

Terror and Beauty

by Jonathan David Farley

It was a Tuesday morning, and I awoke into a nightmare. The phone rang; a friend spoke. "Turn on the television," she said.

You couldn't see it at first. This was before anyone knew it had been caught on camera. All you could see was a plane disappearing behind a building, and a burst of hellfire.

Terrorism is the watchword of the day, and the fear—regardless of whether the threat is real or imagined—requires an antidote: security. Of the \$41.1 billion requested by the US Department of Homeland Security for 2006, \$1.368 billion is slated for the Science and Technology Directorate.

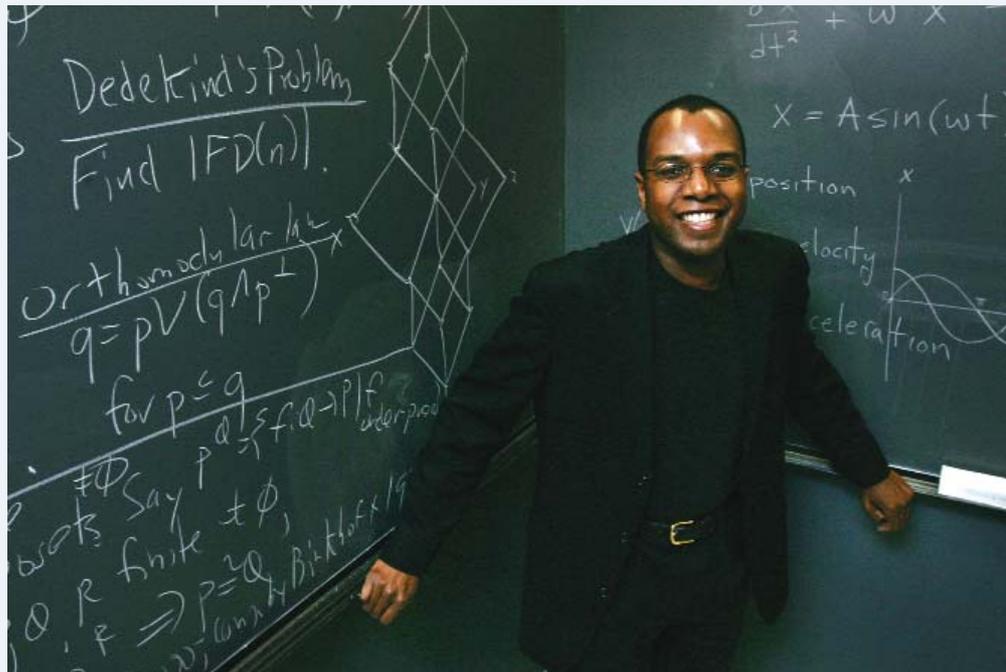
This is funding that mathematicians would normally have no access to – until now.

The opening line of the Oscar-winning movie *A Beautiful Mind* is "Mathematicians won the war": Bletchley Park is now a place of legend. During the Cold War, research in game theory heated up even as the first frost descended on the Soviet East.

Now there is a new war. What is the new mathematics?

At Los Alamos National Laboratory, the lab that built The Bomb, Cliff Joslyn uses Formal Concept Analysis (a branch of applied lattice theory) to mine data drawn from hundreds of reports of terrorist-related activity, to discover patterns and relationships that were previously in shadow.

Lattice theoretical ideas developed at the Massachusetts Institute of Technology tell us the probability that we have disabled a terrorist cell, based on how many men we have captured and what rank they hold in the organization. It can even account for gaps in our knowledge of the structure of a terrorist cell by making assumptions about how the "perfect" terrorist cell must be organized. Boston student Lauren



Professor Jonathan Farley ▲

McGough experimentally tested the accuracy of this model, essentially confirming what the theory predicts.

There is the ever-present threat of a dirty bomb being carried across the borders of the US or Europe. Which border do you guard? Which border do you want the terrorist to think is weak? Phoenix Mathematics, Inc. is using reflexive theory—a branch of mathematical psychology developed by the Soviet military—with Lockheed Martin to devise a quantitative way to help border patrols allocate personnel, and spread disinformation to the adversary.

Since 2001, tremendous amounts of information have been gathered regarding terrorist cells and individuals potentially planning future attacks.

There is now a pressing need to develop new mathematical and computational techniques to assist in the analysis of this information, both to quantify future threats and to quantify

the effectiveness of counterterrorism operations and strategies.

Progress on these problems requires the efforts of researchers from various disciplines such as mathematics, computer science, political science, and psychology. By having researchers from diverse disciplines come to one place to conduct their research, greater progress will be made in developing scientific and analytical tools to deal with the problem of terrorism.

It's time to choose brains over brawn. For, against terror, beauty may succeed where brute force fails.

Professor Jonathan David Farley is a mathematician and Science Fellow at Stanford University's Center for International Security and Cooperation. *Seed Magazine* has named him one of "15 people who have shaped the global conversation about science in 2005" (lattice@stanford.edu). He completed his DPhil in Oxford in 1995.