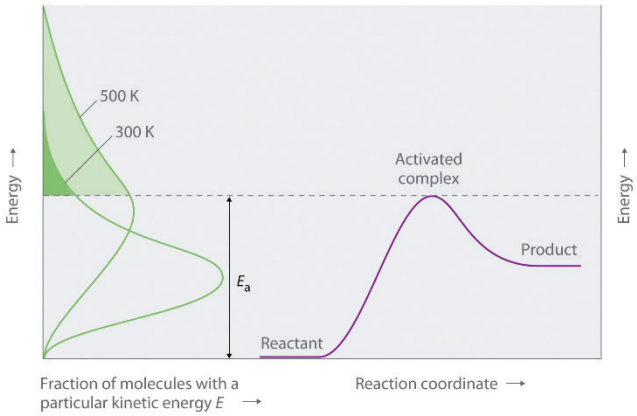
Ann and H.J. Smead
Department of Aerospace Engineering Sciences
UNIVERSITY OF COLORADO **BOULDER**

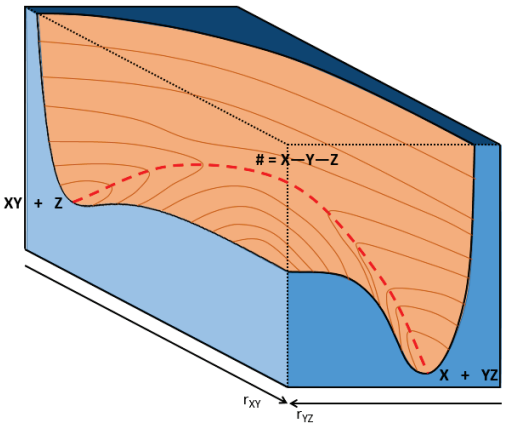
Molecular Thermodynamics and Kinetics

New Core Course in *Fluids*

ASEN 5519 – Molecular Thermodynamics and Kinetics – Tu,Th 4:00-5:15 pm, N250

Prof. Timothy K. Minton, tminton@colorado.edu





The objective of this course is to provide an entry point into the microscopic manifestations of chemistry and chemical change for engineering graduate students who have not done previous learning that would prepare them for research or employment in areas where an understanding of molecular-level processes is important. This course will thus be an introduction to chemical kinetics and theories of chemical reactions. The focus will be on gas-phase and gas-surface interactions, so kinetic theory of gases will be covered at a basic level. There will be an introduction to quantum mechanics and statistical mechanics, and the course will draw on these hierarchical descriptions of matter to help understand the magnitudes of chemical reaction rates and how they vary with macroscopic parameters, such as temperature, and with microscopic parameters, such as molecular size, structure, and energy spacing of quantum states. The course will briefly explore how elementary reaction steps can be broken down into state-to-state reaction rates, where potential energy surfaces control the outcome of molecular collisions. By considering these collisions at the molecular level, students should gain an appreciation for the distinction between chemical reactions and their rates under non-equilibrium vs. equilibrium conditions.