A Mathematical Model of the G1/S Transition for the Budding Yeast

Prof. Pasquale Palumbo
University of Milano-Bicocca
Department of Biotechnology and Biosciences (BtBs)
Piazza della Scienza 2, 20126 Milan, Italy
pasquale.palumbo@unimib.it

ABSTRACT: A mathematical model of the G1/S transition is proposed, for the budding yeast Saccharomyces cerevisiae. It is known in biology that such a transition is promoted by multi-step phosphorylation processes leading to the activation of the over 200 G1/S regulon genes. Feedback mechanisms play an active role, since part of the enzymes catalyzing the phosphorylation reactions are expressed by the G1/S regulon. The proposed Mathematical model is a Stochastic Hybrid System, since it merges such discrete features (modeled by means of Chemical Master Equations) with a continuous part related to protein and ribosome concentrations. The model manages to reproduce a large variety of available experimental data and suggests new experiments (carried out at the University of Milano Bicocca) that further validate the model by means of independent data. Results have been recently published on Nature Communications

BIO: Pasquale Palumbo received the Laurea and Ph.D. degrees in electrical engineering from the University of L'Aquila, L'Aquila, Italy, in 1995 and 2000, respectively. He was a Researcher at the Institute of Systems Analysis and Computer Science "A. Ruberti," Italian National Research Council (IASI-CNR), Rome, Italy, from 2000 to 2019. He was a Visiting Professor at the University of L'Aquila, teaching courses on probability, systems and control theory, and systems biology, from 2000 to 2019. He is an Associate Professor of systems and control theory at the University of Milano-Bicocca, Milan, Italy, since 2019. He is currently an Honorary Professor with Óbuda University, Budapest, Hungary. He has authored over 130 peer-reviewed publications in nonlinear filtering and control systems, mathematical modeling and control of the glucose–insulin system, and systems and synthetic biology.