

# Engineering Neuroscience & Health

Department of Biomedical Engineering

Division of Biokinesiology and Physical Therapy



## ENH SEMINAR SERIES



**Presents:**

**Dr. David Reinkensmeyer**

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**Monday**

**March 23, 2009**

**4:00 p.m.**

**Refreshments will be served 3–4 pm**

### “Mechanisms of Motor Learning during Robotic Movement Training”

David Reinkensmeyer, Ph.D., Professor  
Department of Mechanical and Aerospace Engineering  
Department of Biomedical Engineering  
University of California at Irvine

In the last 15 years there has been a surge of interest in using robotic devices to help retrain movement following neurologic injuries such as stroke and spinal cord injury. In this talk I will summarize clinical studies of robot-assisted movement training, and interpret these results in the context of three computational models of motor learning. Specifically, I will discuss the extent to which results from robot-assisted movement can be explained using Hebbian-like sensory motor learning processes, error-based learning mechanisms, and reinforcement-type learning mechanisms. I will show that a reinforcement model of motor learning, in which use-dependent recovery is driven by stochastic local search of optimal activation patterns for spared corticospinal pathways, explains a wide range of results from clinical studies of robotic and non-robotic movement training after stroke. This stochastic local search model also suggests innovative strategies for optimizing movement rehabilitation.

#### Biosketch

Dr. Reinkensmeyer's received the B.S. degree in electrical engineering from the Massachusetts Institute of Technology, Cambridge in 1988, and the M.S. and Ph.D. degrees in electrical engineering from the University of California, Berkeley in 1991 and 1993, with dissertation work on human control of hand movements and robotic devices for movement therapy after stroke. He was a postdoctoral fellow then research assistant professor in the Sensory Motor Performance Program, Rehabilitation Institute of Chicago and Department of Physical Medicine and Rehabilitation, Northwestern University Medical School from 1994 – 1998. He joined the Department of Mechanical and Aerospace Engineering and the Center for Biomedical Engineering at the University of California, Irvine in 1998. Dr. Reinkensmeyer is an Associate Editor for the IEEE Transactions on Neural Systems and Rehabilitation Engineering.

#### Locations:

*Seminar is simultaneously presented*

**HSC: CHP 147— LIVE**

**Center for the Health Professional**

HSC Campus Map/Directions:  
<http://www.usc.edu/about/visit/hsc/>

**UPC: HNB 100 – Video Conference**

**Hedco Neurosciences Building**

UPC Campus Map/Directions:  
<http://www.usc.edu/about/visit/upc/>

**Organized by Professor Francisco Valero-Cuevas** <http://bme.usc.edu/valero/>

#### Web Cast

<http://capture.usc.edu/college/Catalog/?cid=af180d48-ceff-42b9-a35c-eb199daed320>

Information about all seminars can be found at  
<http://www-clmc.usc.edu/~heiko/ENH>