

Abstract for an Invited Paper  
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### **Coherent frequency combs and spectroscopy**

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Optical frequency combs maintain precise phase coherence across the entire visible spectrum and they have profoundly changed optical frequency metrology and ultrafast science, with breakthrough developments in optical atomic clocks, optical frequency synthesis, direct frequency comb spectroscopy (DFCS), high-resolution quantum control, coherent pulse synthesis and amplification, and control of sub-femtosecond electron dynamics in atoms and molecules. DFCS [1] is a new spectroscopic approach that realizes simultaneously broad spectral coverage, high spectral resolution, many parallel detection channels, ultrahigh sensitivity, and real-time analysis [2]. These powerful capabilities have been demonstrated in a series of experiments where identification and quantification of many different molecular states or species are achieved in a massively parallel fashion [3].

[1] A. Marian et al., *Science* 306, 2063 (2004).

[2] M. J. Thorpe et al., *Science* 311, 1595 (2006).

[3] M. J. Thorpe & J. Ye, *Appl. Phys. B* 91, 397 (2008).