At Los Alamos National Laboratory, the lab that built The Bomb, Cliff Joslyn's team used formal concept analysis, a branch of applied lattice theory, to mine data drawn from hundreds of reports of terrorist-related activity, and to discover patterns and relationships that were previously in shadow.

Formal concept analysis is a way of determining non-obvious implications between data. It could potentially help discover links between people connected to terrorist cells: individuals who share many of the same characteristics are grouped together as one node, and links between nodes in this picture, called a *concept lattice*, indicate that all the members of a certain subgroup with certain attributes also have other attributes in common. For instance, you might group together people based on what cafés, bookstores and churches they attend, and then find out that all the people who go to a certain café also attend the same church (but maybe not vice versa).

Lattice theoretical ideas developed at the Massachusetts Institute of Technology (MIT) tell us the probability that we have disabled a terrorist cell based on how many members we have captured and what rank they hold in the organization: Assume that terrorist plans are formulated by the leaders of a cell, and are transmitted down through the chain of command to the foot soldiers, who carry out those plans. Further assume that the message only needs to reach one foot soldier for damage to result. We endeavor to block all routes from the leaders to the foot soldiers by capturing some subset of the agents. (The agents we remove need not be leaders or foot soldiers.) Such a subset is called a *cutset* in a *partially ordered set* or *poset*.

Boston-area student Lauren McGough experimentally tested the accuracy of this model. She simulated the way that commands pass from the leaders of cells to foot soldiers by organizing fifteen of her classmates as a "binary tree": each person, except the eight foot soldiers at the bottom, had two immediate subordinates. The "leader" was assigned a message or "command" to pass on to her subordinates (for instance, "Look for a red flower with blue thorns," or, my favorite, "Twinkle-toes says hello"). These individuals then passed the message on to their direct subordinates, and so on, until the message reached the foot soldiers, like a game of "telephone". To simulate the capture of terrorists in a cell, three people were randomly removed from the binary tree for each of fifty trials. Each of the three was told not to pass on the message that was sent out for that specific trial (unless it had already reached him or her). McGough's findings showed that, if anything, the predictions of the model concerning the likelihood that a cell would be disrupted were too conservative. The point of all this is that you could calculate how much it would take to turn a comprehensive plan into a botched operation. Of course, the model assumes we know the structure of the cell to begin with, but elucidating that structure is the job of law enforcement, not mathematicians (although the theory, with its perhaps flawed assumptions, can 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).

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., co-founded by lattice theo-