Kolloquium

Institut für Mathematik

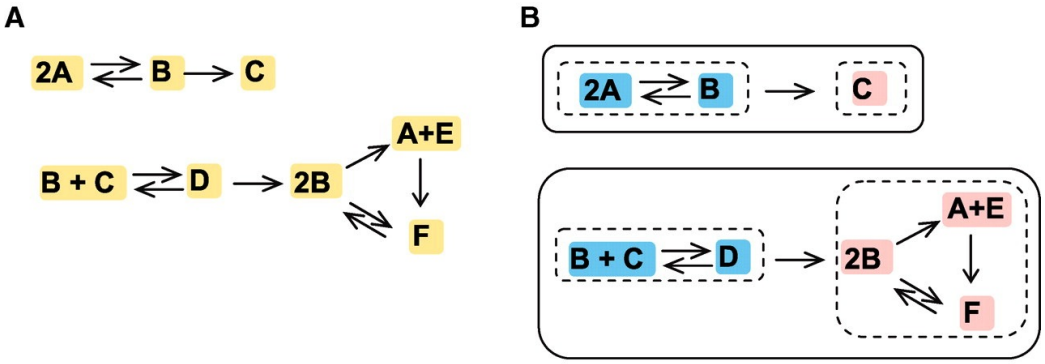
Universität Innsbruck

Georg Regensburger, RICAM Linz

Generalized mass-action systems and polynomial equations with real and symbolic exponents

The study of dynamical systems arising from chemical reaction networks with mass action kinetics was initiated by Feinberg, Horn, and Jackson in the 1970s. Chemical reaction network theory (CRNT) provides statements about uniqueness, existence, and stability of positive steady states for all rate constants and initial conditions depending on the underlying network structure alone. In terms of the corresponding polynomial equations, they give uniqueness and existence of positive real solutions for all positive parameters.

In this talk, we address a recent extension of CRNT, called generalized mass-action systems, where reaction rates are allowed to be power-laws in the concentrations. As with mass-action kinetics, complex balancing equilibria can be characterized by binomial equations and parametrized by monomials. We focus on a constructive characterization of positive real solutions to the corresponding generalized polynomial equations with real and symbolic exponents. We illustrate our results with an implementation in Maple.



Uniqueness and existence for all rate constants and initial conditions additionally depend on sign vectors. Hence a generalization of Birch's theorem, robust with respect to certain perturbations in the exponents. Finally, we discuss the occurrence of multiple complex balancing equilibria.

This talk is based on joint work with Stefan Müller.

Do·12·Juni

16:15·HS·D