

## I N V E S T I G A T O R      I N S I G H T

In this section, we highlight the human side of biomedical investigation, putting a few questions to a researcher at DMS-DHMC.

**Allan Gulledge, Ph.D.**  
Assistant Professor of Physiology

*Gulledge studies the cerebral cortex, the brain's outermost layer and the area most associated with cognition. He examines how chemical neurotransmitters, such as acetylcholine, influence the activity of cortical neurons. He joined the faculty in 2007.*

**What got you interested in science?**

From a very young age I was fascinated with both biology and psychology. But I didn't appreciate the potential for a career in scientific research until several years after I completed my undergraduate education. It was serendipitous that I discovered the opportunity to pursue neuroscience as a graduate student.

**How did you end up studying cortical activity?**

I went to Australia as a National Science Foundation International Research Fellow to study the role of dopamine in modulating the activity of cortical neurons. While I was there I became increasingly interested in acetylcholine as a cortical transmitter and began a long-term project that I continue today. Part of this project, examining the role of acetylcholine in different classes of inhibitory cortical neurons, was carried out in Japan at their National Institute for Physiological Sciences.



**What accomplishments have been most meaningful to you?**

The births of my three children are at the top of the list. My most meaningful career accomplishments include conducting my first successful experiment as a graduate student, publishing my first paper, turning in my doctoral thesis, and attaining outside funding for my research.

**What's your favorite nonwork activity?**

I enjoy spending time with my family and the occasional bike ride along the Connecticut River. I also enjoy skiing in the winter and kayaking on local rivers and lakes during the summer and fall.

**What are some of your favorite books and/or movies?**

They're few and far between lately, but some of my favorites are Jared Diamond's books on human history (*Guns, Germs, and Steel*, for instance) and Steven Pinker's excellent book on the biological basis of human nature, *The Blank Slate*. As for fiction, I love Ayn Rand's *Atlas Shrugged* and anything by Douglas Adams. The last movie I saw in a theater was *Ratatouille*.

**If you could travel anywhere you've never been, where would you go—and why?**

South America, because it was the last continent inhabited by humans, or Antarctica, because it's had only limited human exploration.

**If you invented a time machine, where would you go first?**

I'd zoom ahead to the future to find out the answers to scientific questions that today seem intractable—the big questions that haunt every scientist. In neuroscience, it's how neuronal activity in the brain leads to the perception of conscious experience. Other fields have their own big questions, on issues such as the origin of life and the physical nature of the universe. It would be fun to peek at the answers to these questions in a grade-school textbook of the future.

**What is a talent you wish you had?**

I wish I had even an iota of musical ability.

**What are the keys to success in science?**

I'm still working on that, but I think key ingredients are honesty, objectivity, and a curiosity about the world around you.

**Do you always have a working hypothesis in the lab?**

Most of the time. But I always reserve a little time for exploratory science. Ultimately it is the exploratory experiments that develop into the best hypothesis-driven projects down the road.



## Making an impact on the diagnosis of traumatic brain injury

What do battered women, athletes in contact sports such as football, and veterans of the Iraq and Afghanistan conflicts have in common? They are all at risk of suffering from acquired traumatic brain injury. Some such injuries are so severe they're immediately apparent, even to nonprofessionals. Other victims may have what's commonly called a concussion and is known to doctors as mild traumatic brain injury (mTBI)—a much more subtle and difficult problem to diagnose.

One of the confounding factors, especially in veterans, is that mTBI can be confused with post-traumatic stress disorder—or the two conditions may coexist in the same individual.

**Symptoms:** Sleep disturbances, fatigue, and irritability are symptoms common to both syndromes, while dizziness, blurred vision, impaired balance, and sensitivity to light and noise are characteristic of mTBI. Since the treatment for the two conditions is different, it is important to distinguish between them. Dartmouth is now helping the military set up a new way of doing so.

Elizabeth Pearson, M.S.W., of DMS's Department of Pediatrics has devoted most of her career to the study of mTBI in battered women. She was the first person to use a powerful software tool to assess the extent of their injuries. The tool, called ImPACT, was

**COGITO ERGONOMICS SUM:** Aiming to boost its hand-hygiene rate to 100%, DHMC has been putting alcohol gel and glove dispensers in more easy-to-reach locations and is now closing in on 90%. National studies have found rates as low as 50%.



developed by Mark Lovell, Ph.D., director of the University of Pittsburgh's Sports Medicine Concussion Program. For the past 10 years, ImPACT has been the most widely used concussion management software in the National Football and National Hockey Leagues.

**Test:** The computerized ImPACT test can be administered by a nonclinician with minimal training. It takes about 25 minutes and consists of memory tests, such as word recall exercises, and spatial orientation tests based on geometric shapes.

If Pearson was the first person to see the test's potential to help battered women, it was Lt. Col. Patrick Tangney, M.D., state surgeon of the Maine Army National Guard, who—on learning of Pearson's work—saw its potential to help veterans.

"The percentage of American troops who are surviving battle wounds has risen dramatically," says Tangney, as a result of ad-

vances in both battlefield armor and treatment capabilities. And mTBI is an increasing concern for U.S. troops, since the weapons they most often face in Iraq and Afghanistan are improvised explosive devices and rocket-propelled grenades—both of which are highly likely to cause concussive brain injuries.

What Tangney realized is that if a baseline brain-function test could be performed for all soldiers, diagnosing mTBI would then be much easier.

"The best standard for normal performance in a given individual would be his or her test results before injury," he explains. But "whereas one cannot predict what particular athlete is going to sustain a concussion or what woman is likely to be battered, one certainly knows when a given National Guard unit is going to be sent into harm's way." So the plan is to give the ImPACT test to soldiers before a unit is deployed and then test them again after their return.

DMS has signed on to assist with the initiative, and Pearson, who has experience working in the Maine mental health system, is serving as its director. She's helping the Maine Guard launch the screening program and advising mental-health providers in the state on how to identify and care for mTBI patients.

**Rate:** "This project will help maximize available resources," she says, "so that all of our service members have the highest rate of recovery."

ROGER P. SMITH, PH.D.

## PAGING DOCTOR DO-SI-DO

By day, Dr. Maia Rutman (pictured below) is the medical director of emergency services for the Children's Hospital at Dartmouth. By night, she's a fiddler in the contra dance band Heathen Creek. She and fellow musicians Mark Koyama (mandolin) and Pete Johannsen (guitar) have been "filling the night with music and generally knocking the socks off all and sundry" for seven years, according to the band's website.

Heathen Creek debuted around the time Rutman began her residency in Boston and has played throughout the northeast ever since. In April 2008, the band was invited to perform its fusion of Irish, French-Canadian, and old-time tunes—overlaid on modern rhythms—at the New England Folk Festival in Mansfield, Mass.

Rutman doesn't keep her medical and her musical lives totally separate: Heathen Creek's 2004 CD, *24 Hours*, includes a waltz called "Sea Fog," which she says she wrote after an especially exhausting overnight shift in the hospital. V.H.



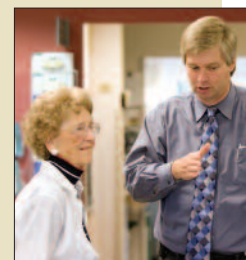
## WHITE-GLOVE TREATMENT

In 1937, when Justine Caldwell enrolled in the first class at the Mary Hitchcock School of Medical Technology, students didn't wear protective gloves and formulated a lot of their own reagents. The school, now called the MHMH Medical Technology Program, is thriving 71 years later—but a lot has changed besides its name.

Today's students take an intense six-month course in the pathology lab. They operate blood gas analyzers to assess oxygen and carbon dioxide levels in preemies. They learn about platelet counts. They do blood tests for patients on anticoagulant therapy and patients with hemophilia.

The program has been affiliated with the University of New Hampshire since 1954. Students complete three and a half years of coursework there, then do their clinical training at DHMC, emerging with a B.S. in medical laboratory science.

Caldwell—a spry 90-year-old—attended this year's graduation and after the ceremony got a tour of the facility (pictured above). Gloves were optional on the tour but are now required attire for anyone who works in the clinical labs. M.C.W.



CRAIG DEROUJRON

**A partnership between DMS and the Maine National Guard may someday help soldiers like this one in Ramadi.**