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برگزار می کنند:

Internal Models: An Introduction

توسط: **دکتر رضا شادمهر**

Reza Shadmehr graduated at the top of his class in high school, and again at the top of the School of Engineering graduating class in college. As an undergraduate, he worked on cryptography algorithms that mimicked biological organisms. This work won the IEEE-Bendix international student competition. In 1985, he started his scientific training with Michael Arbib, a mathematician and brain theorist at University of Southern California. He was an IBM Fellow during graduate school. For his master degree, he used mathematical models of biological learning to improve making of silicon chips. This research led to a Sigma Xi National Student Research Award. For his PhD, he used the mathematical framework of robotics to consider the problem of how a nervous system evolves to control a multi-degree of freedom limb. After completion of his dissertation, he was awarded a McDonnell-Pew postdoctoral fellowship and began post-graduate training in biological motor control at MIT. During his postdoctoral training, Dr. Shadmehr performed one of the key experiments that were instrumental in starting a new field of scientific inquiry called computational motor control. In December of 1994, he became an Assistant Professor of Biomedical Engineering and Neuroscience at Johns Hopkins University, where he now holds the rank of Professor and Director of the PhD program in Biomedical Engineering. In 2003, he co-authored a text book entitled: "*The Computational Neurobiology of Reaching and Pointing*", published by MIT Press. His work on motor control has been continuously supported by the National Institutes of Health since 1988. Professor Shadmehr is an Associate Editor of the Journal of Neuroscience, and an Editor of Experimental Brain Research. He has co-authored about seventy scientific papers. However, *he views the students that he has trained as his greatest accomplishment.*

Abstract:

This lecture is a tutorial that introduces the problem of motor control from a computational perspective, drawing upon advances that have been made in various laboratories around the world in the past two decades. The results suggest that the act of making a movement involves solving four kinds of problems:

1) We need to learn the costs that are associated with our actions as well as the rewards that we may experience upon completion of that action.

2) We need to learn how our motor commands produce changes in state of our body and our environment.

3) Given the cost structure of the task and the expected outcome of motor commands, we need to find those motor commands that minimize the costs and maximize the rewards.

4) Finally, as we execute the motor commands, we need to integrate our predictions about sensory outcomes with the actual feedback from our sensors to update our belief about our state.

In this framework, the function of basal ganglia appears related to learning costs and rewards associated with our sensory states. The function of the cerebellum appears related to predicting sensory outcome of motor commands and correcting motor commands through internal feedback. Together, reward driven optimal feedback control theory appears the most consistent framework to explain a number of disorders in human motor control.

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