

September/October 2006

PURDUE Alumnus

ERIC DIETZ:
Defending our homeland



Preparing for the Unimaginable

For the millions of Americans who witnessed the World Trade Center crumble in realtime, 9/11 may not only reside in their minds as infamous, but also as a day when the unimaginable happened. The diabolic success of the terrorist attacks in New York City, Washington, D.C., and Pennsylvania also ushered in a new century where the country would have to be forever cognizant about the safety issues at home. Now, for the men and women working in Purdue's Homeland Security Institute (PHSI), the job of imagining and managing the "unimaginable" is marking their discovery course.

It was shortly after 9/11 that Purdue faculty gathered to discuss the merits of having a homeland security center. Officially established in October 2003, the PHSI is part of the e-Enterprise Center at Discovery Park, Purdue's interdisciplinary hub for research and enterprise. It's the interdisciplinary nature that Alok Chaturvedi sees as critical to the institute's success.

"Homeland security is a big problem," says Chaturvedi, PHSI director. "You have to look at the problem holistically, and the only way to look at the problem holistically is through computer modeling. That's what brings all these disciplines together."



Alok Chaturvedi is the director of the Purdue Homeland Security Institute, which opened in 2003.

From terror plots to a possible pandemic flu to weather-related disasters, researchers in the Purdue Homeland Security Institute are exploring worst-case scenarios to help keep us safer.

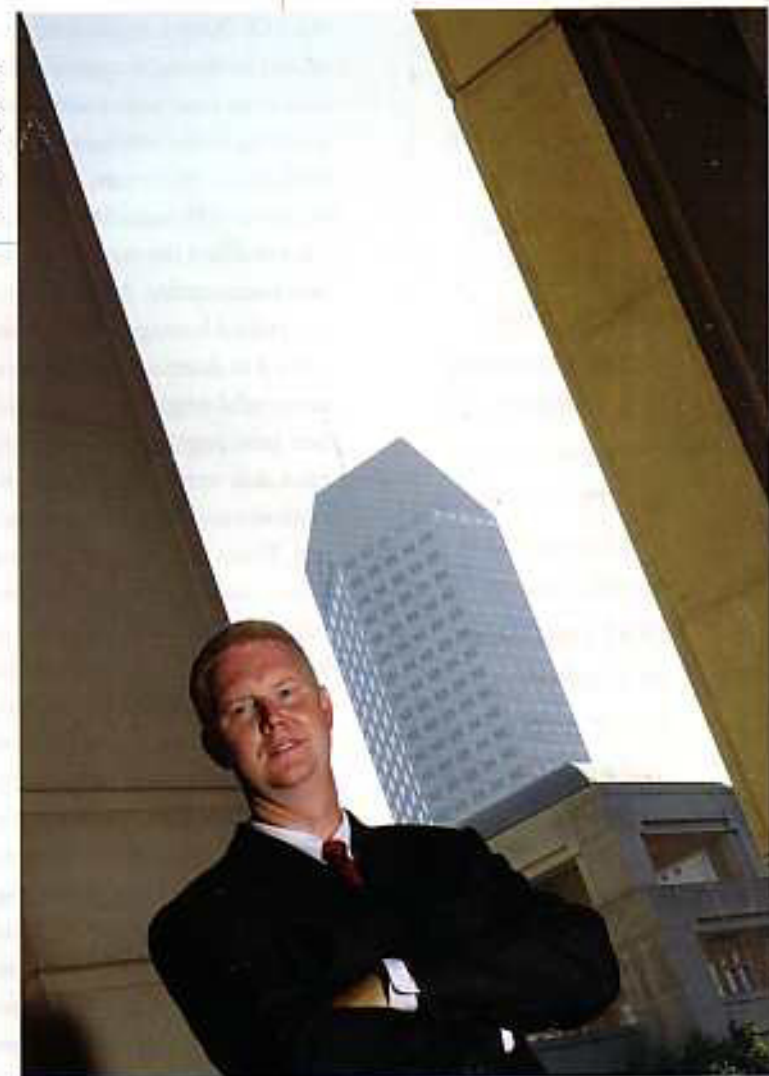
Eric Dietz became Indiana's first director of the Indiana Department of Homeland Security after serving as the managing director of PHSI.

SIX CENTERS OF DISCOVERY

Today PHSI is comprised of six research centers, including the Center for Computational Homeland Security; the Center for Sensing Science and Technology; the Center for Large-Scale Systems; the Center for Military Enforcement and Law Enforcement Technology, Tactics, and Training (T3); the National Biosecurity Resource Center; and the Purdue University Visualization and Analytics Center (PURVAC). And with researchers from disciplines as diverse as agriculture, liberal arts, engineering, technology, science, pharmacy and nursing, the discovery efforts are being built upon collaborations that extend beyond campus.

In March 2005, Indiana Gov. Mitch Daniels named Purdue chemical engineering alumnus Eric Dietz (PhD'94), then the managing director of PHSI, as the state's first director of the Indiana Department of Homeland Security. It was the country's first such comprehensive department at the state level, combining planning, training and exercise, emergency response, and fire and building safety.

"A very important part of our responsibility is to coordinate the plans and activities of all organizations that might be involved in the response to a disaster. This requires tremendous teamwork," says Dietz. "A rapid and effective response to any event will require the inclusion of multiple disciplines at all levels of government. This requires us to build those relationships now and to include all potentially involved entities in the planning process. We saw in our state's response to Hurricane Katrina and to the deadly tornadoes in



"The moment the situations get chaotic, communications start to break down. Each scenario is so different that you cannot really have a global plan, so to speak, that you can pull off the shelf and be able to implement."

-Alok Chaturvedi

southwest Indiana last November how important it is to have that teamwork in place ahead of time."

Along with his PhD, Dietz's own military background (he's a retired colonel in the U.S. Army) makes him a bit of a dual threat in the fight against terrorism. And that's the case with many of the people working in the institute. Tim Collins (MBA'94), its current managing director, is a retired Indiana State Police officer who reached the rank of regional investigative commander. As a state trooper, he was a certified hostage crisis negotiator involved in dozens of incidents requiring successful negotiation. Louis René Beres (see next page), a professor of political science, has more than 25 years worth of experience on the subject of nuclear terrorism. Beres was also part of Project Daniel, a 2003 Israeli project commissioned to assess the threat of Israel from other states in the Middle East, drawing particular attention to Iran and its nuclear program.

Chaturvedi hopes this well-rounded research effort will help PHSI achieve one of its stated goals: "to enhance science through rapid creation dissemination of new discoveries and technology."

For researchers like David Ebert, a professor of electrical and computer engineering, it's a matter of discovering a better way to manage the mass amounts of information during a crisis, which can be crushing if not handled well.

"The general idea is to tightly integrate analysis, abstraction and visual representation to enable an effective decision-making environment," says Ebert, also the director of PURVAC. "For instance, in the event of a catastrophic event such as a chemical spill, natural disaster, disease outbreak or a terrorist attack, information will be coming from many sources, includ-

ing images from cameras, data from sensors and simulations, and text documents from police and healthcare facilities."

The PURVAC team is trying to create a software system that not only integrates different kinds of data, but also presents the information in ways that analysts, decision makers and emergency workers using various types of displays and requiring different kinds of information can easily understand.

A research team led by Yeong Kim, a professor of physics, is finding better ways to detect hazardous materials and explosives in the Center for Sensing Science and Technology. One breakthrough includes a car screener, which utilizes neutron sensors to quickly detect explosive materials.

High on the list of initiatives for the Center for Security of Large-Scale Systems, directed by Oleg Wasynczuk, a professor of electrical and computer engineering, is a high-altitude airship. The solar-powered, helium-filled craft can hover in the same spot for up to a year, aiding in surveillance, missile defense and weather forecasting.

MEASURED RESPONSE AND MIXED REALITIES

Chaturvedi believes computer modeling and technology can help make people better decision makers at the crisis point.

"The moment the situations get chaotic, communications start to break down," he says. "Each scenario is so different that you cannot really have a global plan, so to speak, that you can pull off the shelf and be able to implement."

To help train first-responders like fire

chiefs or police chiefs, programmers in the Center for Computational Homeland Security have created software to create synthetic environments. A simulation may generate a three-dimensional view of a building on fire, for instance, to model a terrorist attack. In this virtual setting, people can be tested on how they react.

"Their decisions" says Collins, "drive the scenario. In turn, they get a visual representation based on their decisions that details the health of the economy, the health of the people in that economy and public opinion."

Since April 2002, Purdue has held an annual exercise called Measured Response to simulate large-scale terrorist attacks. "We create outrageous scenarios and bring in local, state and federal agencies to see how they are going to respond," says Chaturvedi. "Over the years, we've seen some amazing changes in people's attitudes. In 2002, people were totally at a loss on how to deal with a particular crisis. Since then, they've become more aware. They're asking the right questions."

In addition to measuring responses through computer-based training, the PHSI is involved with mixed-reality scenarios at the Muscatatuck Urban Warfare Training Center. Here, in partnership with the Indiana National



Louis René Beres

What makes a terrorist?

For Louis René Beres, a Princeton-educated professor of political science, who has provided many long answers to this question while serving as a consultant to various federal agencies for 25 years. The short answer has to do with two standards of measurements.

"What distinguishes a terrorist from a freedom fighter," Beres says, "is just cause and just means. Whenever an insurgent lacks just cause and/or just means, he is a terrorist."

"Just means has to do with the law of war. Even if a fighter has justice on his side, if he deliberately kills noncombatants, he does not have just means. For example, let's look at the Palestinian insurgency against Israel. Even if you believe the Palestinians have the right to use force, the moment they put bombs on buses to kill noncombatants, they're terrorists. There's nothing else that can possibly justify the use of force against noncombatants. Period."

How prepared are we for a nuclear attack?

In the 1970s, Beres wrote some of the first books on nuclear terrorism. As an ex-New Yorker, he knows how hard it is to police a city that size when a terrorist plot can involve a handful of people with backpacks. "The bottom line is that we are working overtime to be better prepared; however, it is impossible to be fully prepared. It is highly likely that some form of nuclear terrorist event will at some point happen. Nuclear terrorism can take the form of explosives or radioactivity. The most plausible scenario is a dirty bomb, which is not an authentic nuclear weapon, but rather a conventional explosive hooked up to fissile materials. You can get radioactive materials from universities or hospitals and just hook it up to conventional high explosives. It will not be an apocalyptic event, but it can still cause a lot of trouble."

-William Meiners

Guard and the Indiana Department of Homeland Security, emergency personnel are tested in full combat and response gear. With 1,000 acres, 70 buildings and a 2,900-foot tunnel system, Muscatatuck provides a small-city setting to explore real-life situations. On the other end of that training, the physical responses can be fed into the software to extrapolate how the community and the state at-large would have been affected.

"The military is very good at fighting wars," says Collins. "Law enforcement is very good at peacekeeping. But as we've

seen overseas, when you put the military into a peacekeeping role, sometimes you have problems. Likewise, when law enforcement is faced with a situation like a riot, they have problems."

One objective of the Muscatatuck training, as well as research in the center known as T3, is to identify and integrate common strategies for military and law enforcement. And by further validating these strategies in a living laboratory, T3 can enhance the development of technologies with urban warfare applications.

LESSONS LEARNED AND

Are we prepared for another attack?



Peter Beering

To that question, Peter Beering, the terrorism preparedness coordinator for Indianapolis, might pose another. "How prepared," Beering asks, "is prepared enough?"

Because in this business, Beering says, "the good guys have to get it right every time while the bad guys only have to get it right once." But he thinks those fighting the good fight are making significant progress.

"Only a raving idiot would take on the United States with something that flies, floats or marches," he says. "We have dramatic superiority militarily over all-comers."

Still for those participating in what he describes in military parlance as "asymmetric engagement," or terrorism, Beering says that one could make a case for terrorism's "effectiveness." The use of bombing campaigns to further a political cause is not a new phenomenon. "Terrorism has been used for a very long time," he says. "It is in parts methodology, ideology, strategy and tactic."

"We recognize that there are lots of different folks who are capable of conducting such attacks, and we prioritize those who are worth paying attention to and really have the wherewithal to do this," he says. "One can certainly say we've been very effective at eliminating the Taliban and undoing many of the atrocities that have played out in Afghanistan over the past

several decades. We have substantially weakened Bin Laden's network, and, in fact, have driven a change from a fairly central organization to a decentralized one—a franchised terrorism, if you will. And while that presents a number of operational and obvious strategic challenges, the good news is that it is comparably more difficult for them to pull off attacks or simultaneous attacks."

Any discussion of our own preparedness, however, even those jumpstarted by last year's assaulting hurricanes, Beering says, should become part of our normal discourse. Time will tell on just how prepared we truly are. —William Meiners

LEARNING OPPORTUNITIES

From the 9/11 fallout to the hurricanes that assaulted the Gulf Coast last year, PHSI researchers are examining past examples, while anticipating what can possibly transpire in the future. "Homeland security is also about how we respond to natural disasters, hurricanes, a possible pandemic flu, a chemical spill or a cyber attack," says Chaturvedi.

To address some of those other needs of preparedness, the institute is conducting a Hoosier Readiness Challenge, which will hit the road to test preparedness levels of various health departments throughout Indiana counties. The PHSI also launched the National Biosecurity Resource Center this year, providing the agricultural community with an effective online tool. "We want this to be a one-stop shop for people looking for information about animal biosecurity," says Sandra Amass, who serves as both director of the center and associate director of PHSI.

In addition, veterinarians involved in emergency response can now earn a graduate certificate from a distance-learning program in Veterinary Homeland Security from Purdue. "By providing quality training for existing veterinary professionals that is accessible remotely, we hope to address the current shortage of veterinarians to serve our nation's needs in public health, regulatory medicine and medicine for livestock," says Amass, also an associate professor of veterinary clinical sciences.

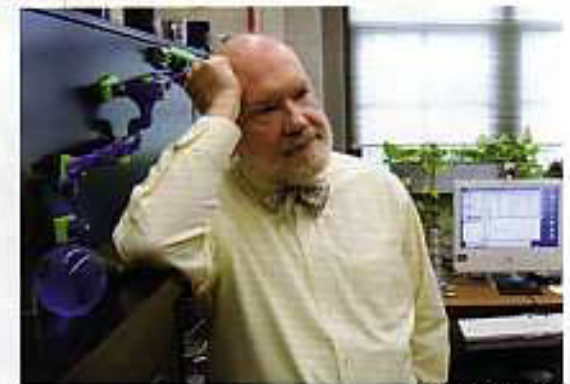
INCREASINGLY AWARE, EVER VIGILANT

While Chaturvedi believes nothing is unthinkable, especially with the way things are going in the world, he doesn't think we'll see something on the scale of another 9/11. "We are a huge nation," he says. "We have lots of vulnerabilities in that we're large, free and at war. But we are alert, and our guards are up."

That awareness, Chaturvedi says, is the best form of defense. To win a war against terrorism, he says, "We have to beat our adversary in the field of the imagination." And with the slogan, "preparing the nation for the unimaginable," researchers within the PHSI seem to be making a great deal of headway.

Visit <http://web.e-enterprise.purdue.edu/wps/portal/phi> to learn more about PHSI. The author is an editor with Purdue Engineering Communications.

How safe is our information online?



Gene Spafford

From Gene Spafford's perspective, the threat of terrorism has helped open the door to a criminal billion-dollar industry of identity theft, bank fraud and other online illegalities. And five years after 9/11, Spafford, the executive director of Purdue's Center for Education and Research in Information Assurance and Security (CERIAS), feels that a less-than-watchful eye may come back to haunt Americans in another five years.

"Information security, protecting networks and computers have not been a priority for policymakers at the federal or state levels," Spafford says. "Very little has been done in regard to making systems safer. However, the market has continued to move where more things are online than ever before. More is exposed. More is controlled. And vulnerabilities are larger."

Spafford doesn't think that electronic systems are a particular target of terrorism because it's only in rare cases that computer attacks result in the death and destruction that terrorists seek. "That's perhaps one of the reasons why our political leaders have chosen to largely ignore what goes on in information security," he says. "Terrorist attacks on a physical infrastructure, however, can be made worse by also attacking our computer infrastructure to shut down water or power grids or telephone systems, thereby magnifying the effect of another attack."

If a positive change is to come, Spafford says the country needs to realize that terrorism is a threat to our security, but not the lone, or even biggest threat. "We need to have a better focus on prevention and better government coordination," he says.

"In general, we have a lot of people who don't understand security. We've been passing rules and setting up things that really are not effective." And it's high time, according to the main man at CERIAS, that our information security be given a serious overhaul.

—William Meiners