Title : Non-generic coincidences of local bifurcations in the fluidic pinball

Speaker: Luc PASTUR (Institut Polytechnique de Paris)

Abstract: Literature contains surprising reports about how local stability properties of the steady solution or averaged flow affect the global dynamics. One example is Malkus'principle of marginal stability [1], postulating that the time-averaged mean-flow should be marginally stable, a frequent observation of fluid flows [2, 3, 4, 5]. Another example are reports how secondary bifurcations of the steady solution are associated with primary bifurcations of the corresponding periodic flow. In both cases, mathematical literature seems to contain no indication how a local bifurcation should effect global dynamics. In this talk, we report the case of coinciding local bifurcations. Generically, local bifurcations only affect single solution branches (e.g. steady solutions, periodic limit cycles, etc). However, branches that are quite different may nonetheless share certain eigenvectors and eigenvalues, leading to coincident bifurcations, as observed in the fluidic pinball at Reynolds number around 70. The mechanism of this non-generic coincidence, modelled and explained in a reduced-order model of the flow, suggests that non-generic coincident local bifurcations should be found in many other instances in fluid mechanics [6].

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