

Physics 6991: Introduction to Research in Physics and Astronomy

Fall 2016

M 16:00-17:00, Room 245, Physics Building

This is a 1 credit course. Incoming graduate students are introduced to the research opportunities in the Department of Physics and Astronomy. Presentations will be given by members of the faculty and each will indicate some recent research papers from their groups that students should read before attending the presentation. Some presentations will include visits to labs in the physics building.

Professor: Professor and Chair David Cinabro (139 Physics, 313-577-2918, david.cinabro@wayne.edu, <http://motor1.physics.wayne.edu/cinabro.html>)

Office Hours: M 15:00-16:00 or by appointment

Weekly Write-Ups (100%)

Students are required to submit a weekly one page summary of the research topic presented the previous week. The last summary is due on 17:00 on 19 December.

Day By Day in Class

Week	Topic	Presenter	Paper Link
12 Sep	Physics and Astronomy Research at Wayne State	Professor Cinabro	-
19 Sep	Theoretical Particle Physics	Professor Petrov	Lepton flavor violating quarkonium decays Direct probes of flavor-changing neutral currents in e^+e^--collisions The role of low-energy observables in precision Higgs boson analyses D^\pm production asymmetry at the LHC from heavy quark recombination Searching for dark matter at LHC with Mono-Higgs production New Physics from rare decays of charm
26 Sep	The Phase Diagram of Nuclear Matter	Professor Llope	Ultrarelativistic heavy-ion collisions: exploring the phase diagram of QCD
3 Oct	New Opportunities in Biophysics: Application of	Professor Chu	Effects of pressure on the dynamics of an oligomeric protein from deep-sea

	Neutron Scattering		hyperthermophile Quasi-Elastic Neutron Scattering Reveals Ligand-Induced Protein Dynamics of G-Protein-coupled Receptor Enhanced Dynamics of Hydrated tRNA on Nanodiamond Surfaces: A Combined Neutron Scattering and MD Simulation Study Effect of Nanodiamond surfaces on Drug Delivery Systems
10 Oct	Perspectives on Electron Correlation, Topological Insulators, and Emerging 2D Materials	Professor J. Huang	Topological Insulators Ordering, metastability and phase transitions in two-dimensional systems Electronic properties of two-dimensional systems Spin-Orbit Coupling Effects in Two-Dimensional Electron and Hole Systems
17 Oct	Adventures in Nanoscale Nechanics	Professor Hoffmann	Squeezing out the last 1 nanometer of water: A detailed nanomechanical study Dynamic Solidification in Nanoconfined Water Films Dissociation Kinetics of an Enzyme-Inhibitor System Using Single-Molecule Force Measurements How Molecular Motors Extract Order From Chaos
24 Oct	The Future of Particle Physics: The Higgs, Dark Matter & the LHC	Professor Shah	Impersonating the Standard Model Higgs Boson: Alignment without Decoupling Complementarity Between Non-Standard Higgs Searches and Precision Higgs Measurements in the MSSM On the Alignment Limit of the NMSSM Higgs Sector NMSSM Interpretation of the Galactic Center Excess MSSM A-funnel and the Galactic Center Excess: Prospects for the LHC and Direct Detection Experiments
31 Oct	From the Big Bang to the Mini Bang and Back!!	Professor Pruneau	Charge correlations using the balance function in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV Event-by-event analysis of heavy ion

			collisions and thermodynamical fluctuations General Charge Balance Functions, A Tool for Studying the Chemical Evolution of the Quark-Gluon Plasma
7 Nov	Contact Engineering of Two-Dimensional Layered Semiconductors beyond Graphene	Professor Zhou	Low-Resistance 2D/2D Ohmic Contacts: A Universal Approach to High-Performance WSe₂, MoS₂, and MoSe₂ Transistors High Mobility WSe₂ p- and n-Type Field Effect Transistors Contacted by Highly Doped Graphene for Low-Resistance Contacts Improved Carrier Mobility in Few-Layer MoS₂ Field-Effect Transistors with Ionic-Liquid Gating
14 Nov	Nuclear Microscopy- A unique qualitative and quantitative tool to study surfaces and interfaces	Professor Padmanabhan	In situ interface analysis by ion backscattering/channeling technique using a thin window cell Ion implantation and ion beam analysis of MOD deposited oxide films Electrochemical properties of V₂O₅ thin films deposited by spin coating Ferromagnetism in CuO-ZnO multilayers The effect of titanium on the lithium intercalation capacity of V₂O₅ thin films Strong plasmon absorption in InN thin films
17 Nov: 2:00 PM	Measuring Susceptibility from MRI	Professor Norman Cheng	Limitations of calculating field distributions and magnetic susceptibilities in MRI using a Fourier based method Magnetic moment quantifications of small spherical objects in MRI Susceptibility and size quantification of small human veins from an MRI method A quantitative study of susceptibility and additional frequency shift of three common materials in MRI Quantifications of in vivo labeled stem cells based on measurements of magnetic moments
21 Nov	Accretion Power In Astrophysics	Professor Cackett	A Universe of Disks

28 Nov	<u>Single molecule to Multi-molecule ensemble</u>	<u>Professor Sakamoto</u>	<u>R1 motif is the major actin-binding domain of TRIOBP-4</u> <u>Actin structure-dependent stepping of myosin 5a and 10 during processive movement</u> <u>Coupling of two non-processive myosin 5c dimers enables processive stepping along actin filaments</u> <u>The actin-bundling protein TRIOBP-4 and -5 promotes the motility of pancreatic cancer cells</u> <u>Effect of N-Terminal Extension of Cardiac Troponin I on the Ca(2+) Regulation of ATP Binding and ADP Dissociation of Myosin II in Native Cardiac Myofibrils</u>
5 Dec	<u>How Big is the Proton?</u>	<u>Professor Paz</u>	-
12 Dec	<u>Nanoscale Membrane Curvature Revealed by Polarized Localization Microscopy</u>	<u>Professor Kelly</u>	<u>Membrane curvature at a glance</u> <u>Membrane curvature bends the laws of physics and chemistry</u> <u>A physicist's view of the role of lipids in membrane curvature and fission</u>