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At Ground Zero: New Technology Aids in the Recovery Effort

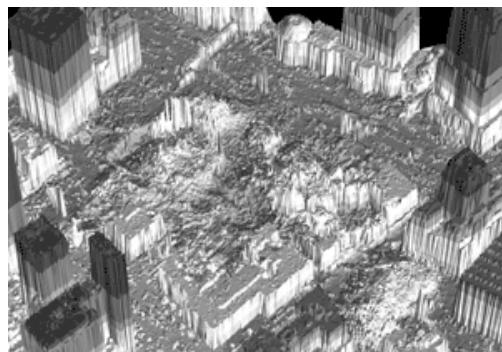
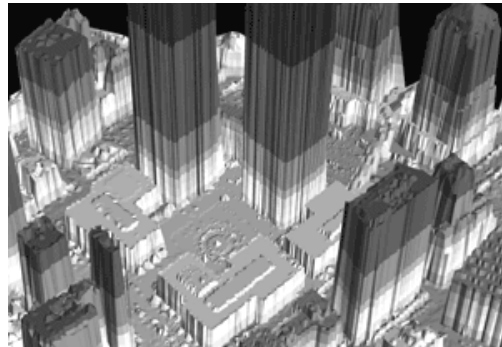
After the terrorist attacks on September 11, emergency workers were faced with the Herculean task of sifting through a surreal landscape of smoking, twisted rubble. One tool that proved indispensable in their efforts was a mapping system -- one that employed the latest technological advancements and took advantage of years of research -- developed and overseen by geographer Sean Ahearn.

Ahearn, who is on the faculty of the Ph.D. Program in Earth and Environmental Science and is an associate professor in the Geography Department at Hunter College, is the director of CARS lab (the Center for the Analysis and Research of Spatial Information). Recently, in his office, he tried to convey the chaos of Ground Zero just after the attack, by pointing to a digital photo on his laptop.

"As you can see, there's really no frame of reference to get your mind around that. There's no analogy. And seeing this picture doesn't even make it. This is 16 acres of destruction, and there are guys crawling all over it." The picture was similar to those seen on television in the days following the attack.

Fortunately, however, Ahearn was able to create a point of reference, which in a way is what geographers do. "They study the relationships of things in time and space," he says. "New technologies allow you to study them as never before."

Immediately after the tragedy, Ahearn's lab was called upon to create maps of the demolished site. He served as a consultant, advising rescue operations on what technology to use and how to employ it. This included hand-held devices with global positioning attachments, which firefighters used to record found objects and their geographical position in time, as well as new maps created by bouncing infrared lasers off the scarred terrain from airplanes. These maps gave the first clear view of the damage and provided some semblance of orientation in what Ahearn describes as "pure hell." The new technology was the subject of numerous newspaper articles, and Ahearn was interviewed on several television news programs.



LIDAR (Light Detection and Ranging) images provided the only usable maps of the terrain at the World Trade Center site, when rising smoke made other photographic techniques ineffective. Hunter's CARS Laboratory, directed by Sean Ahearn, created the images by bouncing light beams from airplanes off the ground plot. The data collected gave the first clear rendering of the physical damage.

How did Ahearn get involved in recovery efforts? The answer is that CARSI lab has been advising the city on groundbreaking mapping techniques over the past seven years. As the creators of NYCmap, the most extensive map of the five boroughs ever assembled, the lab has become the foremost authority on the geography of New York City. (NYCmap used orthophotography -- map-like snapshots taken from planes and fed into a computer database - to make a map so detailed that one can now look at a detailed picture of any square foot of the city). In fact, the lab was the only place still standing after 9-11 that held vital information about the World Trade Center area.



Sean Ahearn at the World Trade Center site.

"When 9-11 happened, we found out that afternoon around 4 o'clock that we had the only copy of the base map available. The command center was destroyed at 7 World Trade Center. City Planning was inaccessible and the Department of Information, Technology and Telecommunications was inaccessible. I got a call from Alan Leidner who's the head of city-wide Geographical Information Systems, and he said 'Get your staff together, and start making some maps.'"

That night they made maps of the site, and the next morning a police cruiser showed up at 7 a.m. to transport computers to the temporary command center, where Ahearn's team set up what was "the core of a pretty large mapping unit." Several government agencies worked together at the command center, including the Office of Emergency Management, the Department of Finance, City Planning, the MTA, and Parks and Recreation.

Of course, Ahearn never imagined that his work would have this particular application, but he did know that the immense amount of data collected in NYCmap, and the platform for research it provides, would be useful in solving many of the city's problems. (A Daily News article from before September 11 rather innocently noted that the map would be "especially helpful during a crisis.")

"It's more than a map. It's really a whole digital environment," says Ahearn. "There are any number of things you can do with that digital environment." You can model just about any spatial-temporal event in the city, he says, and derive data to predict events.

The Department of Health, for instance, could determine the possibility of a building having lead-based paint according to its age. Or, in the case of a water-main break, the City could quickly survey all the services in the area that would be affected. Ahearn and his lab have done work on pollution from industrial facilities in Williamsburg, Brooklyn, studying plumes from smokestacks and modeling where the contents will settle. He has even used similar technology to study the patterns of human interactions with tigers in Nepal, showing how and where the endangered species is most vulnerable to human predators -- a project he has been working on for the past 10 years.

Another New York City project studied the spread of the West Nile Virus in birds to show where humans were most likely to be infected. Using data from the Department of Health, Ahearn was able to record the number of birds killed by the virus in space-time clusters and predict with a high degree of accuracy where the human cases would occur. This information was used to target specific areas where pesticides would be sprayed, rather than blanketing the whole city, as was earlier done.

"If you give me an example of a problem in New York City, I'll show you why it's a spatial problem, a geographic problem, and how we can use this geographic database to address that problem," he says.

Now CARSI lab is working on a major building identification project, and Ahearn is training people to attach BIN's (Building Identification Numbers) to every building in the city. From his experience with the World Trade Center site, he learned that this information was necessary to help fire, health, and building inspectors find exactly what buildings were being affected by a given problem, since many street addresses can be misleading.

Another thing Ahearn gained from his experience working at Ground Zero is a sense of how his work as a scientist can impact people's lives.

"When you're creating maps for people who work in this sort of environment, the stakes are a little bit higher," he says. "You feel the pressure." He remembers hearing from a fire chief that he was using one of the maps, and thinking, "All these 14-hour days have been worth it."

For Ahearn, the experience also reinforced an important point about geography: "I was looking at maps for over a week before I went down there, and that certainly didn't prepare me for what I saw. I always teach the importance of 'ground truth' or 'ground referencing'...to understand how realistic the model is." Working at Ground Zero showed him that "there's nothing like reality to straighten out your scientific perception."

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