Systems Biology Lecture Series

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THE LECTURE(S) WILL BE SAMPLED FROM THE FOLLOWING OUTLINE:

1. Systems Biology
    a. Historical background
    b. Why is it new?
    c. Differences to similar research areas
2. The Role of Mathematical Modelling in the Life Sciences
    a. Mining vs. systems approaches
    b. Statistical modelling: managing uncertainty
    c. Mathematical modelling: managing complexity
    d. Abstraction: Seeking simplicity
3. Cell Biology
    a. The structural & functional organisation of the cell
    b. Cell signalling
    c. Immunoblotting, gel electrophoresis
4. General Systems Theory
    a. Natural and formal systems
    b. Dynamic systems
    c. Stimulus-response systems
    d. Automata, pi-calculus, discrete-event-systems
        i. Automata model of receptor dimerization
5. Dynamic Systems Theory
    a. Phase portrait analysis
    b. Feedback mechanisms in biochemical reaction networks
    c. Delays in signalling pathways
    d. Cross-talk between pathways
6. Rate Equation Modelling
    a. Elementary reactions
    b. Enzyme kinetics
    c. Mass-action type models
        i. Michaelis-Menten type models
    d. Power-law models
        i. S-systems
    e. Receptor modelling
    f. MAPK signal transduction pathway modelling
    g. Dynamic modules (sniffers, buzzers, blinkers)
    h. Tyson & Novak's cell cycle model
7. Stochastic Modelling: Why? When? How?
    a. Markov processes
    b. Stochastic simulation of intracellular processes: Gillespie algorithm
8. Why virtual cell projects cannot model living systems
    a. The machine metaphor
    b. A theory of living systems

A collection of publications, which are recommended reading for this lecture series, are available for download from:

`http://www.sbi.uni-rostock.de/sbpapers/sbpapers.html`