1135-05-2207 **Joel Nishimura*** (joel.nishimura@gmail.com), **Bailey K Fosdick** (bailey.fosdick@colostate.edu), **Daniel B Larremore** (daniel.larremore@colorado.edu) and **Johan Ugander** (jugander@stanford.edu). *Random graph models with fixed degree sequences: choices, consequences and irreducibility proofs for sampling.*

It is surprisingly difficult to determine which features of an empirical graph are noteworthy—a task that requires choosing an appropriate null model against which to compare. Since empirical graphs have distinctive degree sequences, one of the most popular null models is the configuration model: a uniform distribution over graphs with a fixed degree sequence. While it is commonly treated as though there is only a single configuration model, one sampled via stub-matching, there are many, depending on whether self-loops and multiedges are allowed and whether edge stubs are labeled or not. We show, these different configuration models can lead to drastically, sometimes opposite, conclusions. In order to sample from these different configuration models, we review and develop the underpinnings of Markov chain Monte Carlo methods based upon double-edge swaps. Namely, we present new results on the irreducibility of the Markov chain for graphs with self-loops, either proving irreducibility or exactly characterizing the degree sequences for which the Markov chain is reducible. This work completes the study of the irreducibility of double edge-swap Markov chains (and the related Curveball Markov chain) for all combinations of allowing self-loops, multiple self-loops and/or multiedges. (Received September 25, 2017)