Past Physics Seminar Calendar: 1999-2000

Julia Wallace (Carleton): MRI Thermometry of Tissue During

Monday, September 13, 1999
Location: HP 4351
Time: 3:30 pm

Abstract: MRI can be used to non-invasively monitor the highly localised temperature rises which occur during thermal surgeries. However, the accuracy of MRI thermometry during rapid heating is not well established. We have developed a heat application cell which can create a moderately rapidly changing temperature gradient across tissue and which can be modeled theoretically. Time resolved MRI temperature maps obtained with this system will be presented and compared to thermocouple measurements and a theoretical model.

Contact Person: BJ Jarosz

Kim Maltman (York): Finite Energy Sum Rules From the Ground Up

Monday, September 20, 1999
Location: HP 4351
Time: 3:30 pm

Abstract:

The basic formulation of QCD Sum Rules relies only on extremely well-established properties of QCD such as analyticity, unitarity and asymptotic freedom. However, practical implementation require approximations which can obscure the reliability (or lack thereof) of the method. In this talk I show how empirical spectral data from hadronic tau decay guide one to a formulation (a particular implementation of Finite Energy Sum Rules) which can be shown to be extremely well-satisfied, even at rather low scales, and which, in many situations can be expected to provide significant better accuracy than the Borel transformed sum rule implementation. Applications of the method to the determination of the light current quark masses, and to a determination of the nature of the a_0(980), will also be discussed. The talk is structured so that no previous knowledge of QCD sum rules will be required.

Contact Person: Pat Kalyniak

Akira Konaka (TRIUMF) : A conceptual design of a next generation nucleon decay/neutrino detector

Wednesday, September 29, 1999
Location: HP 4351
Time: 1:30 pm

Abstract:

Nucleon decay experiment is virtually the only direct search of the energy scale of 10^16 GeV; the grand unification scale of electro-weak and strong interactions. Recently, the situation has become more exciting because both precision measurement of running gauge couplings (alpha_s) and neutrino oscillation (see-saw mechanism) independently suggest a new energy scale of $\sim 10^16$ GeV. After an introduction of the physics motivation and experimental status, I will introduce a new conceptual idea of a next generation nucleon decay detector using Pb. The detector is also effective for

detailed study of atmospheric neutrinos as well as solar and supernova neutrinos. A prototype detector can be used for accelerator based neutrino experiments, e.g. a LSND type neutrino oscillation experiment using TRIUMF beam.

Contact Person: Pat Kalyniak

Mike Sherar (UToronto): Image Guided Thermal Therapy in Oncology

Monday, October 25, 1999
Location: HP 4351
Time: 3:30 pm

Abstract: Minimally invasive therapies are revolutionizing medicine resulting in less traumatic surgery, shorter hospital stays and improved results. The application of thermal therapy and photodynamic therapy to treating cancer is a rapidly expanding area of research. This talk will concentrate on the integration of image guidance and monitoring technologies for these minimally invasive procedures.

Contact Person: BJ Jarosz

Jan Dubowski (NRCC): Laser Technology for Integrated Photonics

Monday, November 1, 1999
Location: HP 4351
Time: 3:30 pm

Abstract: Manufacturing of photonic devices for telecommunication applications is the area that has enjoyed its rapid growth mostly thanks to the application of both conventional approaches and tools. As the demand is growing for increased reliability, yield, miniaturisation and cost-effectiveness, the ability to realize novel device architectures has become increasingly important. This requires improved and/or new tools since those currently in the use are approaching their limits. Laser-based processing of materials is an attractive addition to the plethora of methods applied in manufacturing of photonic devices. Of particular interest is the use of laser as tools for the manufacturing of monolithically integrated photonic devices. Such device structures require different band-gap material within the same wafer, which can be achieved by controlled intermixing between the barrier and quantum well material - a process referred to as quantum well intermixing (QWI). We have investigated QWI induced with IR and UV lasers in SiGe/Si 1, InGaAs/InGaAsP2 and InAs/GaAs material systems. The results indicate that this approach has the potential for "writing" the material with selectively tuned band-gap in excess of 200 meV. Arrays of detectors and semiconductor lasers, and waveguide-laser microstructures can be fabricated from such material. In this presentation, I will review the current status and perspectives of laser-induced QWI, as well as of some other laser-based technologies, for the fabrication of photonic integrated devices.

Contact Person: BJ Jarosz

Francois Corriveau (McGill):

Monday, November 8, 1999 CANCELLED Location: HP 4351
Time: 3:30 pm

Abstract:

Contact Person: Pat Kalyniak

Carlos Cabal (Santiago de Cuba): Magnetic Resonance (MRI and Relaxation) Studies in the Medical Biophysics Center of Santiago de Cuba

Monday, November 15, 1999
Location: HP 4351
Time: 3:30 pm

Contact Person: BJ Jarosz

James Cline (McGill): Branes, extra dimensions, and cosmological expansion: catastrophe orserendipity?

Tuesday, November 16, 1999
Location: HP 4351
Time: 1:30 pm

Abstract:

I report on recent progress on understanding the weak-scale hierarchy problem and the expansion of the universe, assuming that the latter is a 3-brane embedded in a higher-dimensional spacetime. These two ostensibly dissimilar subjects appear to be closely related. More hints for a string-theoretic origin of the scenario will also be presented.

Contact Person: Pat Kalyniak

Robert de Kemp (Heart Institute): Quantitative Positron Tomography in the Management of Ischemic Heart Disease

Monday, November 22, 1999
Location: HP 4351
Time: 3:30 pm

Abstract: Positron emission tomography (PET) was established historically as a powerful research tool, investigating the biochemical functions of the body in health and disease. In the clinical setting, cardiac PET is now used routinely to evaluate relative blood flow and glucose metabolism of the heart muscle. Absolute quantification of blood flow and metabolism using kinetic models of dynamic PET data, provides added information which can be beneficial in patients with diffuse disease, and in research studies investigating new therapies or mechanisms of heart disease.

Contact Person: BJ Jarosz

Keith Riles (University of Michigan): To Catch a Wave: Searching for Gravitational Radiation

Wednesday, January 12, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

Within the next few years, an international network of large laser interferometers will be commissioned to search for gravitational radiation from astrophysical sources. Candidate sources include the death-spiral of binary systems of neutron stars and black holes; rapidly rotating neutron stars; and supernovae. The principles of gravitational wave generation and detection will be described.

The largest detector in the international network is the Laser Interferometer Gravitational-Wave Observatory (LIGO), consisting of three km-scale Michelson interferometers located in the United States at two sites separated by 3000 km. LIGO I is expected to begin data taking in early 2002. Prospects for gravitational wave discovery with LIGO I and with its planned upgrade, LIGO II, will be discussed.

Contact Person: Pat Kalyniak

Matthew Jones (Pennsylvania): Mixing and CP violation at CDF in Run-I and Run-II

Monday, January 17, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

The first observation of CP violation was made in the neutral kaon system in 1964. To date, this remains the only system in which CP violation has been clearly demonstrated. However, using data recorded during Run-I of the Tevatron p-pbar collider, the CDF experiment has made the world's most precise measurement of the CP violating parameter sin(2 beta). Combined with other recent measurements this arguably constitutes an observation of CP violation in the neutral B system. In the Tevatron's upcoming Run-II, CDF will be the only experiment to provide precise measurements of both sin (2 beta) and the frequency of Bs oscillations. Both measurements are essential to determine the parameters of the CKM mixing matrix in the Standard Model. I will discuss the existing analyses and the upgrades to the CDF detector which will make these measurements possible in Run-II.

Contact Person: Pat Kalyniak

Dave Hanes (Queen's): Globular Star Clusters as Dynamical Test

Monday, January 24, 2000
Location: HP 4351
Time: 3:30 pm

Abstract: Globular star clusters contain the oldest known stars, and were formed during the galaxy formation process shortly after the Big Bang itself. Correlations between their spatial distributions, kinematics and chemical compositions have been used as evidence for a dissipative-collapse-plus-enrichment formation model for our own Milky Way galaxy. In remote external galaxies, some of which contain many thousand globular star clusters, similar studies are now possible

thanks to the development of highly sensitive wide-field CCD detectors on very large telescopes, and especially because of innovative multiplex instruments. In at least some galaxies, there are clear signatures of galaxy formation through successive mergers of smaller galaxies rather than a single monolithic collapse.

Contact Person: BJ Jarosz

Ken Shortt (NRC): Metrology of Ionising Radiation in Canada

Monday, January 31, 2000
Location: HP 4351
Time: 3:30 pm

Abstract: Research and development of measurement standards for ionizing radiation are the responsibility of the IRS group of NRC. Cancer therapy demands high quality measurements of radiation fields. Recent international agreements are forcing laboratories to reconcile their radiation measurement discrepancies. Some aspects of the science underlying radiation standards will be discussed.

Contact Person: BJ Jarosz

Dr. R. Sega (University of Colorado): Space, Technology and Education: Past, Present and Future

Monday February 7, 2000
Location: 624 Southam
Time: 2:30 pm (note unusual time and location)

Abstract:

Contact Person: J. Armitage

Francois Corriveau (McGill): Jet Physics with ZEUS at HERA

Monday, February 14, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

The ZEUS experiment at HERA studies high-energy collisions of electrons and protons. In deep inelastic scattering processes or in photoproduction events, jets are the manifestation, at the hadronic level, of the underlying partons. Examples will be given on how HERA jets can be used to test the Standard Model and QCD, to differentiate between quarks and gluons, and to bring constraints on the photon parton density parametrizations.

Contact Person: Pat Kalyniak

John Reid (JDS Uniphase): The Fiber-Optic Revolution in Telecommunications -- Research Trends and Career Opportunities

Monday February 28, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

The talk will discuss the advantages of fiber optic systems relative to copper-based communication systems, and will explain how the insatiable demand for bandwidth on the internet is driving an explosion in capacity in the entire telecommunication industry. The technology advances that have led to the transmission of terabits of information over megametres of distance will be explained, and the technology drivers for the next generation of products will be discussed.

Contact person: Steve Godfrey

Norbert Bartel (York University): Very-Long-Baseline Interferometry of a Supernova

Monday, March 6, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

Twenty consecutive very-long-baseline interferometry (VLBI) images of supernova 1993J in the nearby galaxy M81 from the time of explosion to the present show in unprecedented detail the dynamic evolution of the expanding radio shell of an exploded star. High prcision astrometry reveals that the supernova expands isotropically from its explosion center. The images display the complex behaviour of the shock front as it interacts with the circumstellar medium left over from the progenitor star. As the shock front sweeps up the medium it is increasingly decelerated and influenced by it. After only five years the supernova has slowed down to half its original expansion velocity, and has likely entered the early stages of the adiabatic phase common in much older supernova remnants in our own Galaxy. The presentation includes the video ``Supernova: Death of a Star." which contains the VLBI images along with an animated explanatory introduction.

Contact person: Pat Kalyniak

Siegfried Janz (NRC): Wavelength conversion in asymmetric quantum well waveguides

Monday, March 13, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

One of the components required in a fully transparent optical communications network is a viable optical wavelength converter. In this talk, we discuss wavelength conversion by optical frequency mixing in nonlinear waveguides. The

concept of quasi-phase matching to achieve high conversion efficiencies will be described. Asymmetric quantum wells can be inserted in nonlinear waveguides to create an artificial second order nonlinearity. This nonlinear susceptibility can be locally modified using ion implantation enhanced quantum well intermixing. Our recent results using this technique to fabricate quasi-phase matched asymmetric quantum well waveguides will be presented.

Contact person: Steve Godfrey

Ruth Wilkins (Health Canada): Development of a biological dosimeter for ionizing radiation

Monday, March 20, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

It is well established that ionizing radiation induces damage to DNA that alters the normal cellular functions. A damaged cell triggers a cellular response to either repair the detected damage or induces the cell to die either through necrosis or programmed cell death (apoptosis). The biological consequence of the acquired cellular damage is traditionally evaluated by the 'dicentric' chromosome assay which is a tedious, expensive, cytogenetic assessment of damage. A more rigorous assay is needed to identify highly exposed individuals in the event of a large scale nuclear accident or to assess radiation exposures when the reading from physical dosimeters are compromised, missing or in dispute. Apoptosis in human blood cells is currently being assessed for its potential as an end point for biological 'dosimetery'. The development of methods used for detecting this type of damage will be described.

Contact person: BJ Jarosz

Georges Azuelos (U. de Montreal): Strong Symmetry Breaking signals

Tuesday, March 21, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

After a brief review of the present situation of the SM and MSSM Higgs search, I shall discuss the importance of a strong symmetry breaking scenario. I shall then show how ATLAS, at the LHC, can serve to investigate different models, principally in channels of longitudinal gauge boson pair production at high mass.

Contact person: Pat Kalyniak

Michael Hudson (Waterloo): Beyond the Great Attractor: Probing Dark Matter with Cosmic Flows

Monday, March 27, 2000
Location: HP 4351
Time: 3:30 pm

Abstract:

Dark matter makes up at least 90% of the mass density in the Universe, but its nature, quantity and distribution are almost completely unknown. I will discuss how cosmic flows --- deviations from the uniform expansion of the Universe -- can be used to probe dark matter on scales from hundreds of millions to billions of light-years. I will review the brief history of this field from the discovery of the "Great Attractor" and present some recent results from current astronomical surveys raise new questions about the nature of dark matter.