

Searching for System Design Principles

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THIS talk will follow the tradition established by opening speakers in previous years. I will give a personal account of the development of one particular aspect of the growing interest in quantitative biology: the identification and elucidation of system design principles in molecular biology. This will include some early history, an attempt to identify a few landmarks in the development, and thoughts on changing attitudes in our scientific culture. I will then briefly outline strategies that my colleagues and I have used in developing a comparative approach to alternative system design. This will be followed by examples of theoretical and experimental results that illustrate elements of this general strategy. Finally, I will describe a new concept, system design space, that allows qualitatively distinct phenotypes of a biochemical system to be identified, counted, analyzed, and compared.