The Office of Naval Research awarded DMS's Dr. Joseph Rosen and a colleague $600,000 to develop a computer to model surgeons' behavior in the OR, with the goal of preventing mishaps.

DMS expert leads the way in dosimetry

In the event of a nuclear accident, terrorist attack, or nuclear war, thousands or even millions of people could potentially be exposed to dangerous levels of radiation. Measuring radiation exposure in an accurate and timely manner would be critical to managing such a crisis. But that's easier said than done.

It's possible to measure radiation exposure using electron paramagnetic resonance (EPR) in a process that's known as dosimetry. However, current EPR instruments are large and not very mobile. Yet without the ability to easily measure radiation, emergency personnel have no way to determine who's received a low dose and doesn't need treatment and who's received a high dose and needs care—until symptoms show up, by which time it may be too late.

One system uses teeth to measure exposure, the other fingernails.

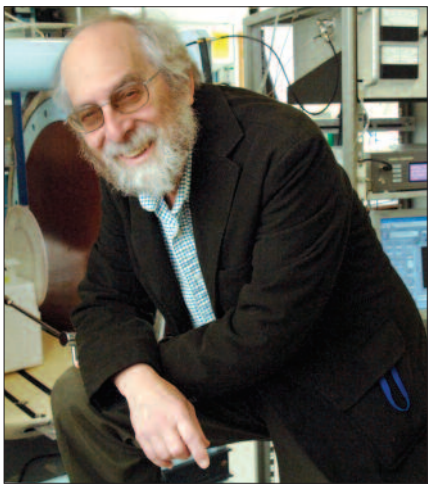
For some time, experts have dreamed of having an EPR instrument small enough to carry into the field to triage victims should a nuclear accident or attack take place. Dartmouth researcher Harold Swartz, M.D., Ph.D., an internationally known expert in EPR, is now well on the way to doing just that—developing a portable bio-dosimeter.

Radiation: Swartz described EPR-based bio-dosimetry in a 2007 article for the journal *Radiation Measurements*. He explained that EPR detects the presence of unpaired electrons, and "ionizing radiation generates large numbers of unpaired electron species. While most of these react immediately and disappear, in some materials . . . the unpaired electrons can persist for long periods." The enamel of teeth is one such material. In 1968, Swartz published a paper showing that EPR could determine radiation exposure by taking measurements of teeth. This was a discovery that, he admits with chagrin, has led some in the field to call him the "Father of Dosimetry." Recently, he has shown that fingernails and toenails also have the same property.

Exposure: The development of a portable dosimeter is understandably of great interest to the Department of Defense (DoD). The DoD's research arm—the Defense Advanced Research Projects Agency, or DARPA—supports research "where risk and payoff are both very high." DARPA has funded four contracts to develop dosimetry systems—two of them with Swartz. One is based on using teeth to measure exposure, the other on using fingernails and toenails.

These contracts are very demanding, according to Swartz. Typical research projects are funded over several years, but the timeline for these is only eight months, plus a month for testing. "It's an impossibly short amount of time," says Swartz.

But with 40 years of experience in the field, he's as likely to succeed as anyone. With the pressure on, Swartz's group has been making great strides on the project. By October, when the contracts are up, portable bio-dosimeters may be not just a dream but a reality. KRISTEN GARNER



JON GILBERT FOX

Swartz has been called the "Father of Dosimetry."

Back and forth

Magnetic resonance imaging (MRI) is an important tool for discovering the cause of lower back pain. "Unfortunately," DMS researchers wrote in *Spine*, "the relationship between findings on MRI and clinical course remains controversial." To test the consistency of MRI readings, they asked three radiologists and one surgeon to examine images of 50 patients suffering from a disc herniation. The doctors agreed closely on the severity of the herniations, but they showed greater variability when it came to measuring the length of disc fragmentations, confirming the fact that reading an MRI can be open to some interpretation.

Time-out for tumors

Lung cancer kills more Americans than any other type of cancer, making better treatment options imperative. According to findings from the lab of DMS's Michael Sporn, Ph.D., erlotinib—a drug often used to treat lung cancer—is less effective than two alternatives. Sporn tested erlotinib against two other types of drugs, a rexinoid and a triterpenoid, and reported in *Molecular Cancer Therapeutics* that the latter two "are highly effective for preventing lung carcinogenesis as measured by significant reductions in the number, size, and severity of lung tumors"—more effective than erlotinib. ■