THEN & NOW

A reminder of the pace of change, and of timeless truths, from *The Journal of William Tully*—a diary kept during 1808-09 by a Dartmouth medical student.

On November 29, 1808, Tully wrote in his diary about a lecture by DMS founder Dr. Nathan Smith. Smith "mentioned the importance of anatomy and physiology," called "the benefits of chemistry . . . inexhaustible," and said "botany is likewise of immense importance," Tully wrote. And, he went on, Smith told his students such knowledge "is also essential to private gentlemen," not just those studying medicine, because "a man who does not understand [science] appears like an ass in everything."

4

Number of science courses required in 2008 to earn a bachelor of arts from Dartmouth College

A blue-light special—in the brain

Each year, about 20,000 Americans find out that they have a cancer that originated in their brain. For most of them, the outlook is grim.

Rapid: High-grade brain tumors—known as gliomas—progress rapidly and usually result in death within a year. Even less-malignant gliomas can cause death or disability, and they sometimes progress into high-grade tumors.

Treatment typically includes surgical removal of the tumor. The more of it the surgeon can remove, the longer the patient is likely to survive. Take out too little, and survival time goes down. But take too aggressive an approach, and the result can be a loss of normal tissue—and thus brain function.

It would help, says Dr. David Roberts, chief of neurosurgery at DHMC, if it were easier to tell where the tumor ends and normal brain tissue begins. "It's the kind of thing we've often had on our wish list," Roberts says. "Wouldn't it be nice if everything were color coded?" Thanks to research he is conducting with Dr. Keith Paulsen, a professor at Dartmouth's Thayer School of Engineering, surgeons may soon get their wish.

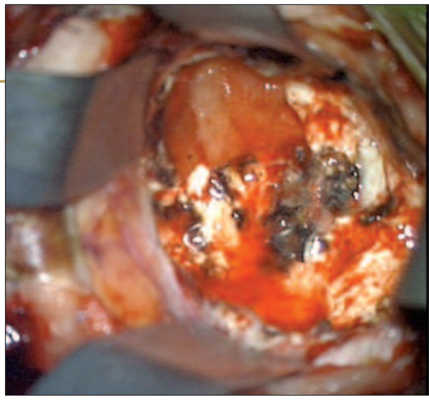
Team: Roberts and Paulsen have collaborated for years on developing cutting-edge technologies to improve surgical outcomes. "I work with Keith more closely than I do with most of my medical colleagues," says Roberts. "We're part of the same team." In 2007, they began their current project, a five-year clinical trial designed to improve the resection, or surgical removal, of gliomas by using fluorescence to highlight tumor tissue.

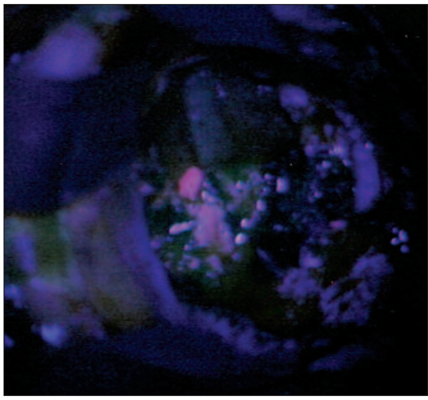
The trial takes advantage of a reaction that occurs between tumor cells and a chemical called 5-amino levulinic acid (5-ALA). The chemical causes tumor tissue to fluoresce under blue light, but it does not react with normal tissue.

Glowing: Three hours before their operation, patients enrolled in the study drink a glass of water containing 5-ALA. Then during surgery, Roberts can take advantage of the effect by flipping a switch on the operating microscope to change the light shining on the patient's brain from white to blue. The result is a pink, glowing tumor. "It looks like lava," says Roberts. When Paulsen first saw the effect in the operating room, he was "flabbergasted."

When Paulsen first saw the effect in the OR, he was "flabbergasted."

Six patients have undergone surgery using 5-ALA so far, and 18 more will be enrolled during the initial stage of the trial. During this phase, Roberts and Paulsen hope to gain a better understanding of how the fluorescence works and how best to take advantage of it. For one thing, Paulsen says, he'd like to develop a means of quantifying the brightness of the fluorescence, which would give surgeons even more information about whether certain tissues are part of the tumor. "I think it's only scratching the surface of what's possible," he says.





Above is the same brain tumor—first as seen through a regular operating microscope (top) and then as seen under a blue light that causes the tumor to fluoresce and turn pink (bottom).

Stage: Midway through the five-year study, a second phase will pit the procedure against tumor resections done without fluorescence. This randomized stage of the trial will address important questions—such as whether using fluorescence leads to more complete resections and longer survival times.

Roberts and Paulsen have a lot of work still ahead of them, but they're clearly impressed by the technology. "It's like looking through a telescope for the first time," says Roberts.

Amos Esty