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Cultivating the Physical Biology Mindset

ROB PHILLIPS, Caltech

Biological experiments now regularly result in data that emphasize functional relationships between key parameters such as level of gene expression and number of transcription factors or motor velocity and applied force. This trend towards quantitative dissection of biological problems has been acknowledged explicitly in learned reports such as "Bio2010" and the recent NAS report "A New Biology for the 21st Century." These reports repeatedly emphasize the need for a new biology characterized by what one might call "biological numeracy" and for overhauling biological education in a way that is consistent with this kind of biological research. In this talk, I will describe my own experience in introducing courses aimed at introducing physical biology both in the lecture hall and in the laboratory. One of the most interesting aspects of the physics-biology interface is the question of what constitutes understanding and here, I will describe my views on the role of polarizing predictions as a test of such understanding with special emphasis on examples from signaling and regulation.