

The Keck Institute for Space Studies  
presents

# Light, Atomic Clocks, and Einstein's Relativity

**Dr. John L. Hall**

JILA, University of Colorado and NIST  
Nobel Laureate in Physics, 2005

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**Wednesday**

**November 4, 2015**

**5:00 P.M. Lecture**

**4:30 P.M. Refreshments**

**Lees-Kubota Hall**

**Guggenheim Building**

**California Institute of Technology**

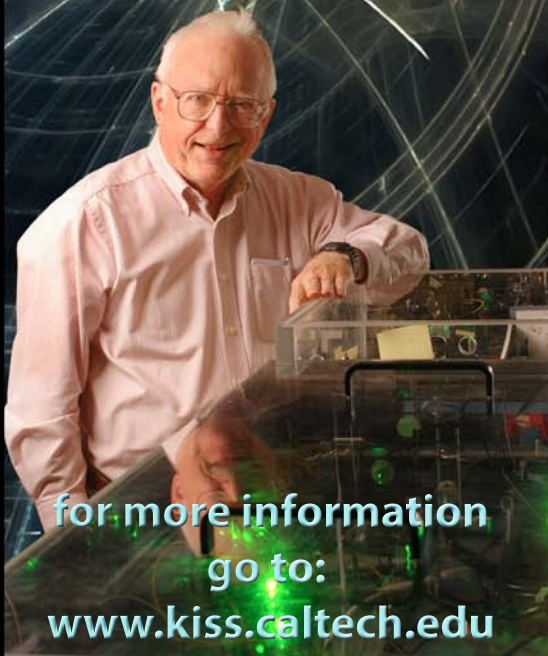
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Even though this is the 55th year of the Laser, progress in its control and application in precision measurements is still accelerating. The Optical Frequency Comb technology exploded in 1999-2000 from the synthesis of advances in independent fields of Laser Stabilization, UltraFast Lasers, and NonLinear Optical Fibers, enabling a thousand-fold advance in optical frequency measurement, and searches (in the 17th digit) for time-variation of physical "constants". Several Optical Frequency Standards now have far better performance than the well-established Cs clock that defines Time in the SI (Metric System) measurement system. But adopting a new "Atomic Clock" to "tick out the Seconds" will be daunting - in many ways.

Current advances in ultra-precise locking are also making possible stable optical frequencies defined by length and the speed of light, as well as by locking lasers to the resonant frequency of atoms. These two "clocks" represent our current prototypes of the clocks postulated by Einstein in 1905 in formulating the theory of Special Relativity, which now should be testable into the 18th decimal in a proposed Space-based experiment now being planned by our international Space-Time Asymmetry Research collaboration (STAR). An improvement in the modulation strategy may allow unexpectedly good frequency standard performance in a compact device, and so be useful on earth as well.

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Seating is limited and is available on a first come, first served basis.

A photograph of Dr. John L. Hall, an older man with glasses and a light-colored shirt, standing in a laboratory. He is looking towards the camera with a slight smile. In the background, there are complex optical setups with various lenses, mirrors, and fiber optic cables. The lighting is somewhat dim, with some green and blue highlights from the equipment.

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