345d A Deterministic Model of Circadian Rhythmicity in *Drosophila*

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Circadian rhythmicity is a robust, free-running, adaptable biological clock found in a diverse range of organisms from bacteria to humans. Developing an understanding of this gene network is important because of both its novel characteristics and its connection to several human health issues. These issues include the familial advanced sleep phase syndrome and chemotherapy treatment efficacy. The use of circadian rhythms to adapt to the environment involves similar topology and regulatory features in both the fly *Drosophila* and mammals. Because of this similarity in addition to its short life cycle and the array of available biochemical and behavioral tools, *Drosophila* has been a model organism for studying circadian rhythms.

We have developed a mathematical framework that includes the two known feedback loops in *Drosophila*. Unlike other models for circadian rhythmicity, this framework does not require explicit time delays to match experimental observations. Using a set of 16 equations, this model is able to qualitatively capture many of the observed experimental phenomena, including several mutant phenotypes.