A kinetic view on equilibrium partitioning

Above it was argued that *equilibrium* typically does not mean that the concentrations of a chemical in various phases are equal. What then is *equal* at *equilibrium* ? The answer is: At equilibrium, the same number of molecules of the partitioning chemical is moving back and forth between phase 1 and phase 2. Hence, there is no NET change in the number (and hence concentration) of the solute molecules between the two phases over time. How is this possible if, for instance, the molecules constituting phase 1 show higher interaction energies with the solute, *i* , than the molecules that make up phase 2? The answer is: The flux of molecules that leave phase 1 and enter phase 2 is the product of the concentration of *i* in phase 1 and the likelihood of each single molecule *i* to leave the phase 1. If phase 1 is an 'attractive' phase for *i* , then the equilibrium concentration of *i* in phase 1 will be high. At the same time, however, the individual likelihood of *i* to leave phase 1 and to enter phase 2 is low. In the less attractive phase 2, the concentration of *i* is lower but the likelihood to leave the phase is higher. At equilibrium, both products are the same i.e., the flux of chemical *i* from phase 1 to phase 2 equals the flux of chemical *i* from phase 2 to phase 1.

Virtual Experiment