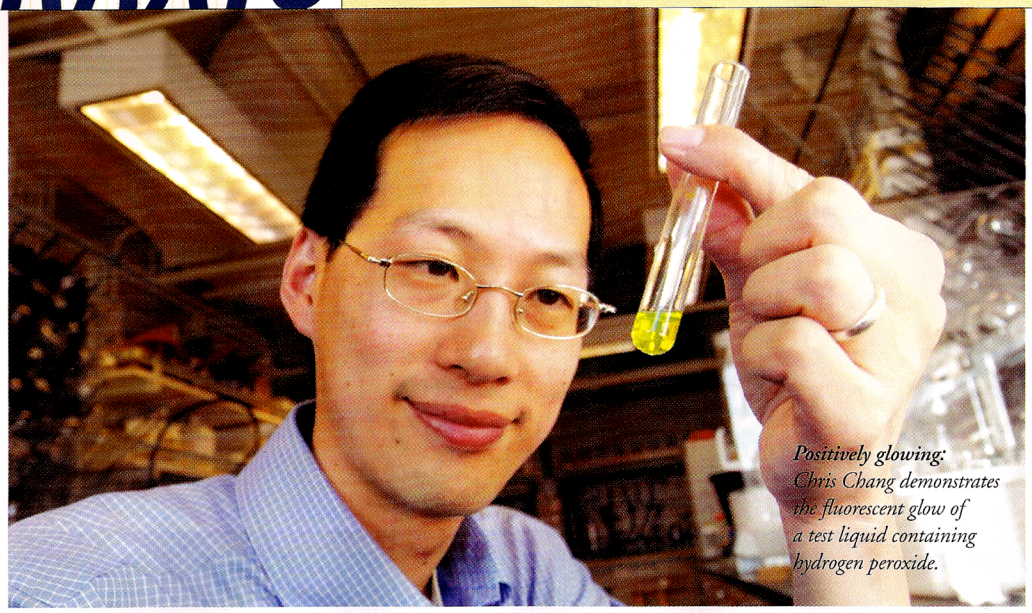


Positively glowing: Chris Chang demonstrates the fluorescent glow of a test liquid containing hydrogen peroxide.

From brain cells to bombs

On August 10, the day British authorities foiled a terrorist plot to blow up ten passenger jets, Berkeley chemist Christopher Chang was sitting in his office in Latimer Hall reading the news on the Internet. Scrolling down the page, he read that the terrorists intended to use a liquid explosive called triacetone triperoxide (TATP), a mixture of acetone and hydrogen peroxide. Lacking a screening process to detect liquid explosives, airport security officials were confiscating beverages, hair gels, toothpaste, lipstick, sunscreen, and hand lotions from passengers' carry-ons.

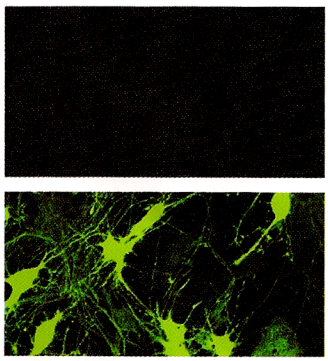
Chang sat up in his chair when he read about the explosive cocktail TATP. "I was like, oh, those are the same types of things we're detecting," says Chang, an assistant professor of chemistry. That same day he had been working in his lab on a method for detecting degenerative diseases such as Alzheimer's, Parkinson's, cancer, and heart disease in living cells, which naturally discharge excess hydrogen peroxide when stressed. Over the past two years, Chang developed a "peroxysensor"—one drop of the substance, mixed with water, could identify hydrogen peroxide in cells within seconds.

In his office, Chang examines a slide of brain cells magnified through a microscope—initially the slide is dark. Once the peroxysensor is dropped onto the slide, however, the cells take on a luminescent green glow. "The cells detect there is hydrogen peroxide, so they light up," he says, adjusting his thin spectacles on his nose. "You can imagine having the same sort of instantaneous glow when you test a little bit of a mixture that [contains explosive chemicals]."

Because the peroxysensor is nontoxic, with easy readouts, Chang says it would be very simple to employ in a security setting. "Envision having a test strip or dipstick—just like you would use for pH—and then you'd have a set of these sensors fixed on the strip," he says. "All you'd have to do is dip it in the liquid, or have a little dropper and drop it on top and look at it. So you'd have something that looked like a bar code, where, say, red, green, and blue would mean [certain chemicals were present] and yellow, purple, and orange would mean something else." But because the test involves taking samples of a suspicious liquid, Chang says the peroxysensor would be most useful as a "secondary test."

To date, the Transportation Security Administration hasn't made much progress with security screening devices to detect explosives carried by passengers at the airport. Most of the focus has been on detecting metal weapons; "puffer" machines that blow air on passengers aim to detect suspicious chemical particles, but so far they've been unreliable and cannot detect liquids. In late August, the Department of Homeland Security put out a call for "bottle screening devices" to fill this security hole.

The university applied for a patent for Chang's peroxysensor, but getting it into the hands of airport security officials could be a lengthy process. Spreading the word to companies that this technology is available seems to be the most logical approach, he says. But how to reach such companies? "To be honest, I don't know … This is brand-new," he says with a shrug. "Maybe they'll read about it in an article?" —*Carrie Ching*



This is your brain on stress: A slide of living rat brain cells is dark (top left) until it tests positive for hydrogen peroxide—a naturally occurring compound created by cells undergoing oxidative stress (bottom left).

Explosive materials often are rated by "flame speed"—how fast the explosion moves. A TNT explosion moves at 15,524 miles per hour, compared with a flame speed of 0.76 miles per hour for a gasoline explosion.

If you uncoil the DNA in one cell, it would be about six feet long. If you uncoiled all the DNA in

PFG SKORPINSKI (CHRIS CHANG IN LABORATORY); CHRIS CHANG (BRAIN CELL SLIDES); DISNEY ENTERPRISES, INC./PIXAR ANIMATION STUDIOS/PHOTOFEST NYC (THE INCREDIBLES); CARIN CAIF (GENE ILLUSTRATION)