Computational Investigation of a Kai-Protein Circadian Oscillator
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Within early Earth, the twenty-four hour day created an environment with which all existing organisms could align their own biological processes. Cyanobacteria present a simple circadian oscillation model requiring only KaiA, KaiB, KaiC, and ATP without any gene regulation. By inputting the necessary reactions and rates of each into Mcell, a program using Monte Carlo algorithms to create realistic reaction results, we can create a model to explore this system’s behavior. From this, we can know not only what does happen biologically, but what would happen if a mechanism mutated and parameters altered. My results draw attention to the contribution of separate mechanisms in the adjustment of an oscillator, and the vital role of time-dependent rates.