

news

SCAN

SECURITY

I Seek You

ARE NEW SECURITY TECHNOLOGIES WORTH THE COST? BY WENDY M. GROSSMAN

Within hours of the September 11 attacks, even rabid civil libertarians were talking about the need for national identification systems, giant linked databases, face-recognition technology, closed-circuit television (CCTV) monitors, biometric authentication, profiling and increased government wiretapping powers. Some of these measures—particularly, more latitude in wiretapping—have already been enacted as law, as security services around the world have seemingly dusted off every plan once deemed too invasive and presented it to legislatures. If to gain security in the U.S. we must compromise some of the liberties that have been considered essential, at least we should be reasonably sure that such measures will be worth the money and lost liberty. Yet based on current uses of the security technology, there is reason to remain skeptical.

Most of the proposed technologies are not only controversial but also expensive, slow and complicated to deploy. Most are either untried or untested on the necessary scale and carry risks that are not well understood. Solid scientific data are frequently lacking—few studies exist detailing the success rate of psychological profiling, for example. One rare ex-

ception is a January/February 2001 study published in *Australasian Science* that tentatively concluded that the few profilers who agreed to be tested (only five did, out of TK NUMBER who were asked) performed slightly better than competing groups of detectives, psychologists, scientists, and, pulling up the rear, civilians and psychics.

Media hype and overblown claims by firms selling the technology—several companies involved in biometrics, the field that attempts to identify people through their biological traits, hired lobbyists in October—don't help. Take, for example, the idea of combining face recognition with CCTV systems to scan airport terminals for suspected terrorists. In the camera-filled U.K., the London borough of Newham claimed its pilot scheme produced a 21 percent drop in crimes “against the person” and unprecedented decreases in criminal property damage, vehicle-related crime, and burglary. In August 2001 the U.K. approved a further £79 million (about \$120 million) for 250 new CCTV schemes. Simon Davies, a fellow at the London School of Economics and executive director of Privacy International, estimates that the country already has at least 1.5 million CCTV cameras in place.

Jason Ditton, professor of law at the University of Sheffield in England and director of the Scottish Center for Criminology in Glas-



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PHOTO CREDIT HERE

WHEN POWER
TRUMPS PRIVACY

Fearing that power, once handed out, is not likely to be rescinded, privacy advocates are concerned about granting law enforcement greater latitude for surveillance. Currently European privacy laws require that all communications data (telephone records, e-mail, Web logs) be destroyed once they are no longer needed by the service provider for billing purposes. Most CCTV systems follow a similar principle, so that tapes are typically retained for 31 days. President George W. Bush is asking a reluctant European Union to loosen these rules in the interests of fighting terrorism, even though such data retention is not required under U.S. law. Meanwhile the U.K.'s Anti-Terrorism, Crime and Security Act whizzed through to become law in December; it includes a confusing clause allowing the retention of data in the interests of national security.

gow, is one of the few sources of academic research into CCTV. His research, funded by the government's Scottish Office, shows that the cameras are not cost-effective and that they reduce neither crime nor the fear of crime. His 1999 study of CCTV in Glasgow's city center revealed that although crime fell in the areas covered by the cameras, the drop was insignificant once the figures had been adjusted to take general crime trends into account. Even worse results were in Sydney, Australia, where a \$1-million system accounted for an average of one arrest every 160 days—a quarter of the Glasgow rate, which Ditton thought was poor.

Moreover, it is not clear how much the displacement effect—the shifting of crime from one area to another—plays a role. A Sydney city council's report indicates that the cameras probably displaced some crime to areas outside the lens's view. The Glasgow study found that the rates at which crime was detected actually fell slightly, although a similar study in the much smaller town of Airdrie nearby found the opposite. But therein lies a fundamental design conflict. For the cameras to be an effective deterrent, everyone has to know they're there; however, to be effective in aiding detection they need to be covert so criminals don't defeat them.

Trying to add face recognition to the camera system leads to an even more fundamental problem: you can only catch people you're already looking for. James L. Wayman, direc-

tor of the U.S. National Biometric Test Center at San Jose State University, says flatly: "You cannot hang a camera on a pole and expect to ever find anybody. Even the vendors say that." Indeed, the American Civil Liberties Union reported in early January that such a system in Tampla, Fla., failed to identify a single individual in the police database of photographs and misidentified some innocents as suspects.

Even if you could, the problem remains of predicting what people will do. Wayman is a strong proponent of the Immigration and Naturalization Service Passenger accelerated service system (INSPASS), which lets frequent travelers register handprints and speed through immigration checks. But "how do you know someone's going to be a terrorist when they get on an airplane?" Wayman asks. "It's

beyond what science is capable of predicting." Besides, as the September 11 events showed, terrorists could patiently build up seemingly legitimate travel logs—and entire apparently innocent lives, even if there were a national ID card system—before committing their acts.

Much of the debate about new security technologies is framed around the assumption that they will work and that our personal privacy is a necessary sacrifice, when in fact the effectiveness of such technologies is questionable. An alternative solution, notes Philip E. Agre, associate professor of information studies at the University of California at Los An-



DIAGNOSTICS

Hears to Your Health

A NEW SENSOR LETS RESEARCHERS LISTEN FOR THE PRESENCE OF GERMS BY MICHAEL BEHAR

When University of Cambridge scientists first heard a virus wresting itself from the tenacious clutch of an antibody, the sound should have elicited a collective sigh of relief from fretting patients everywhere. The researchers were testing a new device that can hear the presence of a virus in a blood sample. For many patients, who some-

times wait days to get test results, the invention could mean on-the-spot detection of HIV, hepatitis and dozens of other pathogens, including anthrax and smallpox.

The Cambridge experiment involved a tiny slice of quartz crystal layered with antibodies. A virus—in this case, herpes simplex—was introduced and subsequently bound to an

antibody on the crystal. The researchers then slowly increased the frequency of an electric current flowing into the quartz. As the quartz oscillated, it whipped the virus and antibody back and forth. Eventually the herpesvirus tore away from the antibody, emitting a faint pop.

“If you apply enough force to a stick, it will snap and you hear a sound,” explains Matthew Cooper, one of six researchers involved in the project. “Likewise, we can hear the sound of the bonds snapping when we break apart a virus and an antibody.” The quartz acts like a piezoelectric microphone, converting mechanical vibrations into electrical impulses. Similarly, when a virus breaks from an antibody, the quartz changes the vibrations into audible signals.

The entire process, termed rupture event scanning, is far better than current enzyme- or biochemical-based viral tests, which reveal the existence of antibodies but can't determine whether or not a subject is carrying the associated virus. “We are directly detecting the virus,” Cooper points out, “which gives you a much more accurate prognosis.”



Using targeted antibodies, the quartz microphone could be fashioned to recognize the sounds of a multitude of viruses. “It could even detect bioterrorist germs,” Cooper says: add a microthin film of an-

thrax or smallpox antibodies to the crystal, then douse it with a sample of infected blood for an instant diagnosis. Cooper is quick to add that the technology is at least three years from its commercial debut.

To that end, the Cambridge team has formed a company called Akubio. With \$1.7 million in funding, including a majority stake from Abingworth Management, a London-based life sciences venture-capital firm, Cooper wants to engineer a cell phone-size tool that can eavesdrop on “cells, bacteria and a variety of different substances in the body.”

Michael Behar is a Washington, D.C.-based science and technology journalist and former senior editor at Wired magazine.

RIDING THE WHIPSAW

To shake the virus loose from the tightly clinging antibodies, researchers had to snap them back and forth 14 million times per second. As a result, the virus and antibodies experience a force roughly 10 million times that of gravity.

PUBLIC HEALTH

Throw the Switch?

NEW VACCINES MAY NOT BE A REASON TO KEEP SMALLPOX AROUND BY DANIEL GROSSMAN

In a brief statement last November, U.S. Health and Human Services secretary Tommy Thompson announced his opposition to the execution of one of the world's most infamous mass murderers. The killer is variola, the virus responsible for smallpox, which took about 300 million lives in the 20th century.

After the World Health Organization eradicated smallpox in 1977, all known cultures were consolidated in two repositories, one at the Centers for Disease Control in Atlanta and one at the State Research Center of Virology and Biotechnology in Koltsovo, Russia. Since eradication, health officials and

scientists have been debating whether to destroy these stocks and, if so, when. Some argue that the variola stocks could be the basis for novel vaccines or a smallpox cure should anyone release any secret stashes of the virus. Other researchers think that there are no good scientific or public health reasons to believe that workable drugs could be created from the existing stocks.

Though very effective for preventing smallpox, today's vaccine is not suitable for everyone. It contains live vaccinia virus (a distant cousin of variola), which causes severe complications in people with impaired immune systems, including chemotherapy and

A POX
OF MICE AND MEN

Last year's report of an experiment conducted on mice in Australia has increased the intensity of the debate over what to do with variola (smallpox) stocks. Researchers hoping to control that continent's wild mouse population added a single gene to the relatively benign virus that causes mousepox. The addition made the virus devastatingly lethal even in mice vaccinated against mousepox.

Some scientists say that if someone were sinister enough to make a similar change to variola, which is similar to the mousepox virus, then existing cultures might be helpful in developing countermeasures. Others argue that samples of the newly altered virus, not the stocks from which it was produced, would be the critical foundations of a treatment.

AIDS patients, and is not considered adequately tested to use on pregnant women. Certain otherwise healthy individuals also develop serious side effects, among them, in rare cases, permanent neurological damage. A new vaccine free of live virus might be safer.

The Bush administration also wants drugs to treat smallpox after it has been contracted. "No one wants to keep this virus forever," confesses one high-level government official familiar with smallpox deliberations. "We just want to get rid of all of it or have the tools to handle it if someone has it in a freezer." Pursuing these goals requires further research with live variola virus.

Frank Fenner, an eradication program alumnus and a longtime WHO adviser on variola research, says new drugs are unneeded. The existing vaccine, he points out, already works as a treatment if administered within several days of exposure. He predicts that efforts to find a cure that could treat smallpox in its later stages will prove "fruitless." And if you do have a new smallpox

drug, Fenner asks, "How on earth do you test it?" There are no longer any smallpox victims.

Laboratory animals could be the answer. Peter B. Jahrling, a biologist at the U.S. Army Medical Research Institute of Infectious Diseases, succeeded in infecting monkeys—an important development because animals don't naturally contract smallpox. The monkeys had symptoms and tissue and organ damage, similar to those in humans and so might pave the way for new drugs. With continued access to the variola virus, Jahrling thinks he could have a treatment for smallpox ready within a decade: "With clenched teeth, I could do it in five."

Critics say it is premature to conclude that Jahrling's monkeys are a valid analogue of smallpox in humans. The animals received the variola virus intravenously, at doses far in excess of what it takes to produce smallpox in humans. In fact, many compounds that work well in lab animals fail miserably in humans. Rather than gambling on a drug tested only on animals, Fenner argues that researchers

SPACE TRAINING

Astronaut Boot Camp

NASA FINDS A NEW WAY TO IMBUE RECRUITS WITH THE RIGHT STUFF BY PHIL SCOTT

Back in the good old days, going on a space mission meant training, training and more training—in simulators. But these days NASA makes sure astronauts also spend time at sleep-away camp with a few fellow astronauts, dining outdoors and sleeping under the stars. Okay, it's a little rougher than

roasting marshmallows and telling ghost stories. In fact, it makes TV's *Survivor* look like a day at Six Flags. The campsite: Cold Lake in Alberta, Canada. "It's really cold -30 degrees Fahrenheit. It gets your attention," says NASA astronaut Andy Thomas.

Thomas put the program together in 1999, af-

ter pitching his tent for four and a half months on Russia's Mir space station. Like the three other Americans sent to Mir, Thomas felt culturally isolated. "So I thought it wise to develop a program to prepare astronauts for interpersonal issues on long space flights," he explains. The experience breaks down into three main topics: leadership, self-management and teamwork. Thomas teaches the first workshop, which consists of classroom lectures on the behavior of astronauts and on leadership in close quarters and in isolation. He draws comparisons between Norwegian Roald Amundsen's and Englishman Robert Scott's Antarctic race. "Amundsen had extraordinary capacity to lead and to give attention to details," Thomas says. Amundsen successfully reached and returned from the South Pole



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A FEW
COLD FACTS

- Carl Walz, a member of the International Space Station's fourth crew, is the first Cold Lake alumnus in orbit.
- Cold Lake training lasts 11 days.
- The International Space Station orbits at an average altitude of 247 statute miles (397 kilometers). Right now the average crew of three—the most that can be accommodated for an emergency exit on the attached Soyuz capsule—stays on the ISS for three months.

because he planned ahead, adapted skis and sled dogs from his studies of the Inuits up north, and adopted a democratic style in everyday decision making. But when the tough decisions had to be made, he would do it.

Scott, who perished with his team on the return trip, “made his decisions in an autocratic, hierarchical style,” Thomas continues. “He then made infamous blunders—such as adding a man at the last minute without increasing supplies and having his men drag back sleds filled with rocks in the name of science while they died in their tracks.” (More recent analyses suggest] that unusually cold weather, more than poor leadership, doomed Scott’s expedition [see “Thawing Scott’s Legacy,” Profile, December 2001].)

After five half-days in the classroom, a group of six astronauts take it outside: to the National Outdoor Leadership School, conducted in Utah and Wyoming. Next comes the true and final stress test: Cold Lake. There the group receives a couple of days of training with their cold-weather equipment, and then they’re dropped by helicopter into the middle of the Canadian military base. Assigned to map an unfamiliar area, they set up a central base and receive commands from instructors on radio, just as they would from Houston’s

Mission Control. “This may be at two in the morning,” Thomas says.

Each astronaut takes a turn as leader for few days. “The leader has to decide who’s best to go, who’s been working hardest and needs a rest. The risks are real in the sense of providing stress,” Thomas adds. “It’s a good analogue for when they end up in space.”

Although some campers have griped that long, cold-weather outings are just NASA’s latest big new idea, response has been positive overall. Soon, however, the astronauts might contend with even more claustrophobic togetherness. NASA has contracted with the National Oceanic and Atmospheric Administration to use its underwater lab Aquarius, off Florida’s Key Largo. That could mean that NASA plans training in addition to Cold Lake—or that the space agency has moved on to its latest big, new idea. —Phil Scott

Phil Scott is a writer based in New York City.

ENERGY

Blowing Out to Sea

CAPE COD MAY HOST THE WORLD’S LARGEST OFFSHORE WIND-FARM PROJECT BY WENDY WILLIAMSON

With very little alteration to the national power grid, the U.S. could quickly get at least 20 percent of its electricity from wind. Yet currently, wind generators supply only about 0.5 percent of energy requirements, in part because people don’t want to live underneath the tall turbines. In Europe one solution to the people problem is to place the wind machines out at sea, where the winds are stronger anyway.

Acknowledging this potential, a Yarmouth, Mass., company plans to build America’s first offshore wind farm—and, coincidentally, the world’s largest—by the end of 2004. Cape Wind Associates has slated construction of a 420-megawatt wind project on a shallow sand bar known as Horseshoe Shoal, located five miles south of Cape Cod,

in between the islands of Nantucket and Martha’s Vineyard.

Each of the 170 ultrahigh-tech wind turbines, 22 feet in diameter and 250 feet tall at the height of the turbine hub, will produce almost three megawatts of power at the highest wind velocities. The turbines, which should be visible in the distance from the Hyannisport Kennedy enclave, will be laid out in a grid pattern over 25 square miles of saltwater. An underwater cable, laid at a cost of \$1 million per mile, will run from the turbine complex to a Cape Cod substation. Project developers claim that at peak operation the farm will provide almost all the electricity needs of Cape residents—a critical selling point in a region that suffers increasingly from air inversions and smog.



Less than a decade old, offshore wind technology has been virtually ignored by U.S. companies until now. In Europe, though, it's the next big thing in "green" energy. Denmark, for example, trumpets the fact that 50 percent of its energy will come from wind by 2030. If successful, offshore wind farms could solve many problems encountered with land-based wind technology in densely populated regions. Ocean winds are stronger and steadier. Land acquisition is unnecessary. And, perhaps most important, the huge turbines are out of sight and earshot of most people. Initially fishermen worried about their catch volume decreasing, but several European studies suggest that the heavily anchored turbines act like shipwrecks and in fact improve fish numbers.

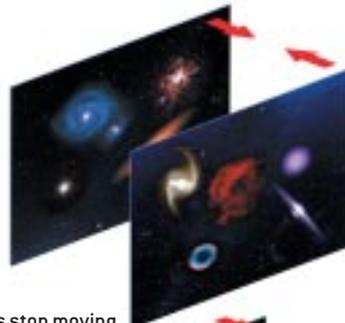
On the flip side, investment costs are mammoth. Cape Wind, having already invested several million dollars in planning studies, expects to spend at least \$600 million on construction. James S. Gordon, president of Cape Wind, is confident that the whole pack-

age can be financed through private sources. Under his 25-year leadership, Energy Management, a partner in Cape Wind, has built a number of natural gas-fired plants in New England. Says Gordon: "We're creating a national model for America's energy and environmental future."

The U.S. Department of Energy is "watching the Cape project very closely," remarks Brian Parsons, a researcher with the DOE's National Renewable Energy Laboratory. But the size of the undertaking has raised some eyebrows. "I'd be a little skeptical about starting with something that big," warns wind-farm economics expert Tim Thomas Cockerill, a research fellow at the University of Sunderland in England. Others in Europe, however, are thinking along the same lines as Cape Wind. Researchers at the Dutch Offshore Wind Energy Converter project are aiming for a single six-megawatt offshore turbine by 2010. Such continued interest may prove within the decade whether this alterna-

PASSING THE CARBON BUCK

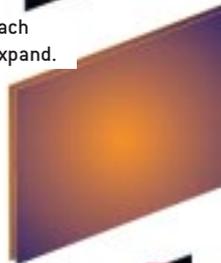
The Kyoto Protocol, an international agreement to curb emissions of global warming gases, allows countries to trade emissions through a commodity called a CO₂ equivalent, which equals the amount of industrial greenhouse gases that have the heat-trapping ability of one metric ton of carbon dioxide. The supply of CO₂ equivalents is severely limited. Some observers say prices range from \$5 a year to more than \$300, although some current trades appear to put the price at \$25. Cape Wind claims that the 420-megawatt wind farm will displace a plant that would have annually spewed 1.134 million metric tons of carbon dioxide. Given the facility's 30-year estimated life, the up-front construction costs of \$600 million don't seem quite so high.



1. The universes stop moving apart and start to approach.



2. Even as they do so, each universe continues to expand.



3. They collide. A new big bang commences.



4. The collision refills each universe with matter.

CYCLIC COSMOLOGY posits that our universe is one of two universes—shown here as planes, but actually three-dimensional—that periodically bounce off each other.

DATA POINTS: TAKING STOCK

Since the time of Carolus Linnaeus, who devised the modern species classification system 250 years ago, scientists have categorized only a small fraction of life on earth. Proponents of the ambitious All-Species Inventory (www.all-species.org) hope to finish the job, which would include bacteria and fungi.

Estimated number of species:
7 million to 100 million

Estimated number identified
so far: 1.8 million

Target time of completion:
25 years

Cost, lower estimate: \$3 billion

Cost, upper estimate: \$50 billion

Total raised so far: \$1 million

SOURCES: WWW.ALL-SPECIES.ORG;
THE SCIENTIST, JULY 23, 2001;
THE NEW YORK TIMES, DECEMBER 9, 2001.

ASTRONOMY

Space Rock Candy

Rocks from space have always posed a threat to life. Just this past January 7, an asteroid discovered just last December came within two moon orbits' distance of the earth. Too close not to be called, considering that at 300 meters wide, it was three times the size of the object that hit Tunguska in 1908. So how ironic that life's building blocks keep showing up on meteorites. First it was amino acids; now it's sugar. NASA researchers analyzed sugar molecules coating two kinds of carbon-rich meteorite leftover from the solar system's first days and found that the abundance of the compounds decreased with



their size and that the sugars were present in many different molecular arrangements. Both characteristics suggest an extraterrestrial origin, because biological sugars tend to be larger and of particular shapes. The isotope concentrations of the meteoric confection were also unlike those of earthly sweets. The simple sugars could have arisen when starlight bombarded dense clouds of dust floating between stars, the authors suggested, which were later caught up in the solar system as asteroids. Their research appeared in the December 20–27, 2001, *Nature*.

—JR Minkel

PHYSICS

Superfluid Freeze

Atoms in a Bose-Einstein condensate, the strange gaseous superfluid that forms near absolute zero, do not have definite locations. Instead each atom is “smeared out” across the whole cloud of atoms, and the cloud behaves a lot like a single entity. Now physicists in Germany have used lasers to “freeze” individual atoms in the condensate. Laser beams bathe the cloud from six directions, and the interfering light waves form an optical egg crate for the atoms. At high intensities, the pits are deep, and each one captures an atom and holds it in place. The quantum properties of the condensate are lost. Turning down the lasers restores the condensate, like ice melting to water. The frozen state, called a Mott insulator, may provide yet another route to building a quantum computer by using each atom in the lattice as one quantum bit. The January 3 *Nature* contains the results.

—Graham P. Collins

ECOLOGY

Bubble Bath of Death

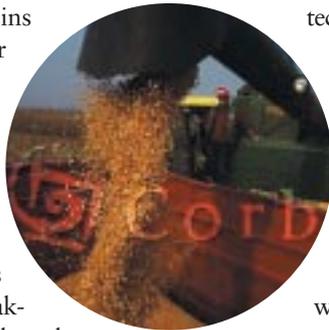
Deoxygenating ballast water could help prevent stowaway species from spreading around the world. Current approaches to killing off invaders rely on heat, poisons and filtration, which are costly and may harm local waters. Researchers found that simply bubbling nitrogen into ballast water depletes it of oxygen, spelling the doom for the larvae of tubeworms, crabs and zebra mussels in a matter of days. The idea first originated as a means to minimize rust; ship owners spend about \$100,000 per vessel every year for the paint needed to protect against corrosion. Though effective against many species, deoxygenating ballast water isn't a panacea—it won't work against anaerobic bacteria or organisms in certain life stages that require no oxygen. The study appears in the January *Biological Conservation*.

—Philip Yam

AGRICULTURE

Microwaves of Grain

The moisture content of grains such as corn, wheat, barley or soybeans is a crucial factor in determining the proper time to harvest them. If moisture levels are too high, grains may be damaged during threshing and shelling; low levels increase the risk of grains being shattered and kernels breaking. Currently samples are collected and tested by hand, and each type of grain requires a separate set of measurements. A new



technique, developed by the Agricultural Research Service of the U.S. Department of Agriculture, can significantly improve moisture measurements. The system sends microwaves through the grain to a receiving antenna, which measures changes in the waves that reveal the moisture content. As important, the same technique can be used on all grains.

—Steve Mirsky

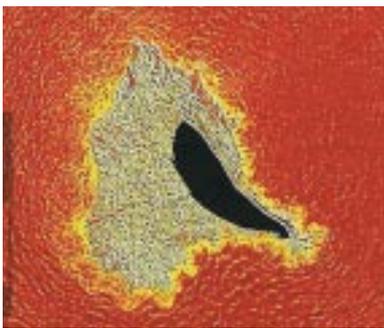
HEART DISEASE

Inflamed Blame Game

Some researchers believe that past infections may increase the chance of an inflammatory immune response to plaque-filled arteries. In possible support, a recent study found a correlation between exposure to multiple infectious organisms and the extent of and risk of death from atherosclerosis. German researchers tested 572 people suffering from heart disease for antibodies to eight organisms, from herpes and Epstein-Barr viruses to the bacteria that cause

pneumonia and stomach ulcers. Participants with the most exposures were up to five times more likely than those least exposed to have advanced atherosclerosis. After three years, the death rate for patients with advanced heart disease who tested positive for a few or no pathogens was seven percent, whereas 20 percent of those positive for most or all of the infections died. Increasing pathogen exposure also correlated with higher mortality in limited atherosclerosis. The study was published in the January 1 *Circulation*.

—JR Minkel



STENCH WARFARE

Blows to the Nose

Of all the repulsive smells you've whiffed in your life, which ones are apt to clear a room the fastest? Experts at the U.S. Department of Defense want to know so they might use them in a nonlethal "odor bomb." Such a nasty device could be useful for quelling demonstrations or repelling enemy troops. Researchers at the Monell Chemical Senses Center in Philadelphia received a DOD grant three years ago to find the stinkiest stench. "We focused on biological odors because we

thought those had the best chance of being recognized universally," explains Pam Dalton, the cognitive psychologist who led the study. "There aren't a lot of data available on malodors; most of the previous work was done on pleasant scents." In recently completed tests, subjects reacted most profoundly to the potent reeks of human fecal waste and rotting food. The former packs foul-smelling skatole compounds, whereas the latter emits rancid-smelling butyric acid and various sulfurous decay by-products. Do the champion malodors work as planned? "Well, one time I managed to evacuate the build-

WWW.SCIAM.COM/NEWS BRIEF BITS

- In a step toward xenotransplantation, researchers have made **genetically modified pig clones** that lack a copy of a gene that causes immune system rejection. </010402/2.html>
- Challenging convention wisdom, an experiment shows that a **language learned in adulthood** is processed the same way as the primary language learned in childhood. </010202/2.html>
- In mouse studies, **gene therapy cured sickle-cell anemia**. After a virus delivered a modified gene into the bone marrow's stem cells, the mice began churning out mostly normal red blood corpuscles. </121401/1.html>

news

SCAN

OVERMATTER PAGE

I Seek You

geles, is to spend the money to bolster existing security practices: improving authentication for airport staff, training flight attendants in martial arts, improving luggage searches and finding ways to prevent identity theft. A society as clever as ours shouldn't have to trade security for dearly held freedoms.

Wendy M. Grossman, based in London, is a frequent contributor who specializes in computer and information technology.

Blowing Out to Sea

tive to fossil fuels is more than just a passing gust.

Wendy Williams, based in Mashpee, Mass., is researching technologies that reduce carbon emissions through a grant from the Fund for Investigative Journalism.

Throw the Switch?

should look to improve existing vaccinations. Figuring out how to treat the complications from the smallpox vaccine would be cheaper and more certain, and such work does not require the variola virus.

Underlying the debate over the variola repositories is a disagreement about human nature. Those who want more research first say September 11 proves that bad people don't necessarily feel bound by international laws or accepted standards of behavior. Those who would like to destroy the stockpiles—heavily represented by veterans of the eradication campaign—insist that civilized nations of the world should nonetheless set an example and send a message to would-be bioterrorists. The WHO World Health Assembly is expected to consider these conflicting views when it convenes for its annual meeting in May.

DANIEL GROSSMAN is a science writer and radio producer based in Watertown, Mass.

Blows to the Nose

ing,” she reports, “and the people around here are used to offensive smells.” —Steven Ashley