The Knowledge-Based Bio-Economy and the "Green Triple-Helix" of Biotechnology, Synthetic Biology and ICT

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Abstract. Over the last decades economies around the globe have transformed into a knowledge-based economy (KBE). Information and Communication Technology (ICT) has served as the principal enabling technology for this transformation. Now biology becomes another major pillar – producing a knowledge-based bio-economy (KBBE). The challenges faced by biotechnology push the requirements for ICT in many ways to the extreme and far beyond its basic utility function. In particular, it is valid for synthetic biology which aims to break ground on the rational design and construction of artificial biological systems with ICT as its backbone for bio-design automation (BDA). This could be best illustrated using a metaphor of a "green triple-helix", where "green" stands for environmental consciousness and "triple-helix" visualizes the inter-dependency of biotechnology, synthetic biology, and ICT as the helical strands. The talk will explore this inter-dependency in dynamics. High level ICT requirements will be identified and discussed along the dimensions of education, research and industry with the emphasis on synthetic biology and BDA. The guidelines for the architecture and implementation of an open BDA platform will be presented so that interested ICT researchers and practitioners will better understand the biology-specific ICT challenges of the KBBE.

Keywords. Knowledge-Based Bio-Economy, Biotechnology, Synthetic Biology, Bio-Design Automation

Key terms. ICTInfrastructure, Industry, Management, Research