In the popular meaning chimera is a mythological, fire breathing monster, commonly represented with a lion's head, a goat's body and a serpent's tail, any similarly grotesque monster having disparate parts, especially as depicted in decorative art or a horrible or unreal creature of the imagination. In genetics chimera is and organism composed of two or more genetically distinct tissues, as an organism that is partly male and partly female, or an artificially produced individual having tissues of several species. After the discovery of the Japanese scientist Y. Kuramoto chimeras are the object which are currently widely studied in physics. Physical definition is different. Consider a number of coupled oscillators which create a network. The coexistence of the synchronized oscillators with desynchronized and incoherent oscillators in the network of identical oscillators creates the spatiotemporal patterns known as chimera states. As an example consider the network of coupled metronomes shown in Fig.1. The pendulum of each metronome is connected to the pendula of nearest neighbor (connection indicated in green) and to the pendula of the second nearest neighbor (red connections) by spring elements. Chimera states can be visible in Fig. 2. The group of metronomes at the background of Fig. 2 is synchronized. Their escapement mechanisms are switched on and they oscillate with the frequency equal to the nominal frequency of 200 tics per minute . The metronomes on the first plane of Figure 4(a) are oscillate with smaller amplitudes. Solitary states are chimeralike states in which appear solitary oscillators which are not synchronized with the rest of oscillators.

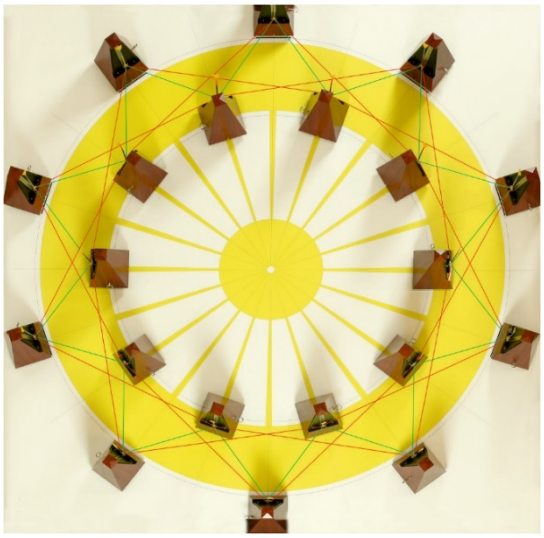

Fig.1

Fig.2

The primary objective of the project is to develop a deep and rigorous understanding on a new class of complex dynamical systems, generically represented by a homogeneous network of interconnected mechanical oscillators. These systems have been very recently explored through their unexpected chimera solutions. The corollary objective, is to anticipate and transpose, thanks to the deep understanding of chimera states (and particularly solitary states), their implications in several well identified technological contexts.

We anticipate that such novel phenomena can provide a rigorous understanding of many yet unexplained observations. It will provide efficient but yet unknown and unexpected engineering design rules for future complex systems made of many interconnected technological elements. Whether desired or unwanted, specific solutions could thus be predicted and/or controlled due to the understanding of the deterministic rules and mechanisms at the origin of the global behaviour of a network-like system of complex interconnected individual elements. In real-world systems, chimera states might play role in understanding of complex behavior in biological (modular neural networks, the unihemispheric sleep of birds and dolphins, epileptic seizures), engineering (power grids) and social systems.