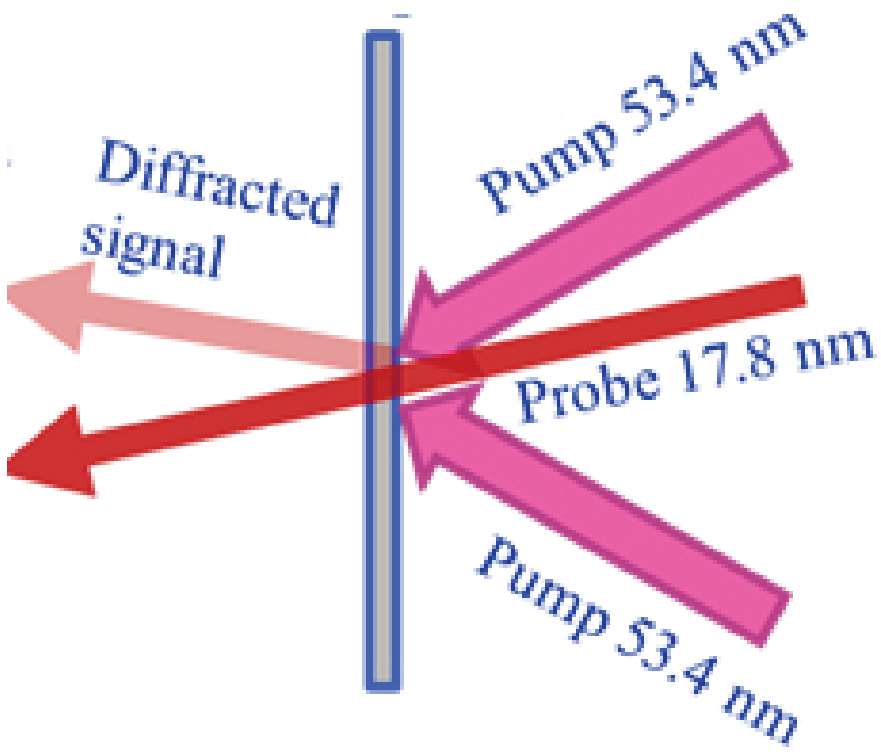
# Keith A. Nelson

## Ultrafast X-ray Probing and Pumping: All About the Wavevector

Sources of coherent x-ray pulses have made it possible to probe dynamical events on ultrafast time scales using x-ray diffraction or other x-ray measurements. Excitation of a condensed-phase sample with a wide variety of pump fields can be followed by x-ray probing to reveal time-dependent phase transitions and many other collective responses. High pulse energies have also enabled experiments in which x-rays are used for excitation as well as probing. Four distinct types of measurement will be discussed: Shock pump, XRD probe; THz pump, XRD probe; x-ray crossed-beam transient grating pump, x-ray diffraction- from-transient-grating probe; and x-ray pump, diffuse x-ray scattering probe. Key information about phase transition dynamics, coherent and incoherent acoustic responses, and nanoscale thermal transport has been made accessible through the high scattering wavevectors that are possible with x-ray wavelengths. The very different experimental elements and geometries illustrate the versatility and broad applicability of pulsed x-ray measurements of condensed matter dynamics.

**Keith Nelson** is the Haslam and Dewey Professor of Chemistry at MIT. He has worked on discovery of new light-matter interactions and their exploitation for spectroscopy and control of coherent acoustic waves, lattice and molecular vibrations, excitons, spins, and their admixtures with light. He has studied the roles these excitations can play in structural and electronic phase transitions, thermal transport, chemical reactions, and other collective and molecular phenomena, in some cases controlling and monitoring far-from-equilibrium dynamical evolution. He received his Ph.D. in Physical Chemistry from Stanford University, and after a postdoctoral stint at UCLA he joined the faculty at MIT in 1982.




## Wednesday, May 2, 2018 | 3:00 p.m.

Bldg. 402 | APS Auditorium
Argonne National Laboratory

APS Colloquium