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Characterizing noise in genetic oscillatory systems BYUNGJOON MIN, KWANG-IL GOH, IN-MOOK KIM, Korea University — Quantitative understanding of fluctuations in genetic circuits is crucial for understanding living systems. Despite the recent advances in the subject, however, fluctuations in non-stationary activities such as molecular oscillations have not been much investigated yet. Here we quantify the fluctuations in periods and amplitudes of oscillation and the noise propagation in the genetic oscillatory system, the repressilator, using exact stochastic simulation. At the single protein level, we found that the fluctuation in oscillation amplitudes is larger than that in oscillation periods. Noise propagation is studied in terms of the correlations in the successive periods and amplitudes, respectively, which decay exponentially down the regulatory cascades. We then study the extended repressilator system to investigate the effect of extra component and identify the combinatoric regulation pattern that reduces the fluctuations in oscillatory activities significantly.

Byungjoon Min
Korea University

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