Using Algorithms to Program Complex Chemical Systems

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The control and prediction of complex chemical systems is a very hard problem due to the nature of the interactions, transformations and processes occurring. From self-assembly to catalysis and self-organisation, complex chemical systems are often heterogeneous mixtures that at the most extreme exhibiting system level functions for instance that could be observed in a living cell. In this talk I will outline an approach to understand and explore complex chemical systems using an automated reactor platform to control chemical unit operations according to a well-defined program. By investigating the system not just at the molecular level, but by characterising the spatio-temporal dynamics, the aim is to understand how to control system level emergence of complex chemical behaviour and even view the system-level behaviour as a programmable entity capable of information processing. In particular I will discuss our ideas for embodying evolutionary algorithms into wet chemical formats attempting to explore ways of developing artificial living systems beyond biology leading to so-called 'inorganic biology'.

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