Chaojie Yuan* (cyuan25@wisc.edu) and David Anderson. Time-dependent product-form Poisson distributions for reaction networks with higher order complexes.

It is well known that stochastically modeled reaction networks that are complex balanced admit a stationary distribution that is a product of Poisson distributions. In this presentation, we consider the following related question: supposing that the initial distribution of a stochastically modeled reaction network is a product of Poissons, under what conditions will the distribution remain a product of Poissons for all time? By drawing inspiration from Crispin Gardiner’s ”Poisson representation” for the solution to the chemical master equation, we provide a necessary and sufficient condition for such a product-form distribution to hold for all time. Interestingly, the condition is a dynamical ”complex-balancing” for only those complexes that have multiplicity greater than or equal to two (i.e. the higher order complexes that yield non-linear terms to the dynamics). We term this new condition the ”dynamical and restricted complex balance” condition (DR for short) (Received July 16, 2019)