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Bogdanov-Takens bifurcations and the regulation of enzymatic activity by autophosphorylation

An important mechanism of information storage in molecular biology is the binding of phosphate groups to proteins. In this talk we consider the case of autophosphorylation, where the protein is an enzyme and the substrate to which it catalyses the binding of a phosphate group is that enzyme itself. It turns out that this often leads to more complicated dynamics than those seen in the case where enzyme and substrate are distinct. We focus on the example of the enzyme Lck (lymphocyte-associated tyrosine kinase) which is of central importance in the function of immune cells. We study a model for the activation of Lck due to Kaimachnikov and Kholodenko and give a rigorous proof that it admits periodic solutions. We do so by showing that it exhibits a generic Bogdanov-Takens bifurcation. This is an example where this approach gives a simpler proof of the existence of periodic solutions than ones using more elementary techniques. Joint work with Lisa Kreusser.

The Seminar will take place online via Zoom as part of the Oberseminar “Nonlinear Dynamics” organized by Bernold Fiedler (FU Berlin), Isabelle Schneider (FU Berlin), Eckehard Schöll (TU Berlin) and Matthias Wolfrum (WIAS). For information on how to access the event, please contact any of the above or: henning.reinken@itp.tu-berlin.de

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