SMU RESEARCH

Theoretical universe: Olness to present at DESY premier research center

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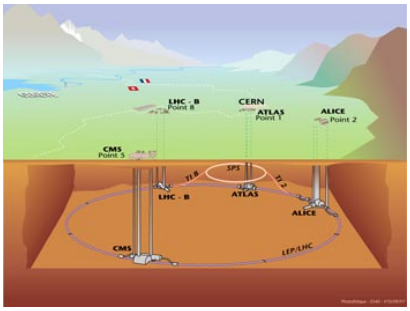
Fredrick Olness, a professor in SMU's Physics Department, has been named the inaugural lecturer in a new program launched by the DESY laboratory, Germany's premier research center for particle physics.



The LHC at CERN near Geneva. Credit: CERN

DESY's "Theorist of the Week" program brings prominent theorists from around the globe to spend a week at the lab's analysis center in Hamburg, Germany. Olness, who will visit the laboratory in March, is the program's first guest physicist.

SMU's Olness is co-spokesman of the CTEQ collaboration, an international collaboration of 30 experimentalists and theorists from 16 universities and 5 national labs working on quantum chromodynamics. Known as QCD, quantum chromodynamics is the theory of the strong nuclear force that binds the protons and neutrons inside the atomic nucleus.

At DESY, Olness will present a seminar on his research specialty, and will also participate in extended discussions with local experts. This program will improve the exchange between theory and experiment, provide a forum for presenting the latest research advances, and will also generate an active intellectual environment for local Ph.D. students.

Fredrick Olness

The visit is hosted by DESY, which is the largest German research center for particle physics. The "Theorist of the Week" program is sponsored by the prestigious Helmholtz Alliance, a structured research network comprising 18 German universities, and 3 institutes, as well as DESY.

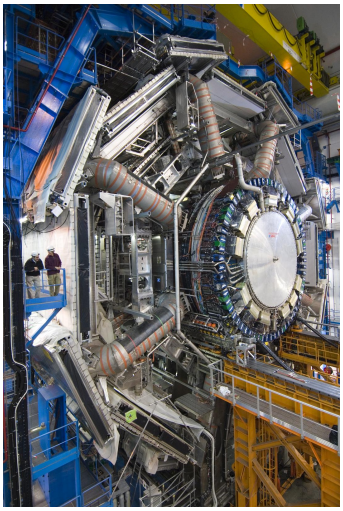
The Alliance is part of a broad international effort to explore the physics at the Terascale — the highest energy scales available in the laboratory; this enables scientists to study interactions at the smallest distance scales as they try to characterize the fundamental forces and building blocks of nature.

An important component of this Terascale program is the new CERN particle accelerator near Geneva, Switzerland, called the Large Hadron Collider, or LHC. It is the highest energy particle accelerator ever built. By accelerating protons to nearly the speed of light, the LHC functions as a "high-energy microscope" to study matter at the smallest distance scales.

"With the start-up of CERN's LHC this past fall, we soon expect revolutionary results which will help us explain the origin of matter and decode the nature of dark matter," Olness said. "Additionally, these results may provide glimpses of proposed extra spatial dimensions and new particles predicted by grand unified theories. Evidence for any of these phenomena would dramatically change our view of the world."

Olness will visit DESY from March 8 to 12 and present his recent work on the "benchmark" processes that will be used to calibrate the discoveries that scientists anticipate will be made at CERN's LHC. For example, Olness' work on the W and Z boson production at the LHC can be used to calibrate various searches for the important Higgs boson, the hypothesized notion of super symmetry, and other "new physics" processes that scientists hope to discover. Olness, with his CTEQ collaborators, will analyze a combination of data from DESY's HERA electron-positron collider, the Tevatron proton-antiproton collider at the Department of Energy's Fermi National Accelerator Laboratory near Chicago, Illinois, and various fixed-target experiments to distinguish "new physics" from "old physics," and thereby maximize the discovery potential of the LHC.

Olness was elected a Fellow of the American Physical Society in 2005 for significant contributions to understanding nucleon structure and heavy quark production in perturbative quantum chromodynamics. In addition to the DESY laboratory, Olness has worked at DOE's Fermilab, and at CERN's LHC. Olness is co-author of the textbook *Mathematica for Physics*, which integrates new computer algebra tools into the core physics curriculum. This text is now in its 2nd Edition, and has also been translated into Japanese.



Moving an ATLAS end-cap calorimeter, which measures the energy of particles produced close to the axis of the beam when protons collide. Credit: CERN

At SMU, Olness received an SMU Ford Fellowship, the SMU "M" Award, and the President's Associates Outstanding Faculty Award. He is also director of the Dallas Regional Science & Engineering Fair, presently serves as president of the SMU Faculty Senate, and brings physics to North Texas students by presenting his "Physics Circus" public lectures to local schools.

Olness is part of an SMU physics group working on projects related to the LHC. The team is led by Ryszard Stroynowski, chair and professor of physics at SMU. Other SMU physics faculty include Robert Kehoe, Pavel Nadolsky, Stephen Sekula and Jingbo Ye.

Stroynowski, Kehoe, Sekula and Ye work on the ATLAS detector, the largest of the four detectors that will study particle collisions at the LHC. Nadolsky is a leading researcher in the area of parton distribution functions, which are an essential component for making accurate predictions for LHC physics.

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Theorist of the Week

Professor Fred Olness

The "Theorist of the Week" is a new concept installed in order to improve the exchange between theory and experiment and to strengthen the theory background of experimental Ph.D. students. The Theorist of the Week will spend about one week at DESY and in this time give one basic seminar on his/her research topic, be available for all kinds of theory questions and discussions, and at the end of his/her stay summarise the discussions and questions of the week.

8-12 March 2010, DESY, Hamburg

During his stay at DESY, Prof. Olness will present a seminar, will be available for questions and will, towards the end of the week, summarise the discussions he had. Contact details will be published at the above given URL
More about Professor Fredrick Olness you will find under www.physics.smu.edu/~olness/www/index.html

At the LHC, W and Z boson production will be used as "benchmark" processes to calibrate various searches for the Higgs boson, SUSY, and other "new physics" processes. In the context of the PDF global analysis, we examine current data from HERA, Tevatron, and fixed-targets to properly quantify the PDF uncertainties. This helps us distinguish "new physics" from "old physics", and thereby maximize the discovery potential of the LHC.

For more details about the theorist of the week, please have a look at :

www.terascale.de/tow