

The SYMBIONIC project: coordinating a neuronal cell simulation initiative with ongoing EU-wide Systems Biology programs

Arisi I.(1), Roncaglia P.(2), Cascante M.(3), Cattaneo A.(1,2)

(1) Lay Line Genomics (LLG), Rome (2) International School for Advanced Studies (SISSA-ISAS), Trieste (3) University of Barcelona

Motivation

The neuronal cell represents a very fascinating and complex system. In addition to basic processes common to all types of eukaryotic cells such as gene transcription, protein synthesis, and metabolism, neurons are electrically excitable and able to receive and propagate excitation via thousands of synaptic contacts. Investigating neuronal functioning requires a cross-disciplinary approach, involving on the one hand quantitative experimental methods to study excitatory processes, large scale molecular networks and the kinetics of protein-protein interactions, and on the other hand computational modeling of intra-cellular processes and, as far as the synaptic transmission is concerned, inter-cellular communication. Thus, an integration of different experimental and modeling approaches is crucial for a comprehensive description of the cell and for a complete biological understanding of neuronal behaviour. Several kinds of expertise are required in order to cope with the great heterogeneity of cellular events that must be investigated and described by computational models in such a comprehensive view: molecular biology, biophysics, mathematics. But it is bioinformatics that plays a pivotal role in extracting information from the huge amounts of data stemming from recent “-omics” research, and in devising ways to integrate such diverse bits of knowledge in order to attain a truly systemic view of cells. Several Systems Biology initiatives are underway worldwide. These are usually large consortia based in the U.S.A. or Japan. A few projects have recently been established in Europe, but none devoted to the study of neurons. The European project SYMBIONIC is a Specific Support Action aimed at establishing a European-wide initiative in the field of the Systems Biology of the neuronal cell. The long-term aim of the project is to contribute to exhaustive in silico models of the neuron. Currently, the activity of SYMBIONIC is mainly focused on the training and dissemination area and on the coordination of this project with other European initiatives in the field of Systems Biology. The project partners are Lay Line Genomics (a biotech company based in Rome that is also the project coordinator), SISSA in Trieste and the University of Barcelona. About 20 other European institutions and industries actively collaborate with the project. The main objectives of SYMBIONIC are the following: 1) To disseminate ideas and techniques among young scientists, also through a training program, in order to create a new generation of specialists in the area of Neuronal Systems Biology; 2) To consolidate among researchers a view of the neuronal cell as a complex ensemble in terms of Systems Biology; 3) To increase the consciousness of the European scientific community that there is a relevant void to be filled, both in terms of scientific topics and available cross-disciplinary expertise, in the study of neuronal cells as a complex system, and in the development of relevant research strategies; 4) To establish contacts and collaborations with other European groups which are carrying out projects in the field of Systems Biology, even if related to other cellular systems. Currently, the main collaboration is with EUSYSBIO, another EU-funded initiative on Systems Biology.

Contact email: <mailto:symbionic@laylinegenomics.com>

URL: <http://www.symbionicproject.org/>