



1st Solvay Conference in Biology ***Organization and dynamics of biological computation***

Scientific background of the conference

Living matter is organized across scales, from subcellular molecular assemblies to cells, tissues, organisms and ecosystems. Such organization is intrinsically dynamical, with components of any system turning over on time scales of seconds to hours and days. The organization and dynamics of living systems unfold in characteristic ways during processes like embryonic development. They persist over time as coherent states, and they respond dynamically to inputs from a changing environment to perform key physiological functions, such as homeostasis, perception and navigation, or to evolve new ones. Thus, fundamental to living systems at all scales is the dual ability: (a) to encode information as internal organization and dynamics, and (b) to extract, store, process, respond to, and evolve in response to information from the environment. From this perspective, biological systems are uniquely powerful computational systems, and it is natural to ask: What are the principles of such computation across different systems and different spatial and temporal scales? How is information stored within the dynamic architecture of genomes, cells, and tissues, whole organisms and ecosystems? How is information processed dynamically to yield reliable outputs in the face of internal and external noise? What is the origin of biological robustness? Information pervades every corner of life science, but there is a need to better understand the unique nature of Biological information, its encoding in living matter, and its modes of transmission, processing and control.

This Solvay conference aims at addressing this problem with the goal of identifying new ways to reveal and understand general principles of biological computation. To this end we will bring together people with different backgrounds in experimental and theoretical sciences, working on a variety of systems.