Advanced measurement techniques that exploit lasers and optics have become well-established tools for characterizing combustion. Such noninvasive measurement approaches are often ideally suited for visualizing complex non-reacting and reacting flows and quantifying key chemical-species concentrations, temperature, and fluid-dynamic parameters. The fundamental information these techniques provide is essential for achieving a detailed understanding of the chemistry and physics of combustion processes. Approaches based on linear and nonlinear spectroscopies for point, line, planar, and volumetric measurements will be explored in this seminar, especially those based on ultrashort-pulse lasers and burst-mode lasers with emphasis on kHz-rate data acquisition. These laser sources, when paired with ultrafast-framing cameras and advanced data-analysis techniques, show tremendous potential for expanding the temporal, spatial, and multi-parameter horizons of combustion measurements.