NOTE FROM THE LAB DIRECTOR

In this year’s newsletter we highlight the postdoctoral fellows and graduate students in our laboratory whose work is vital to our research mission. Our goals, of course, remain the same: to bring the fruits of our research directly to the betterment of our patients; be it more accurate and earlier diagnoses, or more effective treatments and therapies. Impaired vision and imbalance remain troubling and incapacitating symptoms to so many patients that even small improvements in how we take care of them will improve the quality of lives of many. Indeed your support for our research has been crucial since it allows me to keep these people working in our laboratory so they can carry out our important research projects. And training these researchers and clinician scientists is vital as they will be the future leaders in our field.

In the same vein, teaching remains a passion for me both nationally and internationally. By training many individual doctors to better diagnose and care for their patients, I can indirectly participate in and improve the care of many more patients than I could ever see in my own clinic. I strive not only to train people directly here at Hopkins but also physicians around the world. This past year I have had the opportunity to teach abroad in India, Italy, Thailand, Turkey and France, and closer to home at the Cleveland Clinic and in Seattle and Toronto. As many of you know, most practicing neurologists are uncomfortable trying to manage patients with hard to diagnose dizziness and vertigo, or with complex disturbances of vision and balance. Indeed at many national and international meetings the courses in which I participate are some of the best attended as practicing neurologists want to learn how to better diagnose and treat patients with the complex problems with which I deal. Thus, I am able to “spread the word” to a wide audience and in turn, we can reach the lives of many patients.

OUR RESEARCHERS

JING TIAN, PhD is a bioengineer who has been working with us for over seven years now. She has been part of our strabismus (crossed-eyes) team and also more recently has been studying how the brain learns to keep its motor responses accurate and especially how the cerebellum contributes to this capability. She has developed an experimental model of ‘context’ motor learning. This is the mechanism by which the brain can invoke different patterns of learned motor behavior, to the same triggering stimulus, suited to a particular environmental circumstances. A common example occurs in people who switch between contact lenses and eye glasses since each requires a different movement of the eyes in order to see clearly when we move our heads. Dr. Tian’s research also focuses on how the cerebellum contributes to this type of learning. She is a key player on our TMS (transcranial magnetic stimulation) team that is trying to use stimulation of the brain through the skull to coax the brain to compensate faster when faced with a condition that impairs motor behavior and interferes with clear vision. Dr. Tian is the Betty and Paul Cinquegrana research scholar in our laboratory.

XIAOYAN SHAN, MD, PhD is an ophthalmologist who is spearheading our strabismus (crossed-eyes) research project. This is an ongoing endeavor to determine how we might aid the recovery of clear vision after one develops an eye muscle paralysis (common after head trauma, small strokes, and as part of the surgical treatment of strabismus of all types). Dr. Shan is trying to develop new ways of combining patching of one eye followed by wearing prisms to encourage the brains of patients with strabismus to fix up their own double vision rather than having to undergo
eye surgery, which may not always be successful. Our experimental strabismus work has also led to important new information about using MRI scans to diagnose muscle palsies, especially to decide if it is acquired or congenital. This distinction helps us to better plan treatment. **Howard Ying, MD, PhD** in our Department of Ophthalmology is a key collaborator in this project.

**ICHIRO HAMAZAKI, MD, PhD** is an ophthalmologist from Japan who is a specialist on strabismus and is has joined our experimental strabismus project. His particular area of interest is on how tilting of the head (a common occurrence in patients with eye muscle palsies) improves vision and we are trying to find out why this works and how it might be used to understand why some patients improve after surgery and others don’t.

**ALEX TARNUTZER, MD** is a neurologist from Switzerland who has recently joined our laboratory. Alex is moving our research into a new and important direction related to vestibular perception. Patients with dizziness and vertigo frequently have difficulty describing exactly what they feel. Am I spinning? Is the world spinning? Am I tilted? Is the world tilted? How the symptoms produced from inner ear vestibular disorders are interpreted and brought to consciousness by the cerebral cortex is relatively unexplored. Here we use TMS (transcranial magnetic stimulation) to study the influence of the cerebral cortex on the relationship between the “motor aspects of vestibular control” and what patients feel when they are vertigo and imbalance. In normal subjects we stimulate the parts of the cerebral cortex that receive information from our labyrinths with TMS and test the subject’s ability to know which way is up using a test of subjective visual vertical (set a laser line to point upright). These experiments will give us important insights into how the brain processes information for determining the orientation and movement of the body in the environment, and how to better interpret and diagnose what patients are trying to tell us when they are dizzy.

**SEUNG-HAN LEE, MD, PhD** is a neurologist from Korea who is spending a few years with us. He has several projects. He is working with my colleague **David Newman-Toker, MD, PhD**, whose focus is on the early, accurate diagnosis of stroke in patients who come to the Emergency Department with the sudden onset of dizziness, vertigo and imbalance. Unfortunately such patients are frequently misdiagnosed and sent home when they should be admitted to the hospital for management of a stroke. Indeed, Dr. Newman-Toker has recently shown that a careful clinical examination is more reliable than brain imaging, since some strokes may be missed on the first MRI scan. Drs. Lee and Newman-Toker are developing diagnostic algorithms to help emergency room physicians properly diagnose and treat such patients. Their research will have an impact on thousands of patients and save lives.
MINNAN XU is a graduate student obtaining her Ph D degree with REZA SHADMEHR, PhD, Professor of Biomedical Engineering. Minnan is collaborating with us on an exciting new initiative using transcranial magnetic stimulation (TMS) of the brain, and the cerebellum in particular, to improve the way in which the brain learns and retains the ability to perform new (and old) movements more smoothly and accurately. TMS is a safe and painless way to artificially stimulate the brain, and indeed it has just been approved by the FDA for treatment of depression. We use an MRI scan of the subject to determine the exact location in the brain we will stimulate and then apply a very brief and weak magnetic current that causes brain cells to discharge as they might do naturally (See Figures above). Our long-term goal is to use this method to help patients better adapt or recover from the disabling disorders of vision, eye movements and balance that accompany neurological diseases such as ataxia, progressive supranuclear palsy (PSP), stroke and trauma. We have purchased the equipment to get started (thanks to the generosity of one of my patients), and have developed training paradigms in normal subjects that allow us to mimic, in the short term, a neurological problem and stimulate the brain to adapt. Just published in one of the best neuroscience journals are the results of our study of learning in cerebellar patients. Minnan was the lead author. We found that cerebellar patients are relatively impaired in fast but not slow adaptation, suggesting a fundamental feature of how the cerebellum contributes to motor learning as well as how training paradigms might be modified to help cerebellar patients. This work dovetails nicely with that of Sarah Ying, MD who has recently published the results of her work in cerebellar ataxia patients correlating changes in MRI scan with the patients symptoms.

AARON WONG and KARA BEATON are PhD graduate students working in our laboratory with Mark Shelhamer, PhD, of the Departments of Otolaryngology and Biomedical Engineering. Aaron is studying the mechanisms by which the brain can predict and adapt to inaccurate motor performance. Kara is investigating space motion sickness and how we adapt to the microgravity of space flight. Their work is part of a NASA project directed by Dr. Shelhamer.

DALE ROBERTS, MS, ADRIAN LASKER, MS, PHYLLIS BUTLER, BS, AND CORENA BRIDGES remain at the core of our success with their technical and scientific expertise. Together they have worked in our laboratory for more than 100 years!

David Zee, MD is a member of numerous organizations and has received recognition both nationally and internationally. He was a member of the advisory council of the National Eye Institute of the National Institutes of Health. He received the Ottorino Rossi prize (Pavia, Italy), the Hallpike-Nylén Medal of the Bárány Society (Uppsala, Sweden) for outstanding research. At Johns Hopkins he received the inaugural Frank Ford award and the Professor’s award for outstanding teaching. Dr. Zee was the first visiting professor for neurological education at the Mayo Clinic and gave the inaugural Swithin Meadows Lecture at the National Hospital, Queen Square, London. In 2003, he was given the inaugural Houston Merritt award for outstanding contributions to research in neurology by the American Academy of Neurology. In the summer of 2004, an international scientific meeting was held in his honor in Siena, Italy and was attended by 170 colleagues world-wide. This past year he gave the Guy Williams lecture at the Cleveland Clinic. Since 1976, Dr. Zee has had an individual research grant continuously from the NIH, which included a special ten-year merit award. This grant had been recently renewed for another five years. He has published about 380 scientific papers. He is coauthor of The Neurology of Eye Movements, the authoritative textbook on eye movements, which appeared in its fourth edition in 2006.

ON THE WEB...You can learn more about our program at http://hopkinsneuro.org/vestibular/

COME VISIT US... We invite you to visit our laboratories for more in depth information about our current research. Please call Dr. David Zee at 410-955-3319 or email dze@jhu.edu. Our new secretary is Rebecca Scholz (see below) at the same number. Her email is rebecca.scholz@jhmi.edu

PLEASE SUPPORT OUR RESEARCH . . . For more information about supporting our work, please contact Martina Grunwald at 410-516-6890 or mgrunwal@jhmi.edu
VENNIE MATTHEWS (1951-2009)

Sadly, this year we lost Vennie, our secretary of 34 years. Vennie was so much more than a secretary. She was a mother, sister, mentor, advocate, partner and friend to all of us in so many different ways. She will be missed.

I would also like to introduce our new secretary Rebecca Scholz (Rebecca is on the far left in the middle row in the first picture in our newsletter). Rebecca has a bachelor’s degree in economics. She was in the Peace Corps, working in a remote village in Morocco, and learned French and Arabic. She then took time off to raise two children (who are now in college) and comes to us after working with the National Federation of the Blind. We welcome her.

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