Alexey Kolodkin et al., J Comput Sci Syst Biol 2014, 7:5
http://dx.doi.org/10.4172/0974-7230.S1.009

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Summit on
Integrative Biology
August 04-05, 2014 Hilton-Chicago/Northbrook, Chicago, USA

Computing life: Add logos to biology and bios to physics

Alexey Kolodkin[1,2] **Evangelos Simeonidis**[1,2] and **Hans V Westerhoff**[3,4,5]
[1]University of Luxembourg, Luxembourg
[2]Institute for Systems Biology, USA
[3]VU University, The Netherlands
[4]The University of Manchester, UK
[5]University of Amsterdam, The Netherlands

This paper discusses the interrelations between physics and biology. Particularly, the approaches for reconstructing the emergent properties of physical or biological systems are analysed. Approaches to scale emergence according to the degree of state-dependency of the system's component properties are proposed. Since the component properties of biological systems are state-dependent to a high extent, biological emergence should be considered as very strong emergence i.e., its reconstruction would require a lot of information about state-dependency of its component properties. However, due to its complexity and volume, this information cannot be handled in the naked human brain, or on the back of an envelope. To solve this problem, biological emergence can be reconstructed in silico based on experimentally determined rate laws and parameter values of the living cell. According to some rough calculations, the silicon human might comprise the mathematical descriptions of around 105 interactions. This is not a small number, but taking into account the exponentially increase of computational power, it should not prove to be the principal limitation. The bigger challenges will be located in different areas. For example they may be related to the observer effect the limitation to measuring a system's component properties without affecting the system. Another obstacle may be hidden in the tradition of "shaving away" all "unnecessary" assumptions (the so-called Occam's razor) that, in fact, reflects the intention to model the system as simply as possible and thus to deem the emergence to be less strong than it possibly is. In this talk it is discussed that Occam's razor should be replaced with the law of completeness.

Biography

Alexey Kolodkin after completing his PhD joined Luxembourg Centre for Systems Biomedicine (LCSB) as a research associate and since then has been working on better understanding molecular mechanisms of Parkinson's disease (PD). In January 2012, Alexey joined the Institute for Systems Biology as a participant of the 2-year knowledge transfer program between LCSB and ISB. He was selected to represent Russia in the Environmental Expedition of the Tahoe-Baikal Institute. Alexey obtained his next master degree in the area of Chemical Engineering. His interests were always related to more fundamental issues related to understanding biocomplexity as such.

alexeykolodkin@gmail.com