From the author’s perspective, systems biology is concerned with mathematical modelling and simulation of dynamic processes occurring within and between cells. The biologist’s conceptual framework, in which to identify the variables of a biochemical reaction network and to describe their relationships, are pathway maps. A goal of systems biology is to turn these static maps into dynamic models.

In the present paper/presentation we introduce a control systems approach to intra- and inter-cellular dynamics, and which is based on nonlinear ordinary differential equations. The role of feedback loops in the regulation and control of cell signalling is investigated. We describe various sources for sustained oscillations and discuss these in the context of a control engineering approach.

From the formal analysis we draw conclusions on the challenges and hurdles of dynamic pathway modelling as an example of Systems Biology.