Hamilton Institute

Exploring Multistability in Biochemical Networks

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The dynamics of biochemical networks such as regulatory or signalling pathways may entail qualitative changes in its behaviour as the values of their parameters, namely kinetic constants or enzyme concentrations are perturbed. These parameters are in fact responsible of a rich dynamic behaviour which in the form of multistability or oscillations, sustains functionality at the cell level.

From this perspective, it seems worth exploring periodicity, instability or any other qualitative features the system could exhibit for different ranges of parameter values. To that purpose, classical bifurcation techniques could be employed provided that the number of critical parameters remains small. Unfortunately this is not the case for most biochemical networks, where a large number of critical parameters might be involved.

In this seminar I would like to present some ideas and results we are working on to systematically detect and explore the regions in the space of parameters where different complex behaviour might appear. The approach has been built in the formalism of Chemical Reaction Network Theory as developed by Horn and Feinberg. Interestingly, these regions -with their own characteristic behaviour- turn out to depend on a very small number of parameters closely related to the deficiency of the biochemical network under consideration. As it will be illustrated through some representative examples, the methodology can be also applied to compute the set of all possible reaction network parameters leading to multiple equilibria.

Venue: Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

Time: 2.00 - 3.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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