PREFACE

Systems biology is an approach to the study of biology that is clearly distinguishable from the 'gene's eye' view and considers the cell or organism as a complex system of many interacting strata. Although a biology-based field of study, its focus on complex interactions requires a holistic perspective instead of the more traditional reductionist approach to biological and biomedical research. It is as Denis Noble has written 'Biology beyond the genome' (Noble, 2006). One of the distinctive aims of systems biology is to model and discover emergent properties, that is, features of the system whose theoretical description involves metabolic or signalling networks. Consequently, systems biology makes heavy use of mathematical, statistical and computational models and may inspire new mathematical theories or generate new generally applicable models.

This volume brings together three programmes of research that contributed to the SysMO Consortium. SysMO (Systems Biology of Microorganisms) was a European transnational funding initiative that aimed to record and describe the dynamic molecular processes occurring in microorganisms and to present these processes in the form of mathematical models. Each of the individual projects in SysMO worked towards different research outcomes and represented a cross-section of microorganisms, including bacteria, archaea and yeast. The environmental conditions for each organism also varied widely with organisms growing in laboratory culture, soil, water and animal hosts. In this volume are collected three accounts of SysMO-funded research on yeast (the Translucent and Translucent-2 projects on gene interaction networks and models of cation homeostasis in *Saccharomyces cerevisiae*), SUMO and SUMO-2 (Systems Understanding of Microbial Oxygen Responses, as applied to *Escherichia coli*) and SilicoTryp (the creation of a 'Silicon Trypanosome', a comprehensive, experiment-based, multi-scale mathematical model of trypanosome physiology).

It should be clear from this small selection of projects that, intrinsic to systems biology, is its interdisciplinary nature and the common aim of achieving the quantitative understanding of dynamic biological processes through the use of mathematical and statistical analyses. As a consequence of this diversity, there is no one model for experimentation or for the types of data collected or the types of models produced. In order to pool the research outcomes for SysMO, the SysMO-DB programme (http://www.sysmo-db.org)

was established to support and manage this diversity and promote a shared understanding across the community by using the same technologies. SysMO-DB has created a Web-based platform and tools for finding, sharing and exchanging data, models and processes in SysMO, but the principles and methods employed are equally applicable to other multi-site Systems Biology projects. Further details on these three projects (the scientific partners and their funding bodies in the participating countries) as well as the several other projects that could not be presented can here be found at that address.

REFERENCE

Noble, D. (2006). *The music of life*. Oxford: Oxford University Press.