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SUMMER/FALL 2008 A quarterly publication of the CENTER FOR BEHAVIORAL NEUROSCIENCE

NSF Report: CBN Accomplishments Are "Remarkable"

As the Center for Behavioral Neuroscience enters its final year of funding from the National Science Foundation, we have much to be proud of according to the 2008 NSF Site Visit Report. The Report repeatedly lauds the CBN's accomplishments in research, education, and knowledge transfer using such descriptions as "remarkable," "innovative," and "successful."

"It is very rewarding to receive this praise from the NSF," said Elliott Albers, director of the CBN. "I would like to thank CBN members and our community partners who have worked tirelessly to help us reach our goals and establish ourselves as a nationally recognized center for behavioral neuroscience research."

A team of five noted scientists from across the country and four NSF officials compiled the report after the Center's ninth evaluation in September.

According to the report, "research programs supported by the CBN are outstanding. The CBN has not only helped develop and promote the work of individual scientists, but has been transformative in shifting the approach that CBN neuroscientists take in collaboration

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Synapse Summer/Fall 2008
Vol. 9, No. 3

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Editor: Martha Barker Koontz



'Hub' of Fear Memory Formation Identified in Brain Cells

Center for Behavioral Neuroscience (CBN) scientists in the laboratory of Dr. Kerry Ressler have discovered that beta-catenin protein, an apparent "hub" for changes in the connections between brain cells, could be a potential target for drugs that enhance or interfere with memory formation. The results of the study are published in the October issue of *Nature Neuroscience*.

The beta-catenin protein acts like a Velcro strap, fastening the internal skeletons of cells to proteins on their external membranes, which in turn connect the cells with other cells.

"During long-term memory formation, structural changes take place in the synapses – the connections between neurons in the brain," says Kerry Ressler, M.D., Ph.D., associate professor of psychiatry and behavioral sciences at Emory University School of Medicine, researcher at Yerkes National Primate Research Center, and a member of the CBN.

"We thought beta-catenin could be a hub for the changes that take place in the synapses during memory formation," says Ressler. "But because beta-catenin is so important during embryonic development, we couldn't take the standard approach of just knocking it out genetically."

To test beta-catenin's involvement in fear memory, Ressler and graduate student Kimberly Maguschak, a CBN Graduate Scholar, used a genetically engineered virus in mice to modify



Photo courtesy Kerry Ressler, Emory University

CBN members Kerry Ressler, M.D., Ph.D., (pictured above) and Kim Maguschak have found that a protein required for the earliest steps in embryonic development also plays a key role in solidifying fear memories in the brains of adult animals.

the beta-catenin gene in the amygdala, a part of the brain known to be involved in fear memory. Once a cell is infected, the virus inhibits the ability of the gene to make beta-catenin protein. Mice who had been given the virus, along with control mice that had not, were exposed to a conditioned fear paradigm pairing an electric shock with an auditory stimulus (a tone) until the auditory stimulus produced a conditioned fear to the tone.

"We found that after beta-catenin is removed from the amygdala, the mice still learn to fear the shocks," says Maguschak. "But two days later, their fear doesn't seem to be retained because they spend half as much time freezing in response to the tone."

Injecting the virus after the learning process does not affect the ability of the mice to express the conditioned fear response.

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Exciting Opportunities Post 2009

Once again in 2008, the National Science Foundation site visit praised CBN research programs as “outstanding.” The team noted, “the CBN is a model for future research programs,” and, “...is poised to continue to thrive past the period of NSF direct funding.”

With only one year of funding remaining until our NSF Science and Technology Center grant comes to an end in 2009, it is encouraging to know our programs are continuing to progress and receive such praise from the NSF.

Also encouraging are the current and future opportunities for the CBN to engage in and help promote Georgia's growing life sciences industry.

In September, the CBN organized a plenary session at Georgia Bio's 2008 Life Sciences Summit. During the session, we were able to highlight the neuroscience research taking place in Georgia's research universities to an audience of more than 800 scientists and public health officials from around the state.

We are also looking forward to showcasing CBN research among scientists from around the world when the BIO International Convention comes to Atlanta, May 18-21, 2009. BIO is a global event for biotechnology that attracts more than 20,000 business leaders, scientists, executives, investors, and industry leaders responsible for new medicines, fuels, materials, foods, processes, etc.

Outside the conference realm, this past summer, the state introduced Georgia's first regional branding campaign for its life sciences corridor, which stretches from Atlanta to Athens. This area, called “Georgia's Innovation Crescent,” was given the tagline, “Where Life Science Grows.” An Innovation Crescent Regional Partnership has been formed to boost economic development marketing for the life science industry within the Innovation Crescent.

In addition, the state's efforts to increase visibility of its growing life sciences industry were noted in the recently released report, “*Shaping Infinity: The Georgia Life Sciences Industry Analysis 2008*.” In the report, Kenneth Stewart, Georgia's Department of Economic Development Commissioner wrote, “Our goal is to move Georgia's bioeconomy into the top five over the next 10 years by implementing public policies that support translation of technologies from our universities to the commercial sector and recruitment of new technologies and companies to our state in the areas of advanced medical devices, biomanufacturing, vaccine and drug development, nanomedicine, and contract research services.”

With the above initiatives in place, I feel that even though the CBN's time as a NSF center is coming to an end, new opportunities — for us to continue on as a valuable asset to the state's life sciences community — are on the horizon.

Elliott Albers

CBN Organizes Plenary Session During GA Bio's 2008 Life Sciences Summit

More than 800 life science industry professionals attended Georgia Bio's Eighth Annual Georgia Life Sciences Summit, Sept. 24, at the Georgia World Congress Center. The Summit featured more than 70 speakers discussing trends and issues and showcasing the most advanced research and product developments in biomedicine, medical devices, agriculture, and bioenergy.

The CBN organized a plenary session for the Summit entitled: “*Research Advances in Georgia: Neuroscience*.” The panel discussed recent advances in neuroscience research from the laboratories of scientists at Georgia's research universities.

Panel members included: **Elliott Albers**, Ph.D., Director of the CBN and GSU Regents Professor of Biology; **Dennis Choi**, Ph.D., Executive Director of the Comprehensive Neurosciences Initiative, Emory University; **Stephen DeWeerth**, Ph.D., Professor and Associate Chair for Graduate Students in the Wallace H. Coulter Department of Biomedical Engineering, Georgia Tech and Emory; **Gaylen Edwards**, DVM, Ph.D., Professor and Department Head of the Department of Physiology and Pharmacology, College of Veterinary Medicine, The University of Georgia; **Peter MacLeish**, Ph.D., Director of the Neuroscience Institute, Morehouse School of Medicine; **Walt Wilczynski**, Ph.D., Professor of Psychology, Associate Director for Research at the CBN, and Director of the Neuroscience Institute, Georgia State University; and **Robert Yu**, Ph.D., MedScD, Professor and Director of the Institute of Molecular Medicine and Genetics, Medical College of Georgia.



CBN Director Elliott Albers, Ph.D., moderates a CBN-organized plenary session during the Eighth Annual Georgia Bio Life Sciences Summit, Sept. 24.

Be on the lookout for...



BRADLEY COOKE, Ph.D., assistant professor of Neuroscience at Georgia State, uses rodents to study the roles of gonadal hormones and sex-specific experience in the sexual differentiation of the brain and behavior. His research focuses on puberty, and the synaptic organization of hormone sensitive areas in the brain such as the amygdala, and he uses electron microscopy, light microscopy, and patch clamp electrophysiology, to complement his studies of behavior.



DANIEL HUMMER, Ph.D., assistant professor of psychology at Morehouse College, studies the neurobiological mechanism underlying the ability of light to phase shift the circadian clock and thereby synchronize circadian rhythms to the day-night cycle. He is also interested in the role that gonadal hormones play in altering circadian rhythms during adolescent development. He is a member of the aggression collaboratory.

GSU Neuroscience Institute Introduces Web Site



<http://neuroscience.gsu.edu>

The GSU Neuroscience Institute Web site is up and running. In addition to faculty and event listings, the site includes Google Group, which allows members of the Institute to create Web pages for their smaller groups.

'Hub' of Fear

Continued from page 1

Therefore, beta-catenin appears to be necessary only during the initial learning and not in the "memory" of what is learned.

Maguschak also found that when lithium chloride, a compound that can indirectly can block the destruction of beta-catenin protein, is given to the mice before the initial learning process, mice show an enhanced fear response to the tone two days later. She cautions that lithium is an imprecise tool for studying beta-catenin because it affects several enzymes in the brain.

"Psychiatrists have used lithium to treat mania and bipolar disorder for decades, but how it works is not well-understood," Dr. Ressler says.

The authors suggest that medications that inhibit beta-catenin could transiently interfere with memory

formation after trauma, helping to prevent learned fear responses such as post-traumatic stress disorder. Conversely, drugs that enhance beta-catenin function within the brain might serve as new therapies to treating disorders of memory, such as Alzheimer's disease.

Unfortunately, at this time no drugs that target beta-catenin are available except lithium.

Funding for the research came from the National Institutes of Health, the National Science Foundation, the Burroughs Wellcome Fund, the Center for Behavioral Neuroscience and the Yerkes National Primate Research Center.



Without beta-catenin, mice can still learn fear..., but it doesn't seem to be retained, Maguschak said.

Photo courtesy Kim Maguschak, Emory University

Due to space limitations, this story is a modified version of the original release written by: Kathi Baker, Emory University, Woodruff Health Sciences Center.

The complete release can be found at: www.emory.edu/home/news/releases/2008/09/fear-memory-formation-hub-found-in-brain.html

CBN Receives Templeton Planning Grant

The Center for Behavioral Neuroscience was recently awarded a planning grant from the Templeton Foundation. The grant will support a year-long program leading to the development of research into the fundamental neuroscience of positive emotions and social traits, in particular, social bonding, tolerance, trust, altruism, cooperation, empathy, and hope.

The Foundation's support will help the CBN develop a working group within the Center, which will be modeled after its existing collaboratories. The group will guide the preparation of exemplar proposals for research projects into the areas of positive emotions and social traits.

These will serve as test cases for a larger research initiative supporting innovative, collaborative neuroscience research into these complex social and emotional traits.

"We hope that such research will ultimately become an integral part of the Center staying consistent with our vision of collaborative and multidisciplinary research, using a variety of traditional and novel model systems, to explore new areas of neuroscience," said CBN Director Elliott Albers, Ph.D.

The year-long efforts devoted to the research project development will culminate in a major symposium to be held in Atlanta in December, 2009.

2008 Summer Highlights

Budding Scientists Drawn to CBN Summer Programs

Students and teachers from across Georgia were drawn to Atlanta this summer to take part in CBN summer education programs, that reach out to everyone from middle school and undergraduate students, to K-12 math and science teachers.

More than 30 future scientists participated in the Brain Camp for Kids: Neuroscience in Action! program, a weeklong hands-on neuroscience camp for middle school students.

“Every year it seems like the camp fills up faster, and we're getting more and more positive feedback from the parents, school, and teachers who work at the camp,” said Brain Camp for Kids Director Laura Carruth, Ph.D.

Other CBN summer education programs include:

- ◆ Institute On Neuroscience (ION) for high school seniors;
- ◆ Behavioral Research Advancements in Neuroscience (BRAIN) for undergraduate students;
- ◆ Teacher Professional Development Workshop for Georgia’s math and science teachers.



The Institute On Neuroscience (ION) program introduces high school students to research taking place in Atlanta’s neuroscience laboratories.

Photo courtesy Liz Weaver

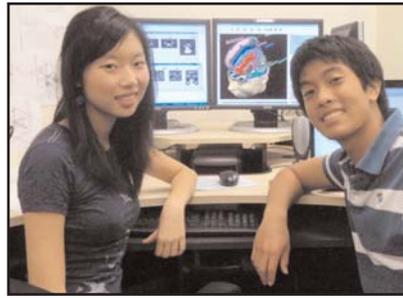
Brain Camp for Kids: Neuroscience in Action!



Sheep brain and cow eye dissection, along with sensory perception experiments are just a few of the fun, hands-on activities designed for middle school students who participate in Brain Camp for Kids.

Photos courtesy Kelly Powell, Ph.D.

ION (Institute On Neuroscience)



ION is an eight-week summer program that introduces high school students to neuroscience and gives them the opportunity to spend time in an actual research lab.

Photos courtesy Chris Goode, Ph.D., and Rob Poh

BRAIN (Behavioral Research Advancements in Neuroscience)



Undergraduate students participating in the BRAIN program have the opportunity to spend the summer working in the labs of notable neuroscientists in the Atlanta metro area.

Photos courtesy Rob Poh and Liz Weaver

Teacher Professional Development Workshop



The Teacher Workshop, that takes place at Zoo Atlanta, is an opportunity for science and math teachers from across the state to learn about teaching behavioral neuroscience in a unique setting.

Photos courtesy Laura Carruth, Ph.D., and Martha Barker Koontz

CBN Graduate Student Retreat Takes Place on Tybee Island

Graduate students and postdocs from Emory University, Georgia State University and Georgia Tech gathered on Tybee Island, Ga., Sept. 12-14, to attend the second CBN graduate student retreat. This year, the CBN Graduate Student Association decided to extend an invitation to all CBN postdocs in an effort to encourage greater collaborative discussions among CBN labs across institutions. Four postdocs, two from Georgia State and two from Emory, attended the retreat in addition to 23 graduate students.

"The CBN retreat was an amazing blitz of behavioral research shared amongst enthusiastic inter-institutional neuroscience students and postdocs," said Dennis Choi, a postdoc at Emory. "It was fun to socialize with other neuroscience researchers on the beach."

Another goal of the retreat was to recruit new graduate students to the CBN. This year, 50 percent of the attendees were first and second year

students -- a large increase from last year.

The CBN Graduate Student Association, consisting of Emory students Cary Leung, Teresa Madsen, and Kim Maguschak; and Georgia State students James Doherty and Luis Martinez, planned the entire retreat from researching housing options to planning activities and cooking meals for the group.

"I greatly enjoyed the trip and was able to establish friendships and foster collaboration," said James Doherty.

Activities during the retreat included discussions of CBN collaborations among labs and institutions, team-building exercises among groups of attendees, data blitz talks, and a key-note speech given by senior Emory graduate student Heather Ross.



CBN student Luis Martinez explains his research during a data blitz talk at the 2008 CBN Graduate Student Retreat.

Photo courtesy Cary Leung

"The CBN retreat was a great opportunity for me to meet students from other Atlanta universities and learn about their research," said Sara Freeman, a second-year graduate student at Emory. "The student organizers did a great job of putting together a relaxing, educational weekend with fellow behavioral neuroscience students."

Story contributed by: Cary Leung, Emory University

2008 NSF Site Visit

Continued from page 1

based research...The CBN has been a catalyst in establishing the Atlanta area as a premier site for behavioral neuroscience research not only nationally, but internationally."

The report stated that the Center's "greatest positive force" has been its Venture Grant program.

"This seed money program helps initiate new directions in collaborative research across labs and across institutions...The CBN also provides a model for how institutions with very different histories and missions can work together to create a vibrant community of collaborating investigators. This remarkable

accomplishment maximizes research productivity and provides the ideal environment for preparing the next generation of scientists to meet the challenges of practicing interdisciplinary sciences in a diverse society."

The report also applauded the Center's education efforts noting "the CBN has added visibility to the graduate programs of the participating institutions...The CBN also has an excellent record of training postdocs and placing them in academic positions, as well as in the private sector."

In the area of knowledge transfer, the NSF praised the Center's effective partnerships with Zoo Atlanta, the Atlanta Chapter of the Society for Neuroscience, the Fernbank Museum of Natural History and Georgia Bio.

The team wrapped up its report by stating, "the CBN is poised to continue to thrive past the period of NSF direct funding."

To read the complete 2008 Site Visit Report, log on to: <http://www.cbn-atl.org/about/reports.shtml> and click on 2008 Site Visit Report.