Megastability: definition and its relation with multistability, extreme mutlistability, and hidden attractors

Abstract: Multistability is one of the most important phenomena in dynamical systems. It occurs in many areas of science including physics, chemistry, biology, economics, and nature. The attracting state of a multistable system depends on the initial conditions. Multistability can be undesirable, for example, in the design of a commercial device with specific characteristics where it must be avoided to stabilize the desired state in a noisy environment. On the other hand, multistability allows flexibility in the system performance without changing parameters, and that can be used with the right control strategies to induce a switching between different coexisting states. Sometimes infinite attractors coexist in a dynamical system. When those infinite attractors are uncountable, the situation is called extreme multistability. However when those infinite attractors are countable, the situation is called megastability. In this talk we investigate recent examples of megastable systems. We categorize them into two groups: megastable systems which are the result of infinite equilibrium points in the systems, and megastable systems which are not. We show that in the latter case, certainly infinite hidden attractors exist.