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Cell Cycle Regulation in Eukaryotes

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Abstract

The eukaryotic cell cycle is regulated by a complex network of interacting genes and proteins. The dynamical properties of this network (and hence, the physiological properties of dividing cells) are governed by a set of nonlinear differential equations (reaction kinetic equations). The solutions of these equations are determined in large part by the bifurcations they exhibit: saddle-node bifurcations, Hopf bifurcations, and homoclinic bifurcations. One-parameter bifurcation diagrams are key to understanding how the cell cycle control machinery (based on cyclin-dependent kinases) coordinates cell division with overall cell growth, and two-parameter bifurcation diagrams provide a direct link from genetics to cell physiology.