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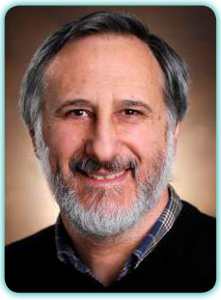

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Recent advancement and developments in synthetic biology

Synthetic biology is a relatively new and very exciting brunch of research. In simple terms, its goal is to create living cells that do what we want. To achieve this, we need precise mechanistic knowledge of cellular processes. In terms of complexity, living systems exceed everything studied by natural sciences. Complex networks of intimately intertwined signaling pathways regulate cellular functions. Mechanistic understanding how the integration of multiple inputs produces coherent behavior is one of the major challenges of cell biology. Perfectly timed highly regulated protein–protein interactions and precise targeting of the "output" proteins to particular substrates area common themes of in cellular signaling. Synthetic biology approaches this at different levels. Many signaling proteins consist of numerous domains. By mixing and matching domains, in essence following in the footsteps of evolution, we can create new signaling proteins with unique functions. This is particularly applicable to scaffolding proteins, which organize and direct signaling. Another level is subtle reengineering of signaling proteins. Most proteins are multi-functional. Disrupting or enhancing individual functions by targeted mutations, ideally without affecting other functions of the protein, generate tools that can channel cell signaling in desired direction. Creating new proteins with subtly or drastically modified functionality paves the way to better understanding of the mechanisms used by living organisms. As an added bonus, engineered proteins have greater therapeutic potential than currently used small molecules, which tend to be one-trick ponies. Thus, synthetic biology holds many exciting promises. It is our job to convert the understanding of biochemical mechanisms into the ability to create designer cells for scientific and therapeutic uses.

Biography

Vsevolod V (Seva) Gurevich has completed his PhD in 1989 from Shemyakin Institute of Bioorganic Chemistry, Moscow, Russia, and postdoctoral training (1991-1995) in the laboratory of Dr. J L Benovic, Thomas Jefferson University, Philadelphia, PA. He is Professor of Pharmacology at Vanderbilt University. He has published more than 160 papers in reputed journals and has been serving as an editorial board member of several journals.

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