NSF Awards $12 Million to UC San Diego 'Science of Learning Center' for Three More Years of Innovation

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The Temporal Dynamics of Learning Center, founded at UC San Diego in 2006 as one of six National Science Foundation Science of Learning Centers, has just been awarded an additional $12 million for the next three years to expand its important work studying the role of time and timing in learning.

More than 40 researchers, working closely together through a unique "network of research networks" collaboration, are focused on the role of time in learning across multiple time scales - from the exquisite sensitivity to firing time between neurons that causes them to link together more tightly, through the timing of social interactions between teachers and students that leads to effective teaching, to the scale of months in spacing effects in learning.

Gratified with the glowing reviews by the nation's leading science funding and review agency, Center Director and UCSD Computer Science and Engineering Professor Gary Cottrell said, "This funding demonstrates NSF's confidence in our work. In order to receive this level of funding, the National Science Board had to review our Center, and they were very excited about our 'Network of Research Networks' structure and the deep scientific progress we have achieved in a very short time. We have an incredibly talented interdisciplinary group of scientists from over 10 institutions in the US, Canada and Australia carrying out groundbreaking basic research, who are committed to making our work relevant to the classroom. Already our researchers and trainees have developed many innovative programs that fulfill that goal of going from laboratory to classroom."

Cottrell cited several cutting edge advances:

RUBI-4, a "Teletubby"-style social robot developed over three years whose real-time machine perception abilities allow her to play give-and-take games with the children in UCSD's Early Childhood Education Center, where she teaches colors and shapes, and interacts in a naturalistic way.

The Computer Expression Recognition Toolbox (CERT), a remarkable automated real-time analyzer of facial expressions. Based on the appearance of the human face observed in videos of participants, the device is being used in several studies that include interventions for children with autism, assessing real pain versus faked pain and interpreting subject interest during automated tutoring sessions.

Patterns of activity in the brain that predict future choices have been discovered by György Buzsáki, a distinguished faculty member of the Center at Rutgers. The work, which was just published in *Science*, describes how patterns of activity in the hippocampus of a rat can be used to predict what the rat will do 20 seconds later. "Now that we are able to predict future behavior choices by rodents, ... the next logical steps are to expand studies to other animals, including humans," said Buzsáki.

The Motion Capture and Brain Dynamics Facility at UCSD. This laboratory makes possible real-time motion-capture synchronized with electroencephalogram (EEG) recordings of the brain, and its potential uses in research are enormous. Already 12 different projects involving researchers worldwide are ongoing in the lab.

This new funding will allow the Center to scale up its efforts on the computational cognitive neuroscience of the role of time and timing in learning. In their approval, NSF emphasized, "This is a group of extraordinarily able and energetic individuals truly dedicated to an exciting unifying theme."

In underscoring the unusual two-way collaboration between scientists in the laboratory and teachers in the classroom, Center Outreach Director Terrence Sejnowski said, "We are innovating a new way of doing science by networks of researchers that brings classroom concerns into the lab and lab discoveries into the classroom."

"Perhaps the most exciting aspect of the Center is the scientific creativity and progress that is enabled by pooling the expertise of so many fantastic scientists," said Andrea Chiba, the Center's science director.

Through the now famous "network of networks" the Center incorporates scientific participants from many academic institutions and disciplines, including Brown, Carnegie-Mellon, the University of California, Berkeley, the University of Colorado Boulder, the University of Pennsylvania, the University of Pittsburgh, the University of Queensland, Rutgers Newark, San Diego State University, the Salk Institute, Vanderbilt and the University of Victoria. The researchers are from departments as diverse as biology, cognitive science, computer science, neuroscience and psychology. Their educational partners include Curie Elementary in San Diego, the Preuss School at UCSD, the Early Childhood Education Center at UCSD, Reach for Tomorrow, the San Diego Cooperative Charter School, Scientific Learning Corporation, the Jensen Learning Corporation and The Science Network, a web-based outlet dedicated to bringing science to the public.

More information about the Center can be obtained at http://tdlc.ucsd.edu

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