

brain and cognitive sciences

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Spring 2002

Volume IV; Issue 2

MRIGANKA SUR



*Mriganka
snowshoeing
at Jackson
Hole,
Wyoming*

[The following article is in lieu of the usual message from the Department Head]

It turns out that our department Head has never had a formal neuroscience course. His studies in high school in India included biology and math, and he then went on to study electrical engineering at the Indian Institute of Technology in Kanpur, an engineering school that didn't even offer biology. (Last month, the Institute accorded him its Distinguished Alumnus Award). He wanted to study the brain, but doubtful about being admitted to a neuroscience program – of which there were very few in the U.S. in the 1970s – he applied and was accepted to a Ph.D. program in engineering at Vanderbilt. Once there, however, he looked for people who studied the brain, and found Jon Kaas in psychology. Though he remained officially in electrical engineering, he did his doctoral research on the processing of touch in the cerebral cortex. His postdoctoral studies were at SUNY Stony Brook, where he studied visual development and function in the brain. In 1983, he left for Yale Medical

School where he had an appointment as an Assistant Professor and set up his own lab. He came to MIT as an Associate Professor in 1986 and rose quickly through the ranks.

Mriganka became Associate Head of the department in 1994, and was appointed Head in 1997. It has been a great experience, though he wasn't sure it was something he wanted to do. What attracted him and has continued to motivate him was the idea of building the department at a time of unprecedented growth and opportunity. He is especially proud of his role in making new faculty appointments, in helping young faculty members develop their careers, and in fostering the growth of CLM and MIBR through the department. Mriganka is also proud that the department is so unique and that it maintains this uniqueness in terms of the breadth of interests and opportunities it encompasses. He realizes that there could be deeper interactions

(continued on p. 3)

MOLLY POTTER



When Molly Potter left Swarthmore, she had a new degree in psychology and a new husband, having gotten married the day after graduation. Today, he is a neurobiologist at Harvard Medical School, and she is our Academic Officer and Professor of Psychology, whose lab examines the initial, rapid processes involved in perceiving, comprehending, and remembering meaningful materials such as words, sentences, or pictures.

(continued on p. 2)

SPRING 2002 CALENDAR OF EVENTS

Mondays – Brain Lunch

Tuesdays – Cog Lunch

Wednesdays – Brains & Machines Lecture Series (<http://www.ai.mit.edu/events/talks/brainsMachines/brainsMachines.shtml>)

Alternate Thursdays – Plastic Lunch (<http://monster.mit.edu/nedivi-lab/plasticlunch.html>)

Fridays – Departmental Colloquia Followed by tea

SPECIAL EVENTS:

Friday, March 1, 4:00 PM Hans Lukas Teuber Lecture featuring Carla Shatz, Ph.D., Chair, Dept. of Neurobiology, Harvard Medical School, “Brain Waves and Immune Genes in Brain Wiring”

Friday, March 15, 4:00 PM Margaret Roche Donlon Bidwell Memorial Lecture featuring Clifford B. Saper, M.D., Ph.D., James Jackson Putnam Prof. of Neurology & Neuroscience, Harvard Medical School, and Chair, Dept. of Neurology, Beth Israel Deaconess Medical Center, “Hypothalamic Control of Sleep and Circadian Rhythms”

(Potter - continued from p. 1)

Molly did her graduate studies and several years of a postdoc at Harvard before her work on perception led to an appointment as a Lecturer in environmental psychology in MIT's Urban Studies and subsequently to a faculty appointment in the Psychology Department (precursor to BCS). She has been here ever since, participating in its evolution.

Molly has always been interested in higher-level perception and cognition and the way information is represented in short term memory. Several significant points mark her career. One was her idea of studying memory for a continuous sequence of pictured scenes, a way of simulating the flood of information brought us by the normal succession of eye fixations. Next, she carried out studies comparing the understanding of words and pictures and their common representations as concepts. Later she used RSVP (Rapid Serial Visual Presentation) as a tool for studying sentence comprehension. Along the way she studied representation of a second language in bilinguals, and—with her students Nancy Kanwisher and Daphne Bavelier—repetition blindness. She developed the idea of conceptual short-term memory, a fleeting form of high level understanding that makes it possible to process complex scenes in a single glimpse and to understand sentences presented serially at 12 words a second. When her student Marvin Chun began studying attention, specifically the attentional blink, Molly became interested in related questions about competition for attention.

Molly's experience as a member of a dual-career couple before such couples became common contributed to her interest in increasing the participation of women at MIT. She and others had some success in the 70's in getting MIT to increase the number of women undergraduates and to address concerns of women faculty. More recently, she represented the department on the Committee on Women Faculty in the School of Science; their report to the Dean in 1996 pointed out that even women with tenure did not always get the same treatment as men.

Molly was elected to a two year term as Chair of the Faculty in the 1980's. She subsequently headed an MIT committee

on undergraduate housing, which led to the somewhat infamous "Potter Report" recommending that all freshmen be housed on campus. More than a decade later, this recommendation is finally being implemented.

Relaxation comes in the form of weekends at Woods Hole, where she has a house, and reading 18th and 19th century novels, particularly those by Jane Austen and Henry James. She occasionally has the opportunity to enjoy her 4 children and 9 grandchildren, who are scattered across the U.S.

As she looks at how things have changed over the years at MIT and in BCS, Molly looks forward to improvements in all arenas stemming from the new configuration of the department with the two major centers, CLM and MIBR. She is also very proud of the growth of interest in the department, despite the occasional inconvenience of over-enrollment in our undergraduate offerings.

MORGAN SHENG



Morgan's son Marco not helping his Dad's career push.

Morgan Sheng, who came to BCS from Harvard/MGH in April 2001, was born in Taiwan, but moved to London UK at age 7. Though he spoke no English at the time, after 3 months he claims he sounded like a Cockney. He was educated at Haberdashers, a 300 year old all boys school, where he had to wear shorts – regardless of the weather – till he was 11. The boys were also forbidden to put their hands in their pockets until that age and, once attaining it, were required to follow rules about how you could put them in your pockets. He was also required to participate in a lot of sports, particularly rugby, where he learned a lesson that stood him in good stead ever since: if you're scared, you get hurt worse. This was the origin of a "try anything" attitude. The only drawback to the school was the lack of girls.

Morgan went on to Oxford University where he was the equivalent of pre-med, having always been interested in science, biology in particular. Science in England is not regarded with as much respect as it is in the U.S., which may also have influenced his choice. He went on to medical training at London University, followed by four years of residency in internal medicine. The first two of those years were the most miserable of his life to date, characterized by slave labor and enormous stress. However, residency taught him to be superbly organized in order to survive. By compari-

son, he claims science is "a doddle" (a breeze).

Though offered the opportunity to attend Cambridge, he felt he couldn't tolerate another ancient university and that the U.S. was the place to go. He had determined that he was more interested in academic than in clinical medicine, and he would need to do basic research for that. The Ph.D. would also give him greater credibility in a field where M.D.s are viewed somewhat skeptically. Immunology inspired him, as he knew little science and no neuroscience at that point. He applied to the places he'd "heard of" and ended up attending Harvard, having been rejected by MIT. The Ph.D. was followed by 4 years of postdoctoral work at UCSF, before returning to Harvard for 7 years as a faculty member and maintaining his own neurobiology lab at MGH. Morgan was persuaded to come to MIT, attracted to the department and CLM because of its excellent scientific environment for his interests and a general wanderlust. Until then he hadn't been anywhere for longer than 4 years. Morgan's primary research interest is molecular mechanisms by which synapses change in response to environment.

(continued on p. 3)

(Sheng - continued from p. 2)

Morgan is a great family man and his free time is spent with his 5 year old son, Marco, and new daughter Mila (born Feb. 22). He takes his son for karate lessons; they go swimming and play catch; and he supervises his piano practice. His own fitness activities are in gyms: aerobics, weights, and some swimming. Morgan's architect wife helped plan some of his lab and her firm is currently working on the Stata Center with Frank Gehry.

His professional goal is to be respected and to train people who become stars in the field. Personally, he wants to help his kids grow up and not hate him, and to make friends with the people with whom he works. The greatest aspect of academia is having so many smart people go through his lab and ending up with dozens of great people around the world with whom to communicate. Ultimately, Morgan could see himself moving on to a position of greater administrative responsibility, as long as he could continue to run a competitive lab. He enjoys the vicarious pleasure of observing others doing well and facilitating their progress. He doesn't have the need to be the person with the good idea.

**BCS ALUMNI
PLEASE KEEP IN TOUCH**

Denise Heintze
Academic Administrator
heintze@ai.mit.edu

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

Judith Rauchwarger
Human Resources
Administrator
jrauch@mit.edu

A VERY SPECIAL AWARD

Sylvester Szczepanowski, Project Machinist, was selected to receive the 2001 Fall Infinite Mile Award. Several members of the department nominated him in recognition of his outstanding achievement and dedication to the department.

(Sur - continued from p. 1)

across the research areas of the department, but feels it is crucial to keep the various ways of studying the brain and mind intellectually "under one roof". Interactions cannot be forced – they happen when fields and individuals are ready - but can often be helped by the right conditions. It is his intention to work even harder to integrate the various components under specific themes of inquiry, and to continue to find ways to promote social and intellectual interaction. The department is a work in progress and it is exciting to be in a field and in a situation that are so dynamic, and to be in a position to help shape them in a place like MIT. He was extremely pleased that MIT decided to build a Brain and Cognitive Sciences Center for the 3 entities – BCS, CLM and MIBR.

The Sur lab studies development and function of the cerebral cortex. This combination is a little unusual for a single lab to study, but plasticity provides the linkage; i.e., they examine how the brain changes through development and in adulthood. The lab uses systems approaches such as single cell recording and brain imaging techniques, together with molecular and behavioral approaches. The big question is: how do genes, the environment, and learning mould the development and function of brain networks. New ideas and techniques such as, most recently, gene mapping and two-photon imaging, are constantly shaping the work being done. Mriganka likes research projects that make unusual links and are at the margin of established fields, even though they tend to be risky. His lab is large and very active, with many graduate students and postdoctoral researchers. It is a constant challenge to balance his time between research, teaching, outside commitments and administrative duties.

Outside of his work, Mriganka is concerned about the fact that we live in a very fragmented world, with profound inequalities and injustices. Mriganka feels that his contribution to making the world a better place would ultimately emanate from his unique perspective: being an engineer now studying the brain; being a laboratory scientist now also deeply involved in institution building; being a person of color born in the third world now living in a first world country. Mriganka also likes to engage in dangerous ventures, like paragliding. He learned to ski when he turned 40, took his first parachute jump at 45, tried rafting soon after, and took his first water ski turn last year. Despite this, he claims to lack athletic prowess or skill, but makes up for that lack with enthusiasm.

Perhaps the biggest surprise about Mriganka is that he started learning Hindustani classical music at age 10 to control his stutter. He eventually abandoned it for lack of time, but about 12 years ago he went back to it when he found a teacher in Burlington. It was fun to rediscover that part of his culture, but when his teacher died, he was too busy to continue.

With his overcommitted life, he is grateful to his understanding family. He is married to Abha, a historian of science and a peace activist. Their son Samir, who will be attending Yale in the fall, is one of 40 national finalists – and the only one from Massachusetts – in the Intel Science competition.

Mriganka enjoys teaching and is thankful for the recognition he has received for his teaching and research. Last year he won the School of Science graduate teaching award. He also feels privileged to have very talented people in his lab and that their work continues to break new ground. This adds to the tension over how much administrative work he should continue to do.

FACULTY HONORS

Ann Graybiel was elected Class Secretary of Class II (Biological Sciences) of the National Academy of Science

Neville Hogan won the Pitts Trophy at the New England Aerobatics Championships in both 2000 and 2001. (He flies aerobatics for fun.)

Nancy Kanwisher was named a MacVicar Faculty Fellow for 2002

Steve Pinker was designated Humanist Laureate by the International Academy of Humanism.

Mriganka Sur was given the Distinguished Alumnus Award by the Indian Institute of Technology, Kanpur.

Richard Wurtman was named the Smithies Lecturer at Balliol College, University of Oxford, this spring.

**A Review of "The Seven Sins of Memory" October 2001
Teuber Memorial Lecture by
Daniel Schacter**

By David Badre, Graduate Student

Humans are equipped with an elaborate set of cognitive and neural systems for encoding and storing knowledge about our past experiences and for retrieving these memories. Although we are often immanently capable of calling to mind relevant knowledge as the context demands, we are typically particularly aware of our memory abilities when memory fails us. In his Teuber Memorial lecture, Dr. Schacter approached the question of memory failure from the perspective of modern cognitive neuroscientific theories of memory.

Dr Schacter began with an empirically motivated, but descriptive, taxonomy of memory failures or "sins" as he terms them. These sins can be divided into two basic categories. Sins of omission involve the inability to retrieve some bit of stored knowledge, either because of forgetting (transience), lack of attention (absent-mindedness), or retrieval interference (blocking). The second category, sins of commission, entails the corruption of an existing memory trace through a failure to identify the source of knowledge (misattribution), leading events during an interview (suggestibility), or the influence of prior knowledge (bias). The final sin, persistence, is included, albeit loosely, in the category of sins of commission and refers to the repeated, involuntary retrieval of an unwanted memory.

Within this framework, Prof. Schacter provided several novel results related to three of the sins, blocking via "tip-of-the-tongue" state, misattribution, and bias. One theme, touched on for both the misattribution and bias studies, was the degree to which the medial temporal lobe (MTL) memory system affects memory corruption. The false recognition paradigm, pioneered by Deese in 1959, has reliably demonstrated that people

will confidently and quite falsely recognize words they have not seen in a recent study period because the new words are semantically related to words that were actually studied. Dr. Schacter provided evidence that, in a number of different experimental contexts, amnesic patients, suffering from MTL insult, demonstrate a decline in these false memories along with veridical memories, suggesting a necessary role for the MTL even in false recognition.

In contrast, amnesics do show an effect of bias on memory similar to that of controls. It has been demonstrated in a variety of contexts that biases, such as cognitive dissonance, can cause us to revise our memories to make them consistent with our current view of ourselves. Interestingly, Dr. Schacter showed that amnesic patients, though having no explicit memory for the events that may have caused them dissonance, will nevertheless revise their beliefs to make them consonant with their past behavior.

These are surprising results. They suggest that the distinctions Dr. Schacter is drawing between different types of memory failure may indeed be more than simply a useful descriptive framework but are actually due to the operations of distinct mnemonic processes. The science of mind often benefits from a good descriptive framework, leading to novel hypotheses and predictions. Those who seek to understand the organization of human memory will certainly benefit from Dr. Schacter's conceptualization of memory as revealed through memory's frailties and dysfunctions.



The brain lunch group

Educational Innovations

Stellar (stellar.mit.edu) is a web-based environment that facilitates learning and teaching among students, staff, TAs, and faculty by supporting a wide range of multimedia content and communication mechanisms including text, graphics, streaming media and various forms of synchronous and asynchronous discussion, and is integrated tightly with MIT's solid information infrastructure and core administrative systems that support education. It is funded by the Provost in an effort to reduce the time the teaching staff needs in maintaining a website.

In the fall, 9 BCS courses used the stellar system and this spring, 19 of the 23 sites are being used for course work.

The course material being loaded on the stellar sites range from acrobat files to streaming video. Lectures can be put on-line in MP3 format so students can go back and review the material. The goal is to make the delivery of all the course material as simple as possible while giving the students access to all the material when they need it. Document services is scanning all the papers that are not available electronically. They can then be uploaded and made available for the students.

For the first time the qualifying exams have their own Stellar sites where all the readings are being posted to aide second year grad students in preparing for their exam. These sites will then be carried forward so they can be updated more easily.

STUDENT ACTIVITIES & HONORS

GRADUATE STUDENTS:

David Badre and **Gail O’Kane** were named 2001 Scholars by the Glenn Foundation and were given AFAR Scholarships for Research in the Biology of Aging.

Daniel J. Casasanto received a fellowship to attend the Vivian Smith Advanced Studies Institute of the International Neuropsychological Society to participate in a Language & Brain symposium this summer in Xylocastro, Greece.

Rutledge Ellis-Behnke was invited to give a talk and present a poster on “A method for non-viral genetic transfection in the CNS using Bci-2 in vivo,” at the December 2001 U.S.-Japan Conference on Drug Delivery Systems.

BCS UNDERGRADUATES:

Rebecca Clinton and **Katrina Lust** (both juniors) were named SHASS Burchard Scholars for 2002. Twenty-seven awards were given to students who demonstrate unusual abilities and academic excellence in the areas embraced by the School of Humanities, Arts, and Social Sciences. The Scholars and a rotating group of faculty attend a series of dinners at which an MIT faculty member or Visiting Scholar presents a work in progress followed by discussion. The emphasis is interdisciplinary.

Senior **Sanjay Basu** was selected as a Rhodes Scholar for 2002 – one of 4 from the Northeast region. As a second semester freshman, he founded and edited the MIT Undergraduate Research Journal that publishes student authored material on science and ethics. He has also written and published research on the relationship between epidemiology and poverty, and on Alzheimer’s Disease. Last year, he founded an entirely student-based organization devoted to humanitarian aid for global problems, called United Trauma Relief (UTR). Operating from his dorm room, he mails out approximately 16,000 monthly doses of AIDS drugs to patients in Haiti and Tanzania. He also assists in relief for Afghan refugees, earthquake victims, Sudanese famine victims and sweatshop workers.

CONGRATULATIONS PH.D. RECIPIENTS:

An Cao, Systems Neuroscience, 9/01, currently working in Peter Schiller’s lab in BCS

Szabolcs Káli, Computational Neuroscience, 9/01, currently a postdoctoral fellow at the Institute of Experimental Medicine of the Hungarian Academy of Sciences in Budapest

Voichita Marinescu, Cellular and Molecular Neuroscience, 9/01, currently a Master of Science student in the HST Program at MIT

Shayan Mukherjee, Computational Neuroscience, 9/01, currently a postdoctoral fellow in CBCL at MIT and the Whitehead Institute

Tessa Warren, Cognitive Science, 9/01, currently a postdoctoral fellow in the Psychology Department at UMASS Amherst

Hilary Barth, Cognitive Neuroscience, 2/02, currently a postdoctoral fellow in the Department of Psychology at Harvard

David Freedman, Systems Neuroscience, 2/02, currently a postdoctoral fellow in Earl Miller’s lab CLM/BCS

Camillo Padoa-Schioppa, Cognitive Neuroscience, 2/02, currently a postdoctoral fellow in Emilio Bizzi’s lab in BCS

Daniel Grodner, Cognitive Science, 6/02, will be a postdoctoral fellow at Brown University

The Brain and Cognitive Sciences Society (BCSS)

Course IX undergraduates have formed an organization that aims to improve the undergraduate experience in the program by acting as a resource for information about grad school, career opportunities and classes, providing fun activities and food, and encouraging interaction among students and the general BCS community. Current activities include a t-shirt/logo design contest and an undergraduate poster session. They also hope to prepare & circulate course bibles (a compilation of information, old exams and problem sets, possibly notes and handouts). The group may be contacted at: bcss-officers@mit.edu

NOTEWORTHY ACTIVITIES OF BCS LABS

From Anthony Wagner's Lab:

A 2001 article in the *Journal of Cognitive Neuroscience* examines the architecture of memory, particularly the processes that underlie rote rehearsal-working memory mechanisms that keep information in mind-impact long-term memory formation.

A 2002 review in *Trends in Cognitive Science* considers recent electrophysiological and fMRI data exploring how neural responses during stimulus processing relate to later episodic memory.

In 2001, *Current Biology* published the results of a study on how subsequent failures to remember--that is, forgetting of things past--can result from a decreased recruitment of encoding processes that build effective memories and an increased recruitment of alternative mechanisms that may impair effective learning.

From Tomaso Poggio's Lab:

PNAS (December 2001) published their study on the expression levels of 16,063 genes and expressed sequence tags that were used to evaluate the accuracy of a multiclass classifier based on a support vector machine algorithm. The results demonstrate the feasibility of accurate, multiclass molecular cancer classification and suggest a strategy for future clinical implementation of molecular cancer diagnostics.

Nature (Jan. 2002) describes the classification system developed by the researchers that is based on DNA microarray gene expression data derived from 99 patient samples. They demonstrated that medulloblastomas are molecularly distinct from other brain tumours including primitive neuroectodermal tumours (PNETs), atypical teratoid/rhabdoid tumours (AT/RTs) and malignant gliomas. They show further that the clinical outcome of children with medulloblastomas is highly predictable on the basis of the gene expression profiles of their tumours at diagnosis.

From Elly Nedivi's Lab:

Graduate student Wei Chung Lee and Elly Nedivi have a paper in press in the *Journal of Neuroscience* suggesting that the prolonged plasticity seen in the visual cortex of dark-reared animals may result from failure to down-regulate genes that could promote structural remodeling and synaptic maturation.

From Richard Wurtman's Lab:

The October 2001 issue of *J. Clin. Endocrinol. Metab.* shows that frequent awakenings from sleep experienced by people over 50 is due to low levels of melatonin at night. A low replacement dose of this hormone (as opposed to the high levels sold in health food stores) can restore levels to what they are in young adults and promote normal sleep patterns.

BCS Faculty and Student Population

28 Faculty Members (including CLM and MIBR Faculty)

7 Faculty Members with joint appointments in BCS

56 Graduate Students

123 Undergraduate Majors, including 10 who are double majors

Dept. of Brain & Cognitive Sciences
Massachusetts Institute of Technology
E25-406
Cambridge MA 02139

NON PROFIT ORG.
U.S. POSTAGE
PAID
Cambridge, MA
Permit No. 54016