NJAAPT

New Jersey American Association of Physics Teachers

SPRING 2008 SECTION MEETING

March 14-15, 2008
Princeton University

Welcome to theNew Jersey AAPT Spring Section Meeting!

The focus of the 2008 section meeting is on current research in fundamental particle physics, and physics/astronomy teaching resources.

NJAAPT would like to acknowledge Joe Spaccavento for suggesting the theme of this meeting. Ray Polomski and Steve Schnetzer, director of the Rutgers QuarkNet center, arranged the guest speakers. Special thanks to Geoffrey Gittelfinger and Ed Groth from Princeton University for their help and the use of Princeton facilities. Thanks also to the Executive Board for all of their planning efforts, to Jessie Blair for coordinating the meeting and catering arrangements, and to Nancy Michaelsen for designing the program booklet.

And, of course, we especially thank our guest speakers, who have taken time out of their busy schedules to be here.

We hope that you will find the meeting informative and enjoyable, and we look forward to seeing you at future events.

NJAAPT
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SCHEDULE of EVENTS

Friday March 14, 2008
Jadwin Hall

5:00 – 6:00 p.m.	Registration, Hors d'oeuvres
6:00 – 7:15 p.m.	Dinner – Buffet style in the Joseph Henry Room
7:15 – 8:30 p.m.	Guest Speaker: **Steven Schnetzer** Rutgers University *"Probing the Structure of Matter: a History of Fundamental Particle Physics"*
9:00 – 10:00 p.m.	Tour of Princeton University Observatory (weather permitting)

SCHEDULE of EVENTS

Saturday March 15, 2008
McDonnell Hall

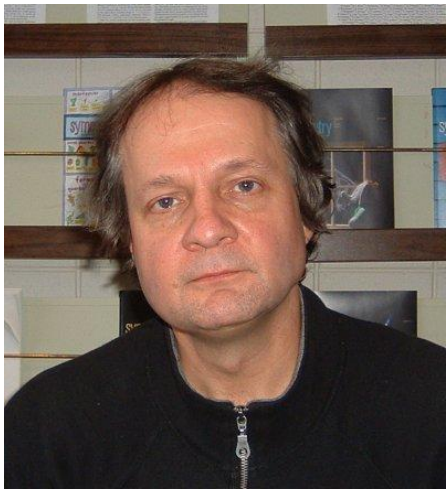
8:30 – 9:00 a.m.	Registration, Coffee, Tea, Bagels
9:00 – 9:15 a.m.	Welcome: **Ray Polomski** President of NJAAPT
9:15 – 10:30 a.m.	**Nima Arkani-Hamed** Institute of Advanced Studies, Princeton *"Fundamental Physics, Cosmology and the Large Hadron Collider"*
10:30 – 10:45 a.m.	Break

10:45 – 12:00 p.m.	**Christopher Tully** Princeton University *"The World's Largest Digital Cameras: Images from Fundamental Interactions at the Large Hadron Collider"*
12:00—12:15 p.m.	Cloud Chamber labs
12:15 – 1:30 p.m.	Lunch (included)
1:30 – 2:30 p.m.	**Bruce Mason,** Director of ComPadre *"Sharing the Wealth of Physics and Astronomy Teaching Resources"*
2:30 – 4:00 p.m.	Demo Show

Steve Schnetzer

Rutgers University

" Probing the Structure of Matter: A History of Fundamental Particle Physics "



Steve Schnetzer is the senior member of the Rutgers High Energy Physics group and has been active in research in fundamental particle physics for over three decades. Steve earned his Ph.D. from Rutgers University. In the 1980's, he was co-founder of an international collaboration that constructed a large collider experiment for the TRISTAN electron-positron collider in Japan. In the 1990's, he worked on a major experiment at Fermilab studying matter-antimatter asymmetry. Twenty years ago, he proposed and pioneered the use of synthetic diamond as a radiation-hard particle detector. He current-

ly works on the Compact Muon Solenoid experiment, one of the large detector facilities being built for the Large Hadron Collider (LHC) at CERN. He is eagerly awaiting the first physics data from the LHC.

Probing the Structure of Matter: A History of Fundamental Particle Physics

Understanding the structure of matter at its smallest scale has been a profound subject of human interest since the dawn of civilization. Following an early period of development in ancient Greece, little further progress was made for nearly two thousand years until around the beginning of the twentieth century when a period of great discovery and advancement began that still continues today. This progress has been made possible by major advances in experimental technology and in theoretical insight. I will describe a few of the revolutionary experiments that make up this history and the equally revolutionary and colorful physicists who carried them out. The focus will be on those key experiments that laid the foundation for the great edifice that constitutes our present understanding of the fundamental structure of matter, the Standard Model of particle physics. The Standard Model is one of the greatest achievements of human endeavor but we know that it is incomplete. The coming decade ushered in by the first data from the Large Hadron Collider promises to be a period of perhaps even greater excitement and discovery. My talk will indicate how far we've come in our understanding and how we've achieved it. It will help set the stage for the talks on Saturday that will describe what we expect to discover at the Large Hadron Collider and the monumental experimental devices that will be needed for making these discoveries.

Nima Arkani-Hamed

Institute of Advanced Studies,
Princeton

"Fundamental Physics, Cosmology, and the Large Hadron Collider"

Nima Arkani-Hamed earned his Ph.D. in Physics from the University of California-Berkeley. He was an assistant professor at the University of California, a professor at Harvard University, and has recently joined the faculty of the Institute of Advanced Studies in Princeton, NJ. He is the recipient of a Phi Beta Kappa teaching award from Harvard (2005), the Gribov Medal of the European Physical Society (2003), and a number of fellowships, including a Packard Fellowship and a Sloan Fellowship, both awarded in 2000.

One of the leading particle physics phenomenologists of his generation, Nima Arkani-Hamed's work is concerned with the relation between theory and experiment. His research has shown how the extreme weakness of gravity, relative to other forces of nature, might be explained by the existence of extra dimensions of space, and how the structure of comparatively low-energy physics is constrained within the context of string theory. He has taken a lead in proposing new physical theories that can be tested at the Large Hadron Collider (LHC) at CERN in Switzerland, which is scheduled to start up in May 2008.

Christopher Tully

Princeton University

" The World's Largest Digital Cameras: Images from Fundamental Interactions at the Large Hadron Collider"

Christopher Tulley earned his Ph.D in Physics from Ph.D., Princeton University. He is an associate professor at Princeton. He was a CERN Fellow, 1998-2000, and the recipient of a Sloan Fellowship in 2003.

One of the world's leading experimental particle physicists, Chris Tully has played prominent roles at several frontier high energy physics facilities: the

LEP electron-positron collider at CERN, the D0 experiment at the Fermilab Tevatron Collider and the CMS experiment at the CERN Large Hadron Collider. At LEP, he led the group responsible for presenting the combined results of all four experimental groups on a search for the Higgs particle. On D0, he leads the group responsible for Top Quark Physics. In CMS, he is co-leader of the Calorimeter Performance Group and of the Jets and Missing Energy Group. This past summer he was elected by US-CMS to be co-leader of the CMS Physics Analysis Center based at Fermilab. He has given over thirty invited talks on Electro-weak Physics, Top Quark Physics and Higgs searches.

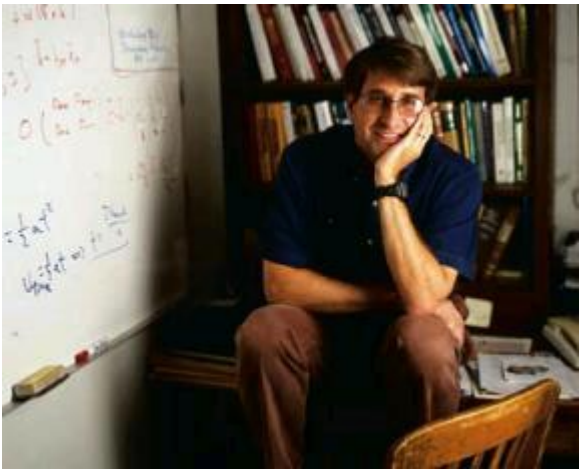
The World's Largest Digital Cameras: Images from Fundamental Interactions at the Large Hadron Collider

The world's largest scientific instrument is on the verge of completion. The Large Hadron Collider (LHC) sits 20 stories underground in a tunnel measuring 16 miles in circumference in the countryside outside of Geneva, Switzerland. Powered by over 1200 superconducting magnets running at superfluid liquid helium temperature, the LHC and its detectors will probe distances billions of times smaller than the most advanced optical microscopes. The culmination of decades of discovery and development in particle physics have brought into being a vision of the microscopic world whose major players will come to light, for the first time, in the images produced at the LHC. Perhaps one of the greatest scientific endeavors of our time, the LHC will give particle physicists the rare, but great, opportunity to unlock secrets of the universe.

Bruce Mason

University of Oklahoma

" Sharing the Wealth of Physics and Astronomy Teaching Resources"



Bruce Mason is an Associate Professor in the Homer L. Dodge Department of Physics and Astronomy at the University of Oklahoma. He received his B.S. at Oberlin College and his Ph.D. at the University of Maryland. He has been the director of the ComPADRE project since 2002 and has been involved in several other projects connecting teaching and technology.

Sharing the Wealth of Physics and Astronomy Teaching Resources

Teachers and faculty tend to be very generous in sharing their teaching experiences and resources, this being particularly true of physicists and astronomers. Many educators and researchers have developed excellent materials to help students learn and are distributing them through various means on the internet. The ComPADRE project is working to enhance this sharing by providing ways to make it happen. Through this effort, the AAPT, APS, AAS, and SPS are developing and expanding an online "card catalog" of materials and, more importantly, hosting the tools that allow members of communities to suggest, comment, rate, organize, and connect items for all to see. This talk will explore the many exciting teaching resources and research results available through ComPADRE as well as the ways in which groups and individuals can access them.

"*The operations of the universe are unlimited, and in the great book of nature, man has scarcely read more than the title page or the preface.* "

Joseph Henry's remarks at the Laying of the Cornerstone of the American Museum of Natural History (New York), June 2, 1874

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PHYSICS EDUCATION