

Upcoming Events

NSF Site Visit

June 11-12, 2009
UC San Diego



**1st Annual TDLC
Trainee Bootcamp**
August 10-22, 2009
UC San Diego



Brains 'R' Us 2
Fall 2009 (Date TBD)
The Salk Institute



**Brain Fitness for
Kids on PBS**
Featuring interviews
with TDLC
Investigators

The public television special "New Science of Learning: Brain Fitness for Kids" features interviews with TDLC investigators April Benasich, Andrea Chiba, Javier Movellan, Terry Sejnowski, and Paula Tallal. This program will be airing nationwide on local PBS television stations.

For more info, dates, and show times, please visit brainfitnessforkids.com



Sections

Science and Research

New! Education

New! Ask a Scientist

Administrative Updates

The State of TDLC: Fully Funded and Moving Ahead on Many Fronts

By Michael Dabney

Having achieved full funding from the National Science Foundation this year, in addition to taking advantage of other sources of funding, and honing its research network strategies, the Temporal Dynamics of Learning Center (TDLC) is indeed moving ahead.

This was the message that more than 100 TDLC members and trainees heard when they gathered recently at the University of California, San Diego for the annual All-Hands Meeting.

In an atmosphere tinged with optimism, representatives from the Center's four research networks and other TDLC components took time to acknowledge their success while gearing up for challenges that lie ahead this year.

Gary Cottrell, Center Director and Principal Investigator, and Professor of Computer Science and Engineering at UCSD, put things in perspective: Through enhancements in TDLC networks, initiatives and external funding, "our science at the Center is becoming more focused," he said.

This is moving the Center toward its primary goal of achieving an integrated understanding of the role that time and timing play in learning (across multiple scales, brain systems, and social systems), thereby helping scientists apply

this knowledge to improving educational practice.

In the coming months, advised Cottrell, "we need to make more effort to synchronize research among our four networks based on our Perceptual Expertise Network (PEN) model –the concept through which we gained our NSF grant and through which we learned each other's network vocabulary and research perspectives." He adds, "Synchronizing our research in probabilistic environments using paradigms under changing temporal demands (such as slow world/fast world) is ideal."

(See *Moving Ahead* on Page 6)

Face Recognition Revolution

By Carolan Gladden

The headline reads, "A New Tool to Blunt Racial Bias," and Brown University Professor Michael J. Tarr of TDLC's Perceptual Expertise Network reports that ALPS (Affective Lexical Priming Score) testing addresses the kinds of biases people show unconsciously and may not even be aware they have. As he says, "There is a strong connection between the way we perceive and categorize the world and the way we end up making stereotypes and generalizations about social entities."

The work of this wide collaboration of

(See *Face Recognition Revolution* on Page 2)

Science and Research

Is it Real, or...

By Carolan Gladden

Albert Einstein was a big hit at the All Hands Meeting in February, looking around, making eye contact, smiling. Indeed, the man has been effectively reincarnated in the form of an “empathetic robot” that interacts with people using emotional nuances.

The rubberized rendition of Einstein's head and shoulders with piercing movable eyes, a shock of white hair and distinctive mustache initially dazzled a crowd of 1,500 at the Technology, Entertainment and Design conference that seeks to foster creativity among entrepreneurs, scientists, and designers.



Einstein got his personality when roboticist David Hanson's contraption was married to software from UC San Diego's Institute for Neural Computation. Nicholas Butko, UC San Diego graduate student and member of TDLC's SIN Network, says they want to make computers that have basic perceptual capabilities -- things that your brain does effortlessly that you never even think about. “One of our goals is to make a computer that can reliably tell how sincere someone's smile is.”

Face Recognition Revolution

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TDLC researchers builds on the Implicit Association Test (IAT) developed at Harvard, and their impressive findings were recently published in PLoS ONE, the online, peer-reviewed journal from the [Public Library of Science](http://www.plosone.org/). Indeed, the group's ALPS measurement system, together with subsequent

part in some ten hours of facial recognition training, in which half learned to tell whether the faces were African-American or not and half learned to tell apart individual African-American faces. This sort of perceptual training is a new tool and, in fact, the training worked on several levels: Subjects who



Examples of faces used in the TDLC study

training, not only identifies unconscious social biases but helps improve the ability to distinguish between faces of individuals of a different race.

In the inaugural study, 20 Caucasian subjects were shown a series of grey-scale images of the faces of people of different races, each photo disappearing and being replaced by nonsense letters or a real word with either a positive or negative connotation. The initial testing generally revealed quicker response to negative words related to African-American faces, slower response when positive words were coupled with African-American faces.

After the ALPS measured their implicit racial bias, the subjects took

showed the greatest improvement in their ability to differentiate between African-American faces also showed the greatest reduction in implicit racial bias when re-tested with the ALPS system.

Sophie Lebrecht, third-year Ph. D. Student in Tarr's lab at Brown, is credited with conception of the idea and is the lead author. She was interested in the interaction of visual processing with such other cognitive functions as emotion or social processing. And, while making no claims that it can eliminate racial bias, this research certainly suggests that teaching people to better tell the difference between individual faces of a different race is one way to help reduce that bias. As Ms. Lebrecht says, “Developing a

(See *Face Bias*, Page 5)

Education

David Weber: The First TEN Educator

By Doris Alvarez

“Scientists are the theory, we are the practice.” This quote from David Weber sums up the philosophy that he brings to The Educator Network (TEN). As a math teacher, David welcomes the opportunity to pose real life problems in teaching and learning that perhaps could be solved through research and collaboration with scientists. He sees as one of his roles to provide a lab for experiments and a context for research by TDLC scientists. He elaborates, “Like many math classes, if one simply teaches a concept without showing where it’s useful, students will see little value in it. Without a context (a classroom, a teacher, etc.), the research will be limited.

Indeed David’s excellence in science and math teaching stems from his belief that students need to learn content in context. Finding real life applications of math and showing students how to apply the concepts creates an exciting environment for learning in his classroom. Additionally, as an International Baccalaureate consultant, he presents workshops nationwide to teachers new to a

program that stresses this learning in context approach.

David comes from a family of engineers. David and his three siblings (two sets of twins) were all trained in engineering (David’s specialty was electrical engineering). His father and grandfather were engineers, too! So how did David, the youngest, end up as a high school teacher? The transition was obvious. He wanted to use his engineering skills in the context of a high school classroom. And what better way to do it?

Born and raised in Montreal, Quebec, Canada, David received his PhD from McGill University in Education and his undergraduate degree in engineering. He has co-authored two textbooks in mathematics. Broadening his inquiry, his Ph.D research focused on finding a theoretical basis for university involvement in the support of beginning teachers. He found that colleagues/teachers mentor beginning teachers for survival to get through the day/week. University faculty mentors a teacher for development, to help the teacher improve over the long haul.



Outside of the classroom, David is an all-around athlete. He cycles (usually daily to The Preuss School where he teaches calculus and intermediate algebra), skies, plays tennis and volleyball. It is not unusual to see him jogging around campus after school with student cross-country runners or coaching student athletes in the practices they missed while he was conducting his math tutorials.

David already has a few questions that TDLC scientists might want to ponder: What does current research tell us about brain activity in learning mathematical concepts? Is the brain activity more similar to what happens when students learn a new language or is it different? Are there gender differences in learning mathematics?

Welcome, David Weber, our first TEN Educator.

Ask a Scientist

Featured Scientist: Sean Kang

‘Ask a Scientist’ is a new section that we have added to the newsletter, which gives readers the opportunity to submit their own questions about learning, the brain, or any Center related topic, and have them answered by the Center’s scientists. We will select one or two submissions for each issue that will be published with the scientist’s responses. Please go online to tdlc.ucsd.edu and

click on the ‘Contact Us’ button, located at the far right of the top menu, to submit your questions.

For the first edition of the ‘Ask a Scientist’ section, we posed a few questions that we have heard from teachers, parents, and students alike: Which is the best way to study? How often? Does cramming work? Many thanks to Sean Kang, a post-doc from Hal Pashler’s lab, who provided the answers.

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Administrative Updates

NSF Site Visit

The National Science Foundation (TDLc's funding agency) will conduct its annual site visit of the Center at UC San Diego on June 11 and 12. The annual site visits are an opportunity for the Center to bring NSF up to speed on its latest research, education, and outreach developments. In turn, the site visit team, which is made up of NSF administrators and appointed academics from relevant research disciplines, conducts a thorough evaluation of the Center, culminating in a written report that will provide a comprehensive assessment of the Center's performance and any suggested changes in its operation for the year ahead.

Annual Progress Report

The May submission of the Center's Annual Progress Report is the culmination of a year-long effort to gather data and information about the Center. The lengthy document provides NSF with a thorough profile of nearly every aspect of the Center's functions. Every member of the Center is involved in providing relevant information about his or her own Center-related research and activities, which is collected in a central database and then organized for inclusion in the report. The last step is the painstaking evaluation of a year's worth of new data and the drafting of the final document by a team of Center investigators and staff.

Inaugural Trainee Bootcamp

TDLc will be hosting its first trainee "bootcamp" from August 10-22. The bootcamp will be a two-week intensive educational experience that will immerse participating trainees in specific areas of research chosen from among the Center's four research networks. There will also be two additional instructional modules, including one that will utilize the Motion Capture and Brain Dynamics facility. The planning committee has agreed to an agenda that will include a first week of intensive instruction and lab work, with a second week devoted to week-long research projects that will culminate on the final day with talks on the results of the participants' projects.

Head of The Educator Network

Doris Alvarez, Ph.D, a career educator, has been recruited as a consultant to direct The Educator Network. The Educator Network is an essential component of the "network of networks" model around which the Center is organized. Under Dr. Alvarez's leadership, The Educator Network will serve as the logistical and intellectual interface between the classroom and the laboratory. Simply put, in one direction, the network will provide TDLc researchers with valuable input from teachers and educators to help guide research, while in the other direction, it will translate the Center's research into instructional tools to improve the teaching and learning experience in the classroom.

Where Are They Now?

Catch up with recent TDLc trainees into new professional endeavors:

Carina Curto, a former Post-Doc at Rutgers University, is now a Mathematics Instructor in the Courant Institute of NYU.

Chris Elliott, a former Graduate Volunteer at UCSD, is now a Consultant at Cogmed Working Memory Training.

Adrian Nestor, a former Graduate Student at Brown University, is now a Post-Doc in Psychology at Carnegie Mellon.

Sarah Shomstein, a former Post-Doc at Carnegie Mellon, is now an Assistant Professor at George Washington University.

Jed Singer, a Graduate of Brown University, is now a

Post-Doc at Children's Hospital Boston/Harvard Medical School.

Cibu Thomas, a former Grad Student at Carnegie Mellon, is now a Post-Doc at Mass General.

Peter Wais, a former Grad Student at UCSD, is now a Post-Doc at UC San Francisco.

Scientist

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1. Which is the best way to study?

This question is very broad, and a complete answer is beyond the scope of this section because there are a multitude of factors that influence the effectiveness of studying. I will mention, however, that research done by cognitive scientists (including Prof. Hal Pashler and colleagues at TDLC) has demonstrated two key principles of human learning/memory that have important implications for how students should study or prepare for an upcoming exam. The first principle is the spacing effect, which refers to the observation that a repetition (e.g., studying the material a second time) is more effective when the two presentations are spaced apart rather than consecutive in time. The second principle is the testing effect, which refers to the phenomenon of better retention of the material when the individual has practiced retrieving the information from memory, relative to merely reading the information. In other words, being tested on the material is a potent way to enhance one's retention of the material. These two principles can be combined to maximize the benefits—i.e., spaced (or distributed) retrieval practice – e.g., practice with a set of flashcards on Day 1, again on Day 3, then again on Day 5, etc.

2. How often? How long for each session?

In general, the more time that a student devotes to studying for an exam, the better prepared he or she will be (bearing in mind that there will be diminishing returns), but only when the study strategy is held constant. A student who uses an ineffective study strategy (e.g., re-reading his or her notes/textbook over and over) may spend more time studying overall than a student who uses an effective study strategy (spaced retrieval practice, as explained above), but the first student may not outperform the second student on the exam. There is no hard and fast rule on how often a student should study, or how long each study session should be, except that a student should devote enough time to studying such that he or she is able to cover the target material at least twice over (i.e., there is sufficient time to repeat the same material more than once, so that the student can take advantage of a spaced repetition), and that the repetitions should be spaced apart in time (it's more beneficial to have two shorter sessions on separate days than to have one longer session where the student repeats the material again and again in that single session).

3. How long before the exam should the student start studying? Does cramming work? How does cramming affect the ability to retain what was learned?

In line with the spacing effect mentioned earlier, cramming is an ineffective study strategy. When cramming, a student typically reads his or her notes/textbook again and again, often the night before the exam. This “last-minute” preparation denies the student the benefit of spaced repetition, and results in poor long-term retention of the information. While previous lab studies comparing cramming vs. spaced repetitions sometimes found a benefit of cramming on immediate tests, these immediate tests were administered usually no more than 10 minutes after the study session. These short-term gains were invariably reversed when the test was administered after a longer delay—i.e., cramming leads to rapid forgetting. Therefore, students should endeavor to begin their exam preparation early, giving themselves sufficient time to space out their study sessions and engage in retrieval practice, so as to improve long-term retention of the material.

Face Bias

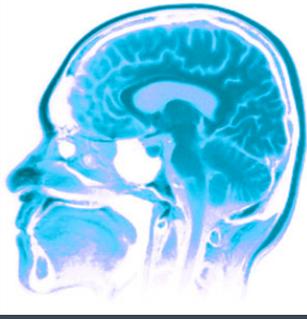
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system that teaches people to make those distinctions should be helpful in reducing generalizations based on social stereo-types. If you give people the tools to start individuating, maybe they will make more individual (rather than stereo-typical) attributions.”

The hope is that this program could someday be used to train those who regularly come into contact with other races – police officers, social workers, immigration officials, etc. And, who knows, one day it could even filter into the general population with the result of fewer incorrect witness identifications and erroneous convictions.

In addition to Ms Lebrecht and Professor Tarr, the innovative research team includes Jim Tanaka, Professor at the University of Victoria, and Lara Pierce, presently a McGill University Grad Student.





Brain Trivia

The Occipital Lobe is most important for which sensory modality?

- a) Touch
- b) Vision
- c) Hearing
- d) Smell
- e) Taste

Look for the answer in the next newsletter.

Last issue's answer:
d) Hippocampus

Congratulations, Shelley!

Shelley Marquez, the Executive Director at TDLC, and Chief Administrative Officer of three other research centers at UCSD, has been named the recipient of the 2009 Betsy Faught Award. The award recognizes excellence and outstanding achievement in the management of general campus academic units, and honors the memory of Betsy Faught, a veteran department manager who managed an academic program at UCSD for more than 20 years. The award recipient is selected by a group of peers based on nominations from within the units of the Academic Affairs Division.

[Read the full article here](#)

What's New Online?

Teacher Resources

Tired of the same old lesson plans? You may have noticed the section online titled *Teacher*

Opportunities. Our plan is to populate this area with downloadable content, such as worksheets and demos, which can be used to liven up the overused lesson plans. Please visit our website at tdlc.ucsd.edu, and provide your suggestions via the 'Contact Us' button at the right of the top menu. We look forward to your input.

The Temporal Huddle

A new initiative of our center is something we've dubbed "The Temporal Huddle". Our basic objective is to foster and encourage communication across different TDLC networks.

Each month, the trainee committee will find one volunteer trainee in each network that will select a recent article published by a TDLC author from a network outside his or her own. The paper will be read at the trainee regular lab meeting/reading group and the trainee will be in charge of formulating one or two questions for the paper's authors. An abstract and a version of the email exchange will be featured in a section of the TDLC web site.

Moving Ahead

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Other key items noted at the All-Hands Meeting:

Acknowledgement of TDLC Planning and Network Concepts. Cottrell acknowledged that TDLC's Strategic and Implementation Plan (written and designed primarily by Andrea Chiba, TDLC Co-director and Science Director) was recommended to another center as a model. Cottrell also relayed that he was told that the Center's innovative Network of Research Networks concept (the brainchild of Tom Palmeri, Co-PI of Perceptual Expertise Network) was well-received at the presentation of TDLC to the National Science Board.

On a related front, it was noted that Cottrell has been elected the new chair of the Science of Learning Center Network (a collaboration among all six NSF Science of Learning Centers across the country).

Full Funding From NSF. This year the NSF announced that it will grant TDLC full funding of \$4M/year for the remaining three years of the cooperative agreement. To date, the Center has received a total of \$7.5 million of the \$15.5 million expected from NSF.

Other Funding. For research equipment, Howard Poizner received \$ 1 million from the Office of Navy Research (ONR) for the Motion Capture/Brain Dynamics facility, and Javier Movellan received a half-million dollars from ONR for equipment to support his research.

Regarding additional funding for research, Gary Cottrell received an NIH supplement this year (an improvement over last year when no such funding was received). This summer, the Center plans to apply to become an NSF REU site (Research Experience for Undergraduates). The grant would

fund a summer research program for undergraduates from all over the country to come to UCSD to jumpstart their graduate careers by learning first hand how to conduct research in TDLC's labs, as well as to receive career development training, and practice writing up and presenting their research.

New Research Strands Added. Efforts have been made to enhance the Center's four research initiatives (the temporal dynamics of the input, brain, output, and learning) to heighten their synergy with TDLC's four networks—the SensoriMotor Network, the Social Interaction Network, the Interacting Memory Systems network, and Perceptual Expertise Network.

For instance, a new strand on Spacing Effects was added to Initiative 1, and a new strand on Decision Dynamics was added to Initiative 2.

Research Updates from Center Scientists. The highlight of the meeting, however, was hearing about Center Science. All-Hands participants heard a number of stimulating research presentations from key Center scientists, including:

Michael Mozer from the University of Colorado at Boulder: Mechanisms of the distributed practice effect. Janet Wiles from The University of Queensland: What is the role of new neurons in the Dentate Gyrus? Christine Smith from UC San Diego: Experience-dependent eye movements reflect hippocampus-dependent (aware) memory. Nick Butko from UC San Diego: Models of salience and eye movements. Yang Dan from UC Berkeley: Burst spiking of a single cortical neuron modifies global brain state (the work just came out in the journal *Science*).

To view these and other All-Hands research talks, go to the TDLC homepage, <http://tdlc.ucsd.edu/portal/>