



brain+cognitive sciences

Fall 2005

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MESSAGE FROM THE DEPARTMENT HEAD

Mriganka Sur

The Fall 2005 semester opened with great cause to celebrate: BCS welcomed a new class of graduate students, enrollment in our undergraduate major showed a steady increase, John Gabrieli and Emery Brown joined our faculty, which now numbers 37, and we moved into our new quarters in the Brain and Cognitive Sciences Complex, thus not only uniting the neuroscience and cognitive science parts of BCS after a long separation but also putting all of us under one roof along with the McGovern and Picower Institutes.

It is a happy coincidence that 2005 also marks the 40th anniversary of the granting of the first PhDs by the department, an occasion that we will celebrate with a symposium on December 2 and will specially recognize at the dedication ceremonies of our building.

As we enter the next phase of the department's growth, we acknowledge the generosity that has made this growth possible and look back on the extraordinary history behind BCS. The Picower and McGovern gifts not only anchored the research institutes that bear their names, but have also provided resources that enabled a significant expansion of the BCS faculty. Generous support from the Singleton family has significantly improved our ability to support our graduate students. Research support from the Simons Foundation and the Marcus Fund has enabled us to establish new collaborative programs on the study of neuropsychological disorders across the Brain and Cognitive Sciences Complex and with other Boston area universities and hospitals.

These gifts and grants are a tribute to the strength of BCS and to the integrative vision that has driven the department since its founding. The foundations of what BCS is today were laid by Hans Lukas Teuber in 1960, when he was recruited to MIT to head what was then a Psychology section within the Department of Economics. Teuber was a pioneer in the study of the psychological effects of penetrating brain wounds in humans. He brought



View of the BCS Complex and Picower Institute from Vassar St.



View of the McGovern Institute from Albany St.

with him from New York his longtime assistant Louise Pfeiffer as well as two of his then recent PhDs, Joe Altman and Steve Chorover. Joined at the outset by Peter Schiller and Charlie Gross, and soon by Walle Nauta and others, the small handful of researchers were assigned modest laboratory and office space in the C wing of Building 20 (which stood at the site of the Stata Center).

Teuber's vision of a unified science of brain and mind was embodied in the three themes he defined for a new Department of Psychology: the study of brain and behavior or physiological psychology, experimental psychology, and social/developmental psychology,

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SIMONS GRANT TO FUND AUTISM RESEARCH

With the help of a \$7.5 million grant from the New York-based Simons Foundation founded by James and Marilyn Simons, MIT brain researchers are undertaking an ambitious multi-faceted approach to understanding the genetic, molecular and behavioral aspects of autism.

Autism, which affects as many as 1.5 million people, is considered the fastest growing developmental disability in America. Typically appearing during the first three years of life, autism is characterized by impairment in social interaction and communication abilities and by repetitive behaviors. Services for autistic adults cost \$90 billion a year. Early diagnosis and intervention can cut the cost of lifelong care by two-thirds.

"MIT is entering a new era of neuroscience and cognitive science," said MIT President Susan Hockfield. "The timing has never been better for applying our new ideas and technologies to understanding brain disorders."

Under the grant, research projects will be led by Professors Mriganka Sur, Mark Bear, John Gabrieli, Ann Graybiel, Pawan Sinha, and Susumu Tonegawa. Collaborators include researchers at the Yale Child Study Center, University of Sydney, Boston University, Children's Hospital Boston and Massachusetts General Hospital.

The grant also will fund a new Boston-area seminar series on autism and developmental disorders hosted at MIT.



Massachusetts
Institute of
Technology

If you would like to be put on the newsletter mailing list, or have information you would like to have published, please contact:

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FALL 2005 CALENDAR OF EVENTS

- Mondays** Brain Lunch
- Tuesdays** Cog Lunch
- Wednesdays** Brains & Machines Lecture Series
- Alternate Thursdays** Plastic Lunch
- Fridays** BCS Colloquia followed by Departmental Tea
- Alternate Fridays** BCS Vision Seminar Series

SPECIAL EVENTS

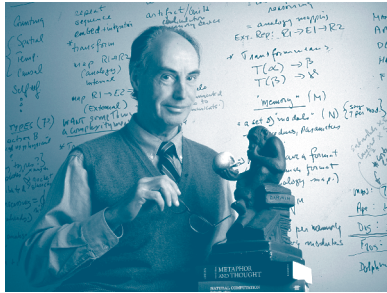
Friday, December 2, BCS 40th Anniversary Symposium, "Looking Back, Looking Forward: Shaping Neuroscience and Cognitive Science"

Friday, December 9, Hans-Lukas Teuber Memorial Lecture
Speaker: Frans de Waal, PhD, Emory University Living Links Center, Yerkes Regional Primate Research Center, "Our Inner Ape and Its Social Cognition."



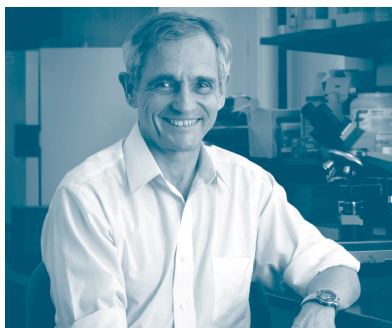
OUR FIRST PHD'S

In 1965, the MIT Department of Psychology awarded doctoral degrees to its first four graduates. BCS News recently asked the members of this first class to reflect on their time with the Department as well as where their careers led them after MIT.



WHITMAN RICHARDS

In the 1960's, with the advent of accessible computer technology, the development of information theory, and the single electrode, there was renewed excitement about prospects for modeling and understanding mind and brain. Informal discussions with Vannevar Bush convinced me to change careers and to restart from scratch, so I could join this new wave. After meeting Teuber, I knew MIT was a near-perfect fit. Teuber's charisma and broad vision for a new psychology was a powerful draw, as well as his own research interests as reflected in the Perception chapter he wrote for Field's Handbook of Physiology. With MIT's prestige and resources, plus the flexibility of the new program, there was a unique opportunity for a non-traditional grounding in a discipline otherwise mired in tradition. Individuals of special interest to me at the outset were Teuber and his young "family" of colleagues – especially Wayne Wickelgren and Dave Green, as well as the many neighboring luminaries in RLE and EECS. I never looked back!



DONALD PFAFF

I took a risk, giving up acceptances at Harvard and elsewhere, to come

to MIT because (1) I was impressed with Professor Teuber's plans for uniting the study of CNS mechanisms with behavior; (2) his new department was flexible enough that I could cross-register at Harvard Med for CNS and endocrine physiology courses; and (3) the professors would let me help shape my own academic program.

The department was brilliant, with Teuber, Altman, Ron Melzack, John Swets, etc., though we rattled around Building 20 for a year before moving to a new building. I joined Joe Altman's lab, impressed by his histochemical techniques that combined high spatial resolution with great chemical specificity.

Coming to MIT was my best professional decision because I was allowed to supplement the Department's training with the Harvard Med courses plus courses in the Electrical Engineering department (Michael Dertouzos, finite state automata theory, referred to in my latest book, from Harvard), and the Biology department (e.g., Pat Wall and Jerry Lettvin). Joe Altman's standards of scientific craftsmanship and novelty are with me still.

I feel lucky when it comes to my career path. I went to Rockefeller expecting to stay for a two-year NSF postdoc. However, because my results at MIT (discovering hormone receptors in the brain) brought some attention, I was promoted rapidly at the Rockefeller. I was also elected to the American Academy of Arts and Sciences (1992), and to the National Academy of Sciences (1994). From my current outside view: BCS still looks terrific. For work related to my interests, Earl Miller is famous and Nancy Kanwisher is carrying a high profile. I admire the BCS program and would choose it again in a trice.

These days the Pfaff lab at Rockefeller is using new molecular techniques to analyze: 1) how the mammalian brain manages specific natural behaviors such as sex, fear, and aggression; and 2) hormonal and genetic influences on generalized brain arousal. While some of this work can be done in nerve cell lines, it is also necessary to study nerve cells in their normal synaptic context to see how, in the governance of behavior, the brain's special connectivity interacts with the types of molecular mechanisms seen in other tissues.



GERALD WASSERMAN

The new department at MIT was attractive because Luke Teuber was going to be its first Head and he had the force of gravity. It turned out to be a very exciting place to be because everything was being done de novo and Luke was brimful of ideas about the right way to build a community of scholars, a phrase he used as he pursued his ultimate goals. I particularly treasure the memories of the regular Friday evening post-colloquium gatherings that he and Marianne hosted in their Arlington home. Everything was open for discussion and everything was vigorously discussed. In due course, Luke would often start a schauspiel which nominally presented intriguing aspects of the behavior of the brain-injured patients he had examined but actually gave him an opportunity to display his remarkable ability as a performer. The latter included an adequate supply of impish grins and grand eyebrow levitations. This was heady stuff for a provincial kid from Flatbush. Above all, Luke treasured wit and the free play of the intellect. And his spirit infected the whole department. Of course, younger people may look at a serious photo of my research setup then and, focusing on the facial expression and the tie being worn, find it hard to believe that there was any free play in those days. But Luke had the gift of seeing through surface appearances. The department he founded has inherited that penetrating characteristic, which has contributed to its eminence. Those of us who were privileged to train at MIT particularly benefited from Luke's way of treating students as friends and colleagues and I have passed this tradition on to my own students.

I left MIT for a postdoctoral position at the NIH with Mike Fuortes. Subsequently, I joined the faculty at the University of Wisconsin-Madison, and later was attracted to Purdue University where I am currently a Professor of Psychobiology. Most

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of my research has addressed Jerry Lettvin's question (what the eye really says to the brain) by examining the temporal properties of visual signals in the eye of the horseshoe crab. Recently, I took up the complementary question by examining the role of the neuromodulators released into this eye by efferents from the crab's brain. My group found that they can either accelerate (Substance P) or retard (Octopamine) the timing of photoreceptor potentials. The implications of these characteristics for selective attention and change blindness make their prevalence in other visual systems a current concern.



JOSEPH MENDELSON

During my senior year at McGill University my mentor, Prof. Dalbir Bindra, suggested that I pursue graduate studies at MIT. He had heard from his friend, Prof. Davis Howes, who was on the faculty of MIT, that a psychology department was in formation. When I visited MIT during one of Prof. Teuber's visits from NYU, it became clear to me that this was an unusual and unique opportunity. Prof. Teuber decided to accept four students into a non-existent graduate program in psychology. The four, Don, Jerry, Whitman, and myself, were to be at the mercy of 17 faculty, but we were actually treated more like colleagues than like students, and given offices and permitted to cultivate our independent research interests. Rather than being forced to choose to work on a faculty member's research project, Jerry and I were allowed to go off in pursuit of our own personal research interests, which did not match those of any of the faculty. We were generously supported by the faculty and given maximum freedom in our research. In addition, my approach to psychological problems, developed under Professors Hebb and Bindra at McGill, was a perfect match for that of Prof. Teuber, who also served as a magnet, attracting all

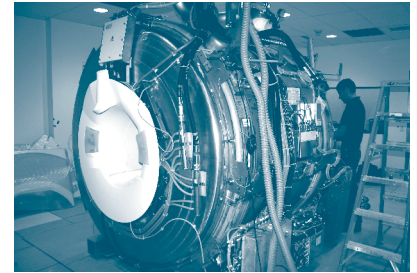
the great minds in biopsychology to visit and give seminars and colloquia.

In 1965, I left MIT for the University of Michigan to study as a postdoc with Steve Glickman and Jim Olds (arranged by Prof. Helen Mahut at MIT). This was followed by four years at Rutgers University and 26 years at the University of Kansas, Lawrence. I retired from the university in 1997 and, since then, have been living in Jerusalem, surrounded by my seven children and dozen (at last count) grandchildren. Because of the lack of the types of schools I wanted for my children in Kansas, I had already moved my family to Jerusalem in 1978 and commuted for the next 20 years. In the summer of 1969, I even started the first research program in biopsychology at the Weizman Institute of Science, which is still going today. In 1970, I turned down an offer from an Israeli University.

My retirement from Kansas brought a career change and my current title is Kosher Food Inspector. As such I conduct kosher inspections of kosher-certified food-production factories, most of which are in Morocco, Tunisia, and Bulgaria, but I have also done inspections in half-a-dozen other countries, including a two-month stint in China where I inspected about 30 of the 600 facilities which are kosher certified. Most of the time, however, I am in Jerusalem, living in an apartment which overlooks the whole of the central city and, on a clear day, I can see from my window the mountains of Moab rising on the far side of the Dead Sea.



BCS Headquarters in E25 all packed up and ready to move



Magnetic resonance imaging system being installed in the new imaging center



A typical wet lab space in the new building

NEW BEGINNINGS

Elizabeth Robbin Baraff (BCS Grad Student) and Keith Allen Bonawitz (CSAIL Grad Student) were married on October 15th, 2005 in Boston, MA.

Postdoctoral Associate Chris Baker was married on September 17 to Julianne Rollenhagen. They were married in Cataumet on Cape Cod and were relieved Hurricane Ophelia decided not to crash the party.

Postdoctoral Fellow Koenrad Kording married Loana Marinescu on July 9th.

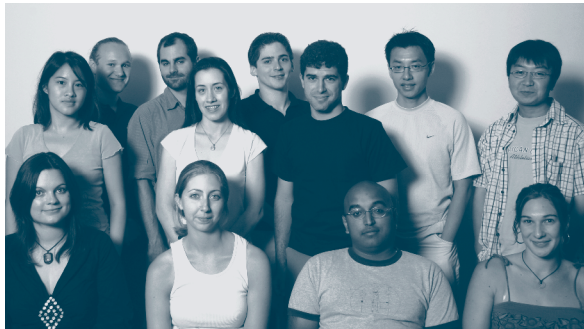
Grad student Tevye Krynski and wife, Dagmar Spichale, had a baby, Jonah, on May 5, 2005. Tevye is starting the fifth year of his PhD, working with Josh Tenenbaum.

BCS grad student Sally Kwok and Kayi Lee, an MIT grad student in course 6, became engaged on the morning of 4th September 2005 at the Grand Canyon. They have not decided on the wedding date.

Administrative Assistant Ray Reisner and Meg Renfrew became engaged on Oct. 1 and are planning a wedding for next fall.



BCS WELCOMES NEW GRADUATE STUDENTS



First row (seated): Retsina Meyer, Michelle Machon, Vikash Mansinghka, Talia Konkle. Second row: Livia King, Veronica Weiner, Dmitriy Aronov. Third row: Ed Vul, Michael Frank, Scott Gorlin, Chia-Wei Lin, Nuo Li

Dmitriy Aronov spent most of his life in New York City, where he graduated from Columbia University with a degree in applied math. He came to MIT because of his interest in systems neuroscience and hopes to join Michale Fee's lab to study songbirds. In his non-lab time he likes to travel and play tennis and the guitar.

Michael Frank also grew up in NYC but went to college at Stanford, where he studied Symbolic Systems (a cognitive science-type program) and Comparative Literature. After college, he taught three year olds the plural of "mouse" for about a year at Stanford and then move to NYU where he poked babies to study their vision. Now he is interested in how babies and children learn to talk, as well as how adults learn new languages. He will be working primarily with Ted Gibson and Josh Tenenbaum. In leisure time, he heads outdoors to go rock climbing and mountaineering, or reads novels, and plays the guitar.

Scott Gorlin remembers his hometown with a quote from Mark Twain, who wrote, "The coldest winter of my life was the summer I spent in San Francisco." Since moving to Boston to escape the cold and extremely cheerful Californians, he has realized that grey matter really is a useful thing and probably should be studied. Between labs he can usually be found reading obscure books of quotations, butchering guitar riffs, mispronouncing Chinese, or trying to sell his own Jesus grilled-cheese sandwiches on Ebay.

Livia (Li-Wei) King was born in Taiwan, grew up in Albuquerque, New Mexico and studied Biochemical Sciences at Harvard University as an undergraduate. She is interested in the cognitive neuroscience of learning and memory and plans to pursue an academic career. Her hobbies include singing, partner dancing, and reading.

Talia Konkle has lived in numerous places for roughly equal amounts of time, but says that "home" means either Berkeley or Denver. At UC Berkeley, she studied cognitive science and applied math, and is interested in sensory modalities and perception, time, spatial reasoning, philosophy, and cognitive neuroscience. Coffee is her primary beverage, and she is most productive in the morning and early afternoon because of it. She loves swing dancing and, in the past, played water polo and swam the butterfly.

Nuo Li, called Noah by his friends, is from St. Louis, where he attended Washington University to study Biomedical Engineering. Originally from China, he came to the US with his parents when he was 16. His main

interest in the department is systems neuroscience and computation, particularly the visual system. His long-term goal is to become a primate neurophysiologist, but his more immediate plan is to learn to cope with the cold winter in Boston. Normally, he likes to occupy his spare time by playing video games, listening to music, and reading manga. He also enjoys fishing.

Chia-Wei Lin is from Taipei, Taiwan and graduated from National Yang-Ming University with a BS in Life Science in 2000. After finishing almost 2 years of military service in the Chinese Marine Corp. as a medical second lieutenant, he worked as a research assistant in the U.S. for the next 3 years before applying to BCS. He enjoys exercise, especially jogging, swimming and table tennis, as well as watching movies. He spent 2 enjoyable years in Oregon learning how to breed high quality miniature African violets. He plans to focus on molecular and cellular mechanisms responsible for our plastic brains: deciphering the complicated neural network using system methodology and computational modeling.

Michelle Machon is originally from Rhode Island, but considers MIT her home away from home as she has been here for five years. She received her B.S. in BCS from MIT in 2004, and has been working in the Miller lab since 2001. When not in the lab, you can usually find her dancing (ballet, jazz, modern, hip hop, etc). She performs at MIT and in other local venues and hopes to someday combine her two loves and investigate the neural correlates of dancing!

Vikash Mansinghka was born in California, raised in San Francisco and Hong Kong, and spent the last few years studying computation and mathematics at MIT. He intends to work on the computational modeling of cognition in the hopes of eventually making himself obsolete. He kills time in many ways, including banging on a piano, cooking badly, and playing in the woods.

Retsina Meyer received her undergraduate degrees from the University of Arizona (in math, biochemistry, and psychology) while working in the Neural Systems, Memory, and Aging group with Drs. Bruce McNaughton and Carol Barnes. She then spent a year in Trondheim, Norway working at the Centre for the Biology of Memory with Drs. Edvard and May Britt Moser on a Fulbright Grant. She loves traveling, especially when it includes hiking, climbing, and camping on the glaciers of Scandinavia, or visiting art museums and castles, and eating her way through the cultural centers of world.

Ed Vul was exposed to abnormally high levels of radiation while growing up in the Ukraine during the Chernobyl incident. At MIT, he plans to use the resultant superpowers (and his degrees in Psychology and Philosophy from UC San Diego) for good: namely, cognitive neuroscience and the study of vision. He has previously worked on feedback and spacing in learning, dynamics of visual aftereffects, and a number of minor projects. Outside the lab he has been found to thoroughly enjoy racquetball, bicycles, guitars, and cooking.

Veronica Weiner was born in Parma, Italy and grew up in New Jersey. She was an undergraduate at MIT in BCS and Economics, then completed a computational Master's degree in Paris, France. Upon her return, she worked in the Schiller and Graybiel labs at MIT studying vision and sequential behavior, respectively. Her interests are systems and computational neuroscience, and her hobbies include many types of sports, visual and performing arts, and traveling.



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Message from Department Head

with emphasis on language acquisition. The Department of Psychology was created in 1964, and our first four PhD degrees – to Donald Pfaff, Joseph Mendelson, Whitman Richards, and Gerald Wasserman – were awarded in 1965.

The department's evolution can be charted through three phases. The first phase started with Teuber and continued under Richard Held's leadership through the mid-80's, during which the department became the Department of Psychology and Brain Science to reflect its growing attention to neuroscience. In the second phase, which started in 1986 under the leadership of Emilio Bizzi, the Department of Brain and Cognitive Sciences was formed through the merger of the department with the neuroscience program of the Whitaker College of Health Sciences and Technology. The department's research themes were extended to include neurobiology, systems neuroscience, computation and cognitive science. In 1993, the department became the newest member of MIT's School of Science.

The third and current phase commenced in 1997, when I became head, and is marked by creation of new research centers as a means of focusing MIT's neuroscience research effort, consolidation of the department's

interdisciplinary strengths, and expansion of key research areas including molecular neuroscience and brain imaging. The Center for Learning and Memory was started in 1994 under Susumu Tonegawa's leadership, and was subsequently re-named the Picower Institute for Learning and Memory. The McGovern Institute for Brain Research was started in 2000. At full strength, these centers will increase the BCS faculty roster to 45.

The growth of the BCS graduate program has gone hand-in-hand with the growth in faculty size. The department has 265 graduate alumni, many of whom have contributed significantly to our present understanding of the brain and mind. Our current graduate roster stands at 80 students. Similarly, the undergraduate BCS major has grown steadily and currently enrolls 140 sophomores, juniors and seniors.

The growth of BCS parallels the growth and maturation of the fields of brain and cognitive sciences. We look forward to our new environment as opening the way to even greater research collaborations (and social interaction), to educating students in the exploding field of neuroscience and cognitive science, and to training the next generation of leaders in our field.

[I thank Mary Parlee for her contributions to documenting the department's history].

RECENT AWARDS AND HONORS

FACULTY

Ted Adelson received the 2004 Longuet-Higgins Award "For outstanding contributions to computer vision that have withstood the test of time." This is a new award, given by the organizing committee of CVPR (The IEEE Computer Vision and Pattern Recognition Conference).

Emilio Bizzi was elected to the Institute of Medicine of the National Academies, effective October 1, 2005. Members are elected by the incumbent membership on the basis of professional achievement and of demonstrated interest, concern and involvement with problems and critical issues that affect the health of the public.

Ann Graybiel received (along with Trevor Robbins and Wolfram Schultz) the IPSEN Neuronal Plasticity Prize "for outstanding work...in the domain of Motivation and Associative Learning" in Lille, France on May 18. She also was awarded an honorary D.Sc. from Tufts University at their May 22 commencement.

Nancy Kanwisher was elected to the National Academy of Science.

Earl Miller was Elected Fellow of the American Association for the Advancement of Science (AAAS), as well as Reviewing Editor of both the Journal of Neuroscience and the Journal of Cognitive Neuroscience. Chris Moore was just awarded the

MITSUI Career Development Chair. Josh Tenenbaum was selected to receive the 2005 New Investigator Award from the Society for Mathematical Psychology.

The team of Profs. James DiCarlo, Christopher Moore and Dr. Sonal Jhaveri has been selected to receive the School of Science Prize for Excellence in Undergraduate Teaching (for teaching 9.02).

STAFF

Postdoctoral Fellow Konrad Kording was awarded the Heisenberg Fellowship from the German Science Foundation.

Financial and Operations Officer Sheila McCabe and Postdoctoral Associate Patrick Shafto were both given School of Science "Spot" Awards for their leadership in facilitating the move to the new building.

GRADUATE STUDENTS

Monica Linden was awarded a Dean's Educational and Student Advising award last spring from the School of Science for her work as a TA for Introduction to Neuroscience.

UNDERGRADUATE STUDENTS

Jun Liu '07 was awarded the Ragnar and Margaret Naess Award for special growth and achievement in solo performance by Emerson Scholar pianists.

The Walle Nauta Award for Outstanding Research was presented to Nao Gamo '05, Kimberly Kempadoo '05, and Shijun "Cindy" Xi '05.

The Hans Lukas Teuber Award for Outstanding Academics went to Melanie Cornejo '05, Anna Holt '05, Jonathan Karr '05, Gargi Khare '05, Farhan Merali '05, Sidharth Puram '05, and Lara Rogers '05.

Honorable Mention for Outstanding Academic Record was presented to Brigid Dwyer '06 and Ryu Yoshida '06.

Honorable Mention for Outstanding Research was accorded Christian Camargo '07 and Walter Lin '06. Graduating Seniors Melanie Cornejo, Gargi Divya Khare, Farhan Iqbal Merali, Sidharth V. Puram, Lara Anne Rogers were all elected to Phi Beta Kappa.

Boit Manuscript Prize – essay (1st prize) was given to Anna Wexler '07.

Boit Manuscript Prize – poetry (2nd prize) was given to Nedezhda Belova '05.

Dewitt Wallace Prize for Scientific Writing for the Public went to Uta Maeda '07.



NEWS FROM THE LABS

Edward Adelson's lab is looking at the gain control mechanisms that biological and machine vision systems can use for dealing with high dynamic range in images, such as when you have a mixture of bright illumination and shadow in the same image. They have an algorithm that models retinal and cortical gain control; it should have useful applications in digital video and photography. They are also studying the perception of material properties such as brightness and gloss, and have found that certain textural statistics are diagnostic of these properties for complex surfaces. This allows them to build a computational system that can estimate the surface properties, and which gives similar estimates to those given by human observers.

Jim DiCarlo's lab continues to focus on understanding the neuronal representations that support the brain's remarkable ability to recognize objects under a very wide range of viewing conditions. This year, they discovered that specific, subtle alterations in the visual world that are invisible to the human subjects can alter a property of their visual recognition that was previously assumed to be rock solid – the ability to recognize objects in different positions. They also discovered that IT neuronal responses to objects in clutter (more than one object) can be remarkably well-understood from their responses to single objects. This result greatly clarifies the existing literature and adds important constraints to computational models of visual recognition. Both projects appear in *Nature Neuroscience*.

Ann Graybiel's lab conducts research on the "habit system" of the brain. New work has demonstrated through recording with many electrodes simultaneously what happens to brain activity in the basal ganglia as animals learn to perform a task that requires decision making, and what happens when they forget and then relearn. The brain cells reorganize their activity patterns, new cells are recruited, then drop out, then come back. They believe these changes are fundamental fingerprints of learning in the brain's habit system. They have also discovered and cloned a gene that is critical for responses to addictive drugs such as amphetamines. This work is of direct relevance to the field of drug addiction and to seeking pharmaceutical reagents for this purpose.

Neville Hogan's lab, which emphasizes how humans and robots control physical interaction, has developed an

Anklebot, a robotic device designed to help stroke patients regain movement in paralyzed ankles. MIT and the Baltimore Veterans Administration Medical Center will establish a Center of Excellence on Task-Oriented Exercise and Robotics in Neurological Diseases to further such work on lower extremity movement.

A June 2005 article in *Nature* focused on research done by Postdoctoral Associate Gabriel Kreiman, Prof. Itzhak Fried of UCLA, and Prof. Christof Koch of Caltech. The work could help shed light on how the brain stores memories, an expert said. When scientists sampled brain cell activity in people who were scrutinizing dozens of pictures, they found some cells that reacted to a particular famous person, landmark, animal or object. The findings appear in a part of the brain that transforms what people perceive into what they'll eventually remember, said Dr. Fried, a senior investigator on the project. The study suggests that the brain appears to use relatively few cells to record something it sees. That's in contrast to the idea that it uses a huge network of brain cells instead. Of particular significance in their results is that a single brain cell can respond so consistently to completely different pictures of a given person. The part of the brain the researchers studied draws heavily on memory as well as signals from what the eye sees, so the result may illustrate how memory is represented in the brain and how it relates to visual signals, he said.

In Mary Potter's lab, researchers discovered that the so-called attentional blink is caused by having to select one of several stimuli, not by the demands of consolidating memory for the selected item (as had been generally assumed). They also found that people have good memory for the gist of a pictured scene but relatively poor memory for spatial and visual information about the scene, and that unusual pictures that people tend to email to each other are slightly harder to encode initially, but are remembered longer, than comparable but more ordinary pictures.

Mriganka Sur's lab studies the development, function and disorders of the cerebral cortex. In the past year, the lab described a fundamental principle by which the visual cortex represents multiple features of visual images. They examined a mathematical principle called "dimension reduction," whereby several properties of neurons come to be systematically mapped on the two dimensions of the

cortical sheet. The findings demonstrate that multiple maps of response features in visual cortex are intertwined in highly specific relationships, such that at locations where one feature changes rapidly, other features change slowly, thereby maximizing coverage and continuity of representations.

Using techniques that make it possible to measure the responses and interactions of large groups of neurons, Matthew Wilson's laboratory is studying how memories of personal experience are formed and used. This effort has led to the study of sleep and the dreaming life of rats, yielding surprising insights into the relationship between dreams and memory. Wilson's laboratory, in collaboration with the Tonegawa laboratory, demonstrated for the first time the role of circuits within the hippocampal area CA3 in mice in the formation of memories of novel events. These findings have implications for the formation of human memories. Recent experiments have also found that certain brain rhythms may serve to coordinate the functions of widely separated brain areas during memory-guided planning and decision-making. This finding may lead to new methods of the diagnosis and treatment of a variety of neurological disorders, such as schizophrenia and autism, which may involve the disruption of communication between brain structures such as the hippocampus and prefrontal cortices.

Richard Wurtman's lab has found that the amount of brain membrane – including synaptic membrane – per brain cell can be increased by as much as 25% in 4 weeks if animals receive, orally, the three essential membrane constituents that the brain must obtain from the circulation. In animals, such treatments can promote memory, e.g. restoring memory functions in aged rats. Clinical trials to determine whether they also enhance human cognitive function will start in Europe in the next few months.



Ted Gibson and the Palm Beach Boat Club competing in the Head of the Charles Regatta. They finished 3rd in the Masters 8 class.



BCS BOSTON HARBOR CRUISE AND COLLOQUIUM

Left: Henry Hall with his gear



Above: (left to right) Carol Walkins, Meg Himmel and Meredith Albrecht



Left: (left to right) Nuo Li, Hans Op de Beeck, Chris Hemond, Alexandre Papanastassiou

Below: Sheila McCabe and Peter Schiller discuss the finer points of sailing.



Left: (left to right) Laura Schulz, Rebecca Saxe, Jim DiCarlo and Josh Tenenbaum

Below left: James Schummers, Mriganka Sur and Beau Cronin

Below: John Gabrieli, Nina Strohminger, Ming Meng and Susan Whitfield-Gabrieli





ALUMNI NEWS

Terry Allard (PhD '84) is a research program manager at NASA headquarters in Washington, D.C. (though he's not doing bench research). His primary research interests include human space exploration, human-computer interaction, bioastronautics, and human-systems integration. You can check out the work being done in his group at <http://exploration.nasa.gov/>

David Berson (SB '80), a professor in the Department of Neuroscience at Brown University, is studying the structure and function of the mammalian retina, especially retinal ganglion cells. Recently, his lab discovered a novel ganglion cell in rat retina that is intrinsically photosensitive. These ganglion cells exhibit robust light responses even when all influences from classical photoreceptors (rods and cones) are blocked, either by applying pharmacological agents or by dissociating the ganglion cell from the retina. These studies are of potential value in understanding and designing appropriate therapies for jet lag, the negative consequences of shift work, and seasonal affective disorder.

After receiving her bachelor's in BCS in 1992, Jennifer Glos left for Seattle where she developed computer interfaces for Microsoft; designed websites and software for children's education in Kyoto, Japan; and built technological children's toys for storytelling at the MIT Media Lab. Her Master's thesis work (she was awarded an SM in 1997 in the Media Lab) was published in the book "Human Cognition and Social Agent Technology," and she is a contributing author to the book "From Barbie to Mortal Kombat: Gender and Computer Games." After finishing her Master's degree, she directed editorial and design for Third Age Media, a dot-com company based in San Francisco, and then decided to pursue a lifelong dream of filmmaking by attending UCLA Film School. Her thesis film, a 30 minute documentary, "War on their Minds: Voices of American Kids," aired nationally on Showtime Networks in November, 2004. She's currently working with Academy Award-winning director Terry Sanders as the Associate Producer on "Fighting for Life," a feature length documentary on military medicine.

After graduating, Bill Jarrold (SB '89) moved to Austin Texas to work on Cyc, an ambitious and controversial AI project which aims to encode elementary common sense in a rule-based system. He stayed with the endeavor for 10 years, first at MCC and then at Cycorp. He also enrolled in graduate school and completed his PhD in Educational Psychology at UT Austin in August 2004. His course of study involved counseling and clinical neuropsychology, plus cross disciplinary work in computer sciences. He is currently a postdoctoral research fellow in the department of computer sciences at UT Austin where he is working on knowledge based systems. His interests include knowledge representation and reasoning, evaluation of knowledge based systems, affective computing, and autistic spectrum disorders. He's discovered swing dancing and strongly recommends Austin as a great place to live.

Cathy Lachapelle, a 1992 graduate of BCS with a BS, is currently working at the Museum of Science as a research associate on the Engineering is Elementary project. The EiE curriculum aims to introduce basic concepts in engineering and technology to children in grades 1-5 through stories, activities incorporating science content, and design challenges.

Lawrence D. Rosen, MD, an Assistant Professor in Pediatrics at NY Medical College, was one of only a few undergrad members of the BCS Course IX graduating in 1988. These days he is doing work in neurodevelopmental pediatrics. He directs one of the country's few Integrative Pediatric centers at the Maria Fareri Children's Hospital, Valhalla, NY. Integrative Pediatrics is a primary care approach utilizing the best evidence-based therapies in both conventional and CAM (complementary and alternative) medicine. Many families use CAM therapies for children with neurodevelopmental issues, especially in the autistic community, and they turn to Dr. Rosen's group for guidance in this regard. They are very interested as well in new imaging/assessment technologies, including brain SPECT and fMRI in the autistic spectrum disorder population. The seed of this functional neuropsychiatry work was planted during his UROP days working with Dr. Dermot O'Rourke and early serotonin reuptake blocker therapy in seasonal affective disorder. For those interested: <http://www.integrativepeds.medem.com>.

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