CRC 1461 Neurotronics

Reprogramming Genetic Circuits with Cellular Context

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The design of genetic circuits, a key focus in synthetic biology, involves arranging genetic components into regulatory cascades that process inputs into outputs, enabling biological computations like Boolean logic. However, traditional designs often face challenges with stability and robustness. This research highlights that the performance of biological circuits in living cells extends beyond DNA sequences. While this notion is intuitive, the intricate dependencies within cellular environments remain underexplored in circuit design. We introduce the concept of contextual dependencies, encompassing factors such as plasmid vectors, host chassis, intracellular spatial positioning, and environmental conditions that critically impact gene performance. A biological circuit's behavior can be reprogrammed not by altering its genetic code, but by modifying these dependencies. For example, rearranging genetic components within the chromosome affects their interactions and output, unlocking new circuit behaviors. This shift from a reductionist to a more holistic approach in genetic circuit design offers a promising pathway to more versatile and adaptive biocomputations. Embracing cellular complexity could lead to innovative, beyond-Boolean architectures that harness the dynamic, context-sensitive nature of living systems, paving the way for breakthroughs in cellular computing and programmable organisms.

CRC 1461:	Neurotronics
Colloquium:	28-November-2024_32
	Thursday, **01:30 pm to 03:00 pm** (CET)
	The colloquium will start at **02:00 pm**
	Link to the zoom meeting

Invited by Jan Steinkühler
Kiel University, Faculty of Engineering, Bio-inspired Computation