Symbiosis is described as a close relationship between different biological species, often of a long term nature. It is a pervasive phenomenon. It has for instance been estimated that 50% of all known species are parasites, that is maintain a symbiotic relation with another species from which they benefit while the partner in the relation is harmed. And it is believed that close to a 100% of all plants and animals are parasitised as individuals, in general by more than one species. Indeed, there are thought to be 10 times more bacterial cells in a human body than human cells (Savage, Tract. Annual Review of Microbiology, 1977). The idea of humans, and other animals or plants, as “superorganisms with an internal ecosystem of diverse symbiotic microbiota and parasites” has thus been advanced (Nicholson, Nature Biotechnology, 2004) and raises the issue of what is an individual, and what is species identity.

Symbiosis, or at least its extent, role and precise nature are controversial but symbiosis appears also essential to understand some of the most fundamental evolutionary and functional questions related to living organisms. The enormous variety in the observed types of pair- and multi-wise symbiotic relations, and the fact that these relationships touch upon almost every aspect of biology, from molecular to ecological, raise formidable mathematical and computational issues that should keep a computational biologist busy for decades.

Prof. Marie-France Sagot obtained a BSc in Computer Science in 1991 at the University of São Paulo, Brazil, and a PhD and Habilitation in Theoretical Computer Science in 1996 and 2000 respectively at the University of Marne-la-Vallée, France. She was appointed Associate Researcher at the Pasteur Institute in Paris from 1997 to 2001, before joining the French National Institute of Research in Computer Science and Control (INRIA) and the Laboratory of Biometry and Evolutionary Biology at the University of Lyon 1 and CNRS, France, where she currently is Director of Research and head of the BAOBAB-BAMBOO teams. Her main research interests concern computational biology, algorithmics, and combinatorics, and more specifically comparative genomics, chromosomal time and space dynamics, RNA structures, biological networks, and symbiosis. She co-founded the French National Conference on Bioinformatics (JOBIM) and is member since its foundation of the Steering Committee of the European Conference on Computational Biology (ECCB). She co-founded the French National Conference on Bioinformatics (JOBIM), is member since its foundation of the Steering Committee of the European Conference on Computational Biology (ECCB), and member also of the Steering Committee for the Latin American Theoretical Informatics Symposium (LATIN) and the International Symposium on Bioinformatics Research and Applications (ISBRA). She serves as editor of several international journals and as editor-in-chief of the IEEE/ACM Transactions on Computational Biology and Bioinformatics (TCBB). She has supervised twenty PhDs and nine post-docs, and coordinated some 15 national and international projects. In 2010, she was awarded a five years ERC Advanced Investigators Grant.
This talk will survey part of the work we have done on this issue, and some of the questions we wish to address in the coming years.