

A Passion for Precision

Séminaire Général du Département de Physique de l'École Polytechnique

“Very high precision physics has always appealed to me. The steady improvement in technologies that afford higher and higher precision has been a regular source of excitement and challenge during my career. In science, as in most things, whenever one looks at something more closely, new aspects almost always come into play. ...” With these words from the book “How the Laser happened,” Charles H. Townes expresses a passion for precision that is now shared by many scientists. Masers and lasers have become indispensable tools for precision measurements. During the past few years, the advent of femtosecond laser frequency comb synthesizers has revolutionized the art of directly comparing optical and microwave frequencies. Inspired by the needs of precision laser spectroscopy of the simple hydrogen atom, such frequency combs are now enabling ultraprecise spectroscopy over wide spectral ranges. Recent laboratory experiments are already setting stringent limits for possible slow variations of fundamental constants. Laser frequency combs also provide the long missing clockwork for optical atomic clocks that may ultimately reach a precision of parts in 10^{18} and beyond. Such tools will open intriguing new opportunities for fundamental experiments including new tests of special and general relativity. In the future, frequency comb techniques may be extended into the extreme ultraviolet and soft x-ray regime, opening a vast new spectral territory to precision measurements. Frequency combs have also become a key tool for the emerging new field of attosecond science, since they can control the electric field of ultrashort laser pulses on an unprecedented time scale. The biggest surprise in these endeavours would be if we found no surprise.



Professeur T. Haensch
*Max-Planck Institute of Quantum Optics
Prix Nobel 2005*

20 octobre 2006

ÉCOLE POLYTECHNIQUE
Amphi. Pierre Faure

14 h 00

