 13, 1995
Location: HP 4351
Time: 3:30

Recent results from the Collider Detector at Fermilab (CDF) experiment will be presented. This experiment has now collected the largest data sample of the highest energy particle-antiparticle collisions in the world, providing fresh insights into the fundamental structure of matter. Electroweak and heavy quark studies will be the highlight of this seminar, including a significantly improved measurement of the mass of the W boson and the observation of the top quark.

Contact Person: Dean Karlen

Giles Santyr (U Wisconsin) : Recent Advances in Magnetic Resonance Imaging of the Breast

Thursday, March 16, 1995
Location: HP2160
Time: 3:30

Over the past decade, several factors have conspired to improve the overall clinical utility of Magnetic Resonance (MR) imaging of the breast. These factors include: higher static magnetic field strengths, surface coils and improved pulse sequences (e.g., fat suppression and fast imaging techniques) and exogenous contrast agents (e.g. Gd-DTPA). This

seminar will provide an overview of breast MR with emphasis on areas of current research interest including: spin locking and magnetization transfer contrast (MTC), dynamic Gd-DTPA-enhanced imaging and MR-guided biopsy.

Contact Person: Paul Johns

M.K. Sundaresan (Carleton U) : Environmental Effects in Beta Decay

Monday, March 20, 1995
Location: HP 4351
Time: 3:30

The theoretical analysis of the environmental effects during beta decay involves the solution of a many body problem in quantum mechanics. The beta decaying nucleus may be in an atom, molecule, in solid state, or in a plasma. The environment in which the beta decay occurs influences the beta spectrum - the screening corrections to the beta spectrum due to the atomic electrons is an example of such an effect. A systematic investigation of these effects in the beta decay of tritium (atom, molecule, etc.) has been undertaken. The results will have a significant bearing on the extraction of neutrino mass from very accurate measurements of the beta spectrum of tritium. The rate of the reaction, p + p -> d + e + neutrino, occurring in the core of the sun is influenced by the environment of the plasma in which the reaction takes place. The results of these ongoing investigations will be presented.

Herzberg Lecture: David Schramm (U Chicago) : Probing Creation: Testing the Big Bang

Wednesday, March 29, 1995
Location: Theatre A
Time: 8:00 pm

This talk will review the basic Big Bang Model of the Universe. In particuliar it will focus on how modern technology has enabled experiments to be developed which probe the Universe as a whole. Recent developments such as new work on the age of the universe, on the dark matter of the universe, on the light element abundances and on the origin of galaxies will be discussed.

Contact Person: Peter Watson

David Schramm (U Chicago) : Neutrinos in Cosmology

Thursday, March 30, 1995
Location: HP 4351
Time: 10:30 am

Contact Person: Peter Watson

Charlie Ma (NRC) : Application of Monte Carlo Techniques in Radiotherapy Dosimetry

Monday, April 3, 1995
Location: HP4351
Time: 3:30 pm

Monte Carlo techniques have been widely used in medical physics. This talk will provide an overview of Monte Carlo radiation transport with emphasis on the EGS4 (Electron Gamma Shower version 4) code system and its applications in radiation dosimetry and radiotherapy treatment planning. Monte Carlo calculated correction factors for ionization chambers and Fricke dosimetry in medium-energy x-ray and high-energy photon and electron beams will be presented. The simulation of high-energy electron beams from clinical linear accelerators will be described and the absorbed dose distributions in a water phantom calculated using the simulated beam data and those calculated using various beam models will be analyzed.

Contact Person: Paul Johns

Jamal Charara (Laval U) : Hemodynamics and Endothelial Cells Behavior

Thursday, April 6, 1995
Location: HP2160
Time: 3:30 pm

Our objective is to investigate the effects that flow characteristics have on the morphological behavior of endothelial cells and on the patency of vascular grafts. These investigations are important in many pathophysiological processes (thrombosis, atherosclerosis, etc.) and biotechnological applications (development of artificial organs).

Contact Person: Paul Johns

Louis Lemieux (London, England) : Multi-modality Brain Imaging and Electrophysiological Modelling

Monday, April 10, 1995
Location: HP2160
Time: 3:30 pm

Recent advances in imaging and post-processing techniques are opening new avenues of investigation in neuroscience. The accurate combination of data from different imaging modalities, or the same modality, using anatomical or synthetic landmarks provides a basis for numerous applications. In particular, stereotaxy has greatly benefited from recent developments. The principles at the basis of both frame-based and frameless stereotaxy will be reviewed; a practical application will be presented (on video) as well as a new frameless method which can be useful in interventional radiology. A new method for the accurate registration and comparison of 3D MR images acquired at different times will also be discussed. Finally, I will present a model of electrical conduction in the head which uses patient-specific anatomical information extracted from MRI.

Contact Person: Paul Johns

Giorgio Giacomelli (Bologna/INFN) : Physics and Astrophysics at the Gran Sasso Laboratory

Monday, April 24, 1995
Location: HP 4351
Time: 3:00 pm *** NOTE SPECIAL TIME ***

The present status of the Gran Sasso National Laboratory of INFN is described. The lab is situated under the Gran Sasso mountain, on the highway Rome-Teramo. The lab has facilities typical of a High Energy Physics Laboratory and has low natural radioactivity. It is a unique facility for performing many experiments at the interface of particles physics and astrophysics. The exeriments concern neutrino physics, astrophysics, high energy cosmic rays, searches for magnetic monopoles, dark matter particles, and neutrinoless double beta decay. An extensive air shower array on the top of Gran Sasso mountain allows coincidences to be made between the array and the largest underground detectors.

Contact Person: Peter Watson

Hannes Jeremie (U Montreal) : Comparison of O(alpha_s**2) Matrix Element Calculations with 4-Jet Events from Hadronic Decays of the Z

Monday, May 1, 1995
Location: HP 4351
Time: 3:30 pm

The shapes of 4-jet angular correlations of hadronic events originating from four quarks (q,q_bar,q,q_bar) are different from those coming from other events (q,q_bar,g,g). This property is used to compare second order matrix element calculations with OPAL data by extracting an apparent fraction of four-quark events from the data with this theory.

Contact Person: Dean Karlen

Graduate Student Seminars

Tuesday, May 16, 1995
Location: University of Ottawa, MRN 021
Time: 1:30 pm

Contact Person: Pat Kalyniak

Ion Stancu (UC Riverside) : Status of the Neutrino Oscillations Search with LSND

Friday, May 19, 1995
Location: HP 4351 Time 2:30 pm *** NOTE SPECIAL TIME ***

The LSND experiment at LAMPF/LANL has been designed to study a variety of neutrino processes and in particular neutrino oscillations in both nu_mu_bar -> nu_e_bar and nu_mu -> nu_e appearance channels. After the first two years of data taking, LSND observes an excess of events which appears to be consistent with neutrino oscillations. The talk will review the results of the various neutrino processes measured, with emphasis on the current status of the oscillations analysis.

Contact Person: Dean Karlen