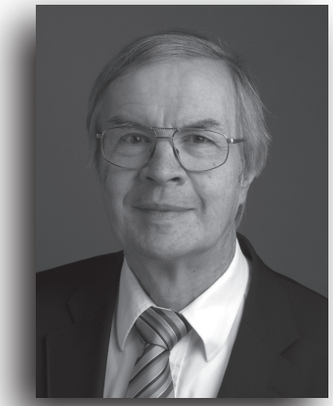
2005 Nobel Laureate in Physics

Theodor W. Hänsch



Professor Theodor W. Hänsch is a Director at the Max-Planck-Institute of Quantum Optics in Garching, Germany and is the Carl Friedrich von Siemens Professor in the Department of Physics of Ludwig-Maximilians-University in Munich, Germany. He was born in Heidelberg, Germany, where he received his doctorate in laser physics in 1969. In 1970, he joined Arthur L. Schawlow at Stanford University as a postdoc. Two years later, he accepted a faculty appointment in the Stanford Physics Department, where he worked as a Full Professor from 1975 until he returned to his native Germany in 1986. In 1974, Hänsch and Schawlow made a seminal proposal for laser cooling of atomic gases. 25 years later, Hänsch and his Munich team were the first to realize Bose-Einstein condensation on a microfabricated atom chip. In 2005, Theodor W. Hänsch shared half of the Physics Nobel Prize with John L. Hall for their contributions to the development of laser-based precision spectroscopy, including the optical frequency comb technique.

Lectures

Public Lecture:

Passion for Precision

The Balmer spectrum of atomic hydrogen has provided the Rosetta stone for deciphering the strange laws of quantum physics during the early 20th century. Precise spectroscopy of the simple hydrogen atom can yield accurate values of important physical constants and it can stringently test basic physics laws. The invention of the laser frequency comb a decade ago has given us a tool for accurately counting the ripples of a light wave, so that we are now able to measure resonance frequencies in hydrogen to 15 decimal digits. Recently, it has become possible to perform laser spectroscopy of exotic muonic hydrogen, where the electron is replaced by a 200 times heavier muon. The measured 2S – 2P Lamb shift gives an accurate value of the charge radius of the proton. However, this radius is significantly smaller than the value obtained from spectroscopy of ordinary hydrogen or from electron scattering experiments. This proton-size puzzle is the subject of intense discussions. It may be caused by a mistake, or it may indicate a dent in the armor of quantum electrodynamic theory.

Physics Seminar:

What can we do with laser frequency combs?

The spectrum of a mode-locked femtosecond laser consists of several hundred thousand precisely evenly spaced spectral lines. Such laser frequency combs have revolutionized the art of measuring the frequency of light, and they provide the long-missing clockwork for optical atomic clocks. High-harmonic generation with intense femtosecond pulses provides a path to extend frequency comb techniques into the extreme ultraviolet and perhaps into the soft x-ray regime. Laser comb techniques can give control of the electric field of ultrashort laser pulses, and they have become key tools for the emerging field of attosecond science. The availability of commercial instruments is facilitating the evolution of new applications far beyond the original purpose, ranging from fundamental research to telecommunications and satellite navigation. Laser combs are revolutionizing molecular spectroscopy by dramatically extending the resolution and recording speed of Fourier spectrometers. The calibration of astronomical spectrographs with laser combs will enable new searches for earth-like planets in distant solar systems, and may reveal the continuing expansion of space in the universe.

This publication was funded by the University of Wisconsin-La Crosse Foundation Inc.

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Distinguished Lecture Series in PHYSICS

The UW-L Physics Department, with 145 majors, is one of the largest undergraduate physics programs in Wisconsin. The department has 10 full-time faculty and offers a B.S. in physics with the options of emphases in astronomy, computational physics and optics, as well as physics majors with business, bio-medical or secondary education concentrations. The department has a dual-degree program (physics and engineering) in cooperation with the engineering programs at UW-Milwaukee, UW-Madison, UW-Platteville and the University of Minnesota. The department is active in undergraduate research and in the past few years has received nearly $1.5 million in research grants. The department was profiled as a successful undergraduate program for the National Task Force on Undergraduate Physics report, which is available at ***www.aapt.org/Programs/projects/spinup/upload/Final-Case-Studies.pdf***, and was featured on the cover of the September 2003 issue of Physics Today. The department was awarded the 2004 UW Regents Teaching Excellence Award for Academic Departments and Programs.

For more information on UW-L's physics department, visit our Web site at ***www.uwlax.edu/physics.***

The UW-L Distinguished Lecture Series in Physics is funded by private gifts to the UW-La Crosse Foundation Inc. and through support from the Department of Physics, the College of Science and Health and Wettstein's. The series annually brings to La Crosse a physicist whose significant accomplishments and communication skills can inspire and enrich the careers of students, faculty and the community.

Nov. 3-4, 2011

Thursday, November 3, 2011

Public Lecture

4:30 p.m. **Reception**
Skogen Auditorium A Room 1400
Centennial Hall
Refreshments served

5 p.m. **Passion for Precision**

Friday, November 4, 2011

Physics Seminar

3 p.m. **Reception**
Cowley Hall Atrium
Refreshments served

3:20 p.m. **What can we do with laser frequency combs?**
Cowley Hall - Room 100

All events are open to the public, but we suggest making arrangements in advance by filling out and sending the form attached. Reserved seats will only be held up until 15 minutes prior to the start of each lecture.

Groups of five or more must make special arrangements with the Foundation. Persons attending the public lecture Thursday may park in any commuter lot. Parking will be available at the Cleary Alumni & Friends Center parking lot on Friday.

For further information contact:

www.uwlax.edu/physics

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University of Wisconsin
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Distinguished Lecture Series in PHYSICS

Nov. 3-4, 2011

2005 Nobel Laureate

Theodor W. Hänsch

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