Chirped-pulse Fourier-transform microwave spectroscopy has stimulated a resurgence of interest in rotational spectroscopy owing to the dramatic reduction in spectral acquisition time it enjoys when compared to cavity-based instruments. This suggests that it might be possible to adapt the method to study chemical reaction dynamics and even chemical kinetics using rotational spectroscopy. The great advantage of this would be clear, quantifiable spectroscopic signatures for polyatomic products as well as the possibility to identify and characterize new radical reaction products and transient intermediates. To achieve this, however, several conditions must be met: 1) products must be thermalized at low temperature to maximize the population difference needed to achieve adequate signal levels and to permit product quantification based on the rotational line strength; 2) a large density and volume of reaction products is also needed to achieve adequate signal levels; and 3) for kinetics studies, a uniform density and temperature is needed throughout the course of the reaction. These conditions are all happily met by the uniform supersonic flow produced from a Laval nozzle expansion. In collaboration with the Field group at MIT we have developed a new instrument we term a CPUF (Chirped-pulse/Uniform Flow) spectrometer in which we can study reaction dynamics, photochemistry and kinetics using broadband microwave and millimeter wave spectroscopy as a product probe. We will illustrate the performance of the system with a few examples of photodissociation and reaction dynamics, and also discuss a number of challenges unique to the application of chirped-pulse microwave spectroscopy in the collisional environment of the flow. Future directions and opportunities for application of CPUF will also be explored.