

ECE-616: Fall 2011

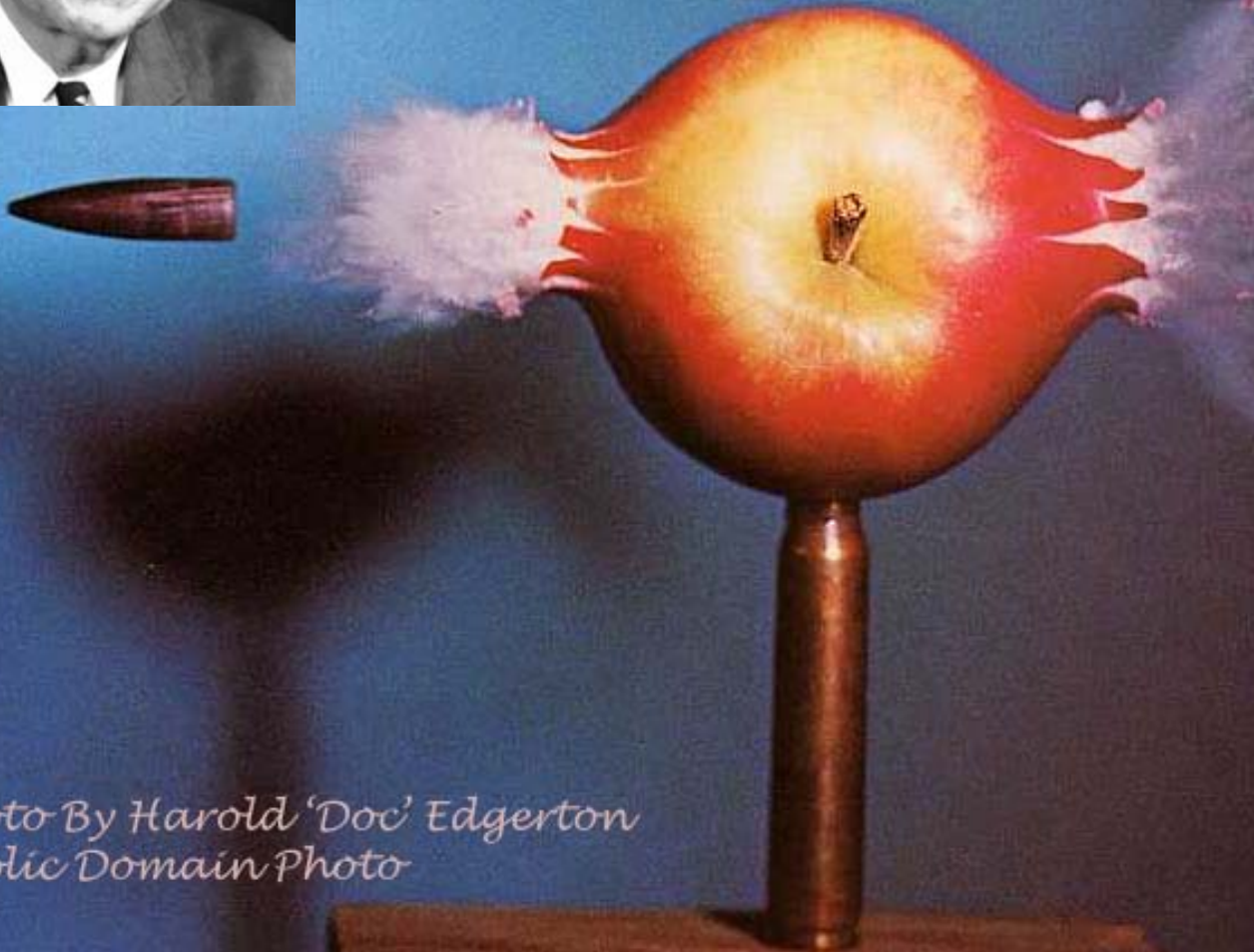
**Lecture 1:
Introduction to Ultrafast Optics**

Professor Andrew Weiner
Electrical and Computer Engineering
Purdue University, West Lafayette, IN USA

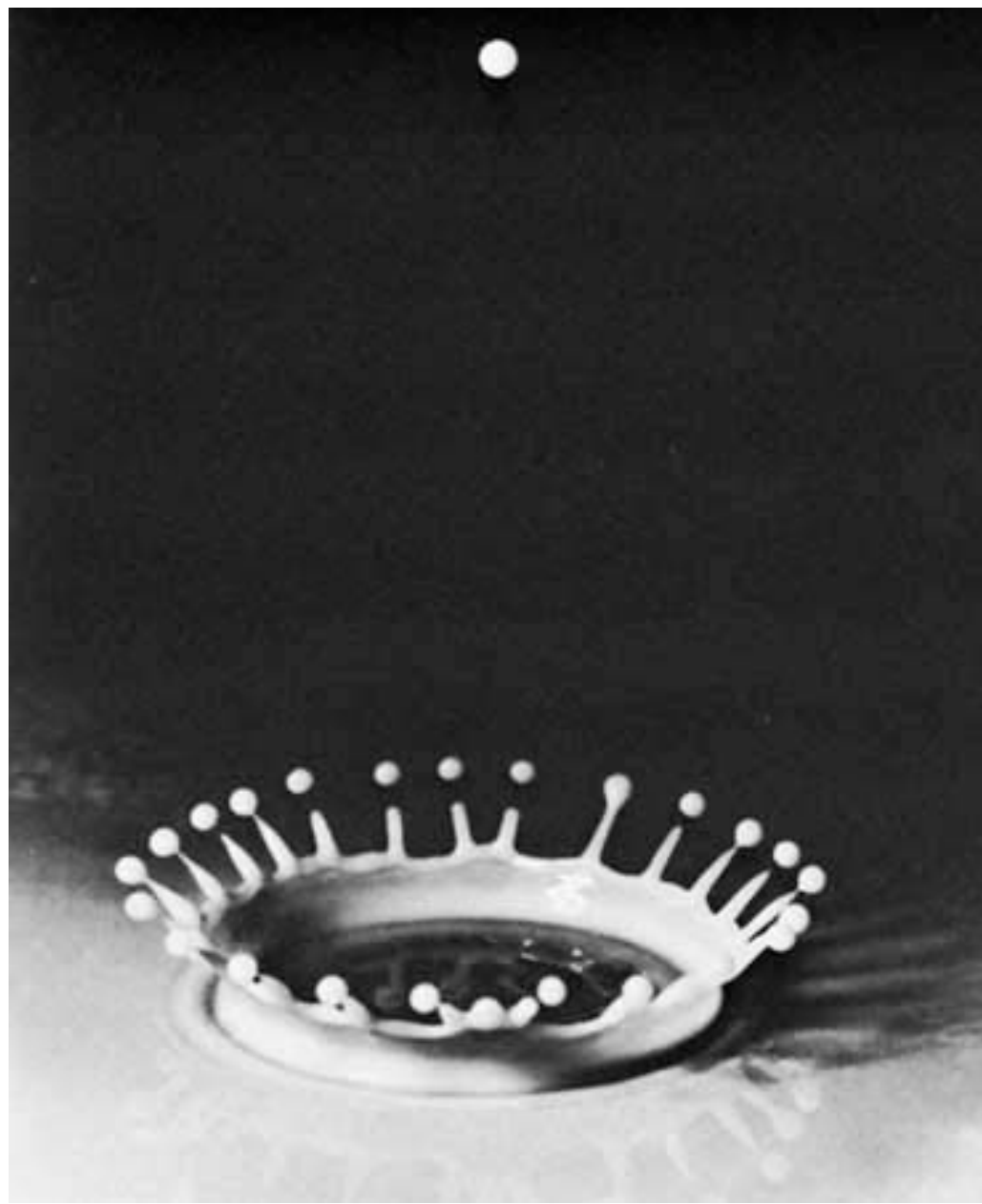
8/25/11



See H.E. Edgerton, *Stopping Time: The Photographs of Harold Edgerton*, H.N. Abrams, New York, 1987.



*Photo By Harold 'Doc' Edgerton
Public Domain Photo*





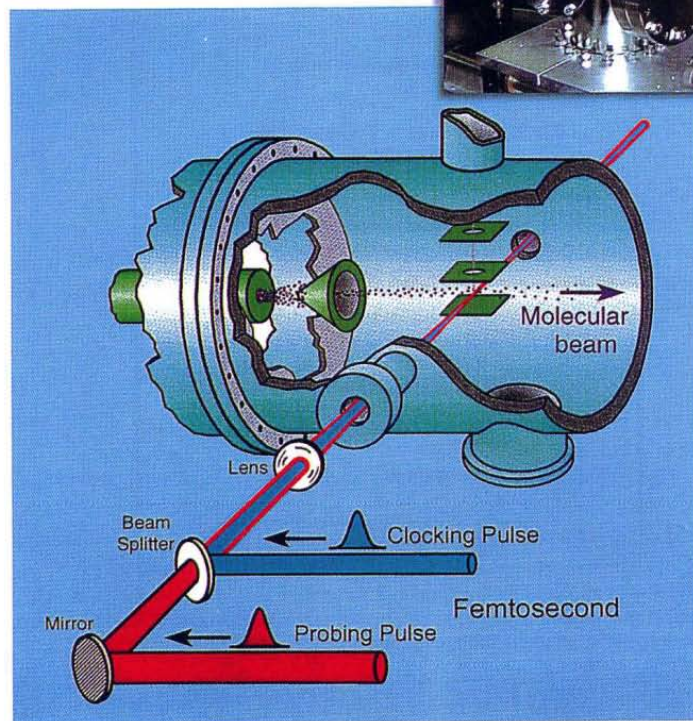
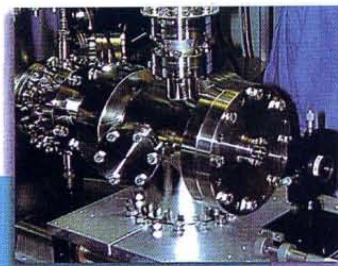
Femtochemistry

(Ahmed Zewail, 1999 Nobel Prize in Chemistry Lecture)

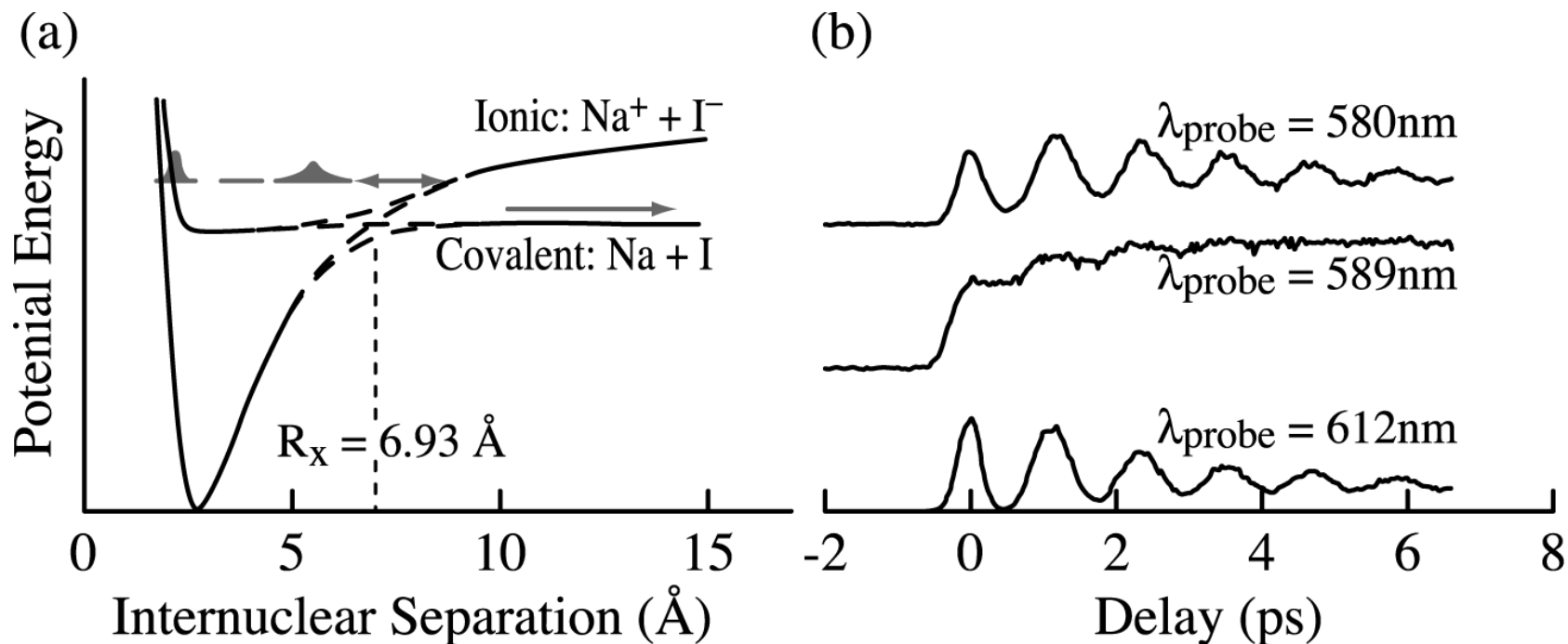


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Chemistry 1999



Transition State Spectroscopy of a Photodissociation Reaction (Ahmed Zewail, 1999 Nobel Prize in Chemistry)



reproduced from *Ultrafast Optics*, A.M. Weiner, © John Wiley & Sons, 2009, Fig. 9.20
– adapted from Rosker, Rose, and Zewail, *Chem. Phys. Lett.* **146**, 175-179 (1988)

“Measuring Spectral δ -functions with Temporal δ -functions?!” (quoted from Jan Hall, 2005 Nobel Prize in Physics lecture slides)

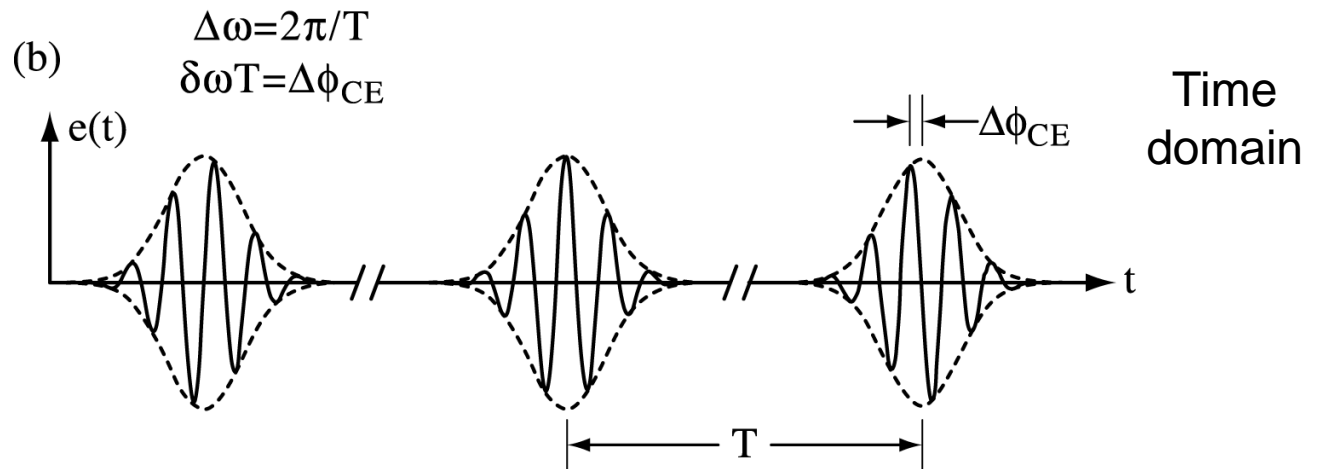
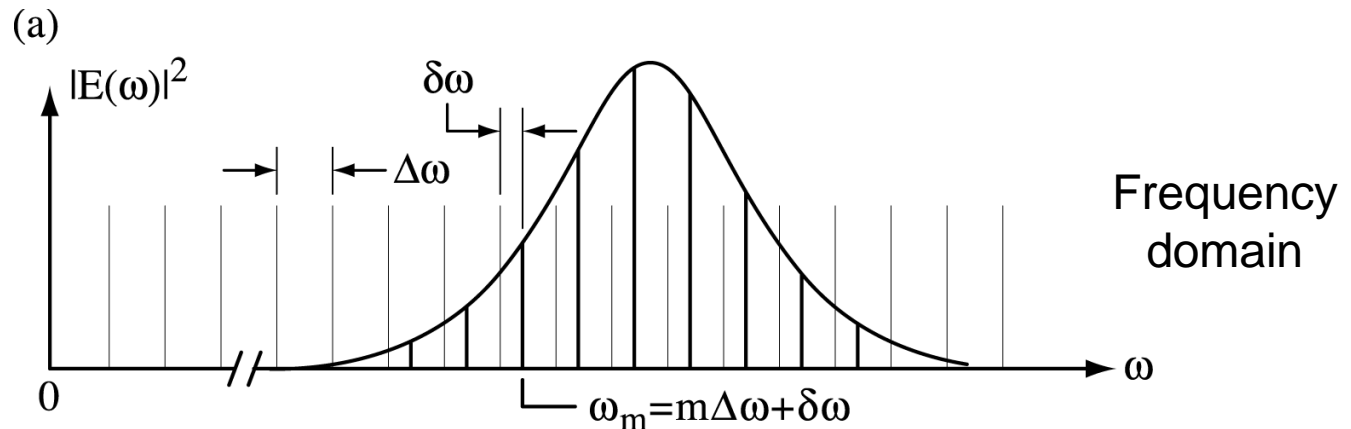


John Hall



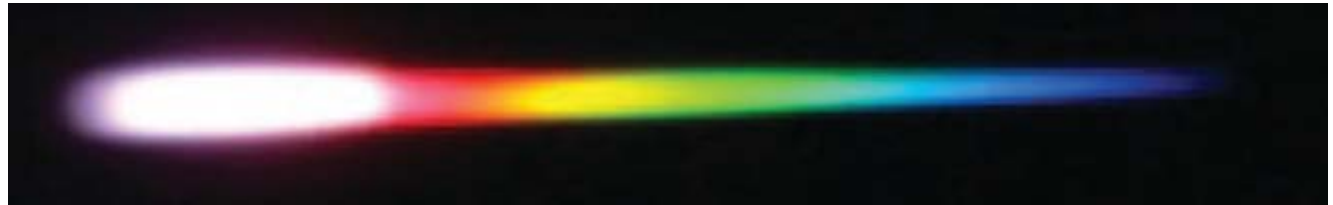
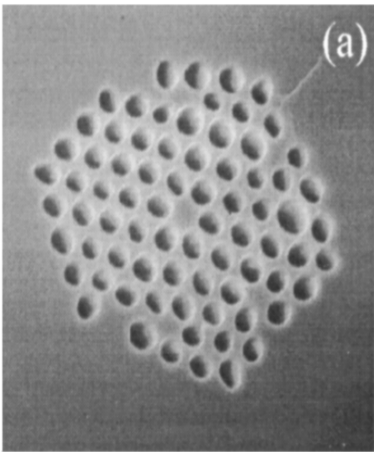
Theodor Hänsch

Femtosecond Frequency Combs



Supercontinuum - Nonlinear Spectral Broadening to an Octave

Enables frequency comparison leading to stabilization of combs

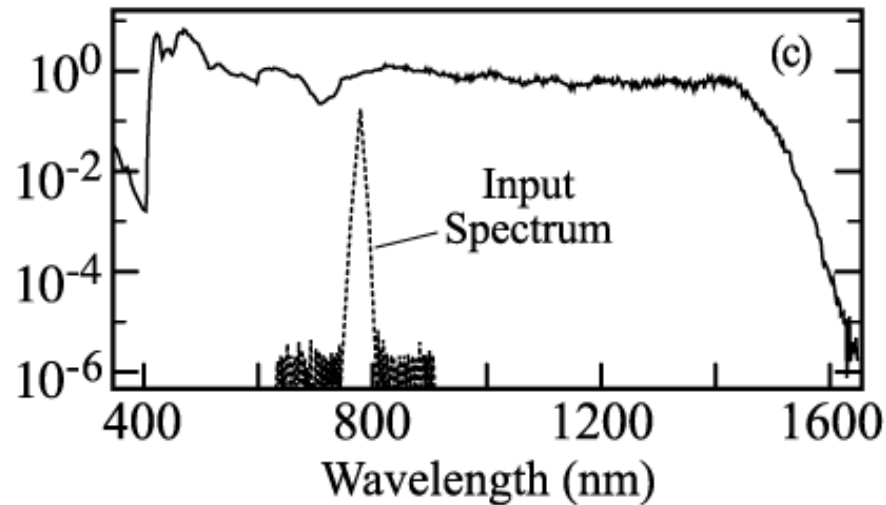


Newport Corporation

<http://www.newport.com/images/web900w-EN/images/2167272.jpg>

Microstructured
fiber

Ranka, Windeler, and Stentz,
Opt. Lett. **25**, 25-27 (2000)



reproduced from *Ultrafast Optics*, A.M. Weiner, © John Wiley & Sons, 2009, Fig. 6.21
– from Ranka, Windeler, and Stentz, *Opt. Lett.* **25**, 25-27 (2000)