
Stability and Instability in Complex Chemical Reaction Networks

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Abstract

Across the landscape of all chemical reaction networks, including very complex ones, there is a surprising degree of dull, stable behavior. This appears to be so no matter what might be the details of the kinetics for the individual reactions. Yet there are also reaction networks, in particular certain ones commonly encountered in biochemistry, that exhibit quite rich dynamical behavior. Apparently, then, dull behavior in reaction networks is enforced by certain structural features that are shared widely across the reaction network landscape but not universally so. One of the central problems in chemical reaction network theory is to understand the connections between the structure of a reaction network and its capacity for various kinds of behavior. We will describe some recent results that are wide-ranging and that also indicate just how subtle such connections can actually be.

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