



WORLD

THE NEW RULES OF ENGAGEMENT

As the insurgency rages on, a TIME investigation reveals a new U.S. push to exploit splits in its ranks. Can that help lead to an exit?

By MICHAEL WARE BAGHDAD

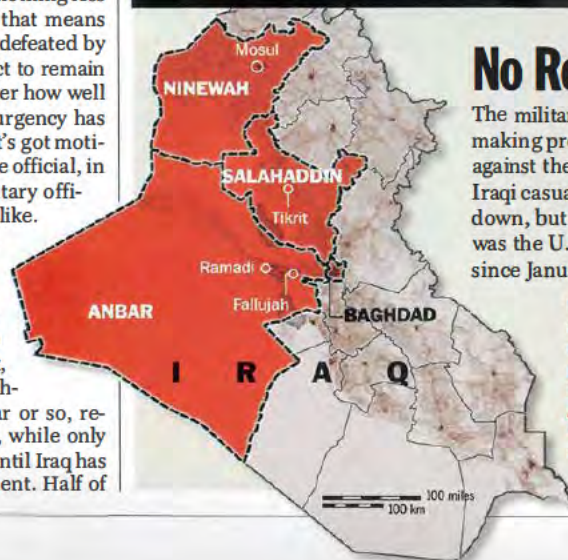
THE SECRET MEETING TOOK PLACE EARLIER THIS year on the outskirts of Baghdad, in a safe house known only to the insurgents in attendance. One of them, an Iraqi known by the nom de guerre Abu Marwan, is a senior commander of the leading Baathist guerrilla group called the Army of Mohammed. Together with a representative of an alliance of Iraqi Islamist insurgent groups, Abu Marwan met aides to Abu Mousab al-Zarqawi, the leader of al-Qaeda in Iraq. The purpose was to discuss the idea of uniting under a joint command the disparate networks fighting U.S. forces in Iraq. When the conversation turned to leadership issues, Abu Marwan's companion suggested that al-Qaeda replace al-Zarqawi with an Iraqi, "as it would have an enormous impact on the other groups." But an al-Zarqawi aide rebuffed the notion. "Who started our organization?" he asked rhetorically. No one was prepared to ask al-Zarqawi to step aside.

That episode might seem inconsequential in a long and bloody war that's growing deadlier on the ground—20 service

members died last week, including 10 Marines killed by a bombing in Fallujah on Thursday—and increasingly unpopular at home. Yet it reflects a critical new dimension to the war, a shifting tide within al-Qaeda and the broader insurgency. The Jordanian-born al-Zarqawi and his network of hard-line jihadis have long been the driving force of the insurgency, transforming it from a nationalist struggle to one fueled by religious zealotry and infused with foreign recruits. But a *TIME* investigation, based on dozens of interviews with military and intelligence officials as well as Iraqi leaders inside and outside the insurgency, reveals that Iraqis are reclaiming the upper hand, forcing al Zarqawi to adjust. Differences between Baathist insurgent groups and al Qaeda are driven by discomfort with al Zarqawi's extreme tactics and willingness among some Iraqi commanders to join the political process. U.S. officials in Baghdad confirm to *TIME* that they have stepped up their efforts to negotiate with nationalist insurgents and the Sunnis they represent. "We want to deal with their legitimate concerns," U.S. Ambassador Zalmay Khalilzad tells *TIME*. "We will intensify the engagement, interaction and discussion with them."

That doesn't mean the U.S. is any closer to getting out of Iraq. In a speech at the U.S. Naval Academy in Annapolis, Md., last week, President George W. Bush responded to mounting doubts about the war by offering a glowing assessment of the mettle and readiness of fledgling Iraqi troops, which the Administration hopes will steadily assume security duties, beginning with next week's national elections. At the same time, Bush refused to set a timetable for a pullout, pledging to "settle for nothing less than complete victory." Yet if that means staying until the insurgency is defeated by arms, U.S. troops should expect to remain in Iraq for a long time, no matter how well the Iraqis perform. "This insurgency has got roots, it's got money, and it's got motivation," says a U.S. intelligence official, in an assessment echoed by military officers and insurgent leaders alike. "And the life span of this insurgency could be years."

But it's becoming increasingly doubtful that Americans are willing to wait that long. In a *TIME* poll taken last week, 47% said they supported withdrawing most troops in a year or so, regardless of conditions in Iraq, while only 40% said the U.S. should stay until Iraq has a stable, democratic government. Half of

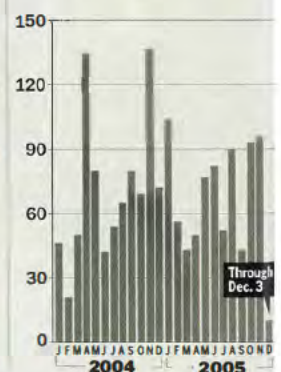


No Relief

The military says it's making progress against the insurgents. Iraqi casualties are down, but last month was the U.S.'s deadliest since January

85% of attacks occur in four provinces: Baghdad, Anbar, Salahaddin and Ninevah

U.S. troop fatalities





CONFINED Suspected rebels detained by Iraqi forces sit in al-Nsour prison in Baghdad

those surveyed said the U.S. was wrong to go to war in Iraq, a figure largely unchanged for the past year. The U.S. doesn't have many options. Despite White House hopes that local security forces can relieve U.S. troops, intelligence officials are not nearly so optimistic that Iraqification will bring stability. "Will we ever see Iraqi security forces capable of crushing this insurgency? Probably not. No," says a high-ranking military-intelligence officer in Iraq. The dilemma is that the longer U.S. forces stay, the more the insurgency is sustained by new recruits, yet withdrawing now could allow al-Qaeda and Iran to consolidate their influence in Iraq, dealing a body blow to U.S. regional interests. Even Washington's staunchest political ally, former Prime Minister Iyad Allawi, says the U.S. is not winning and must have the courage to seek new solutions.

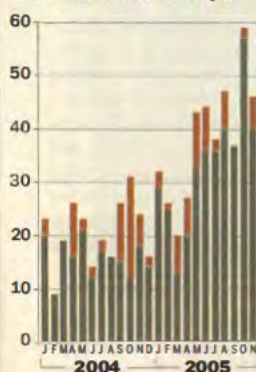
That's why U.S. officials in Iraq are reaching out to the Sunnis, the insurgents and former Baath Party members as part of a program to quell the violence by peeling them away from al-Zarqawi. "The fault line between al-Qaeda and the nationalists seems to have increased," says Ambassador Khalilzad. Here's an inside look at how those splits have started to emerge, how they are redefining the shape of the insurgency in Iraq—and why the U.S. is now turning to some of its old enemies.

INSIDE THE RESISTANCE

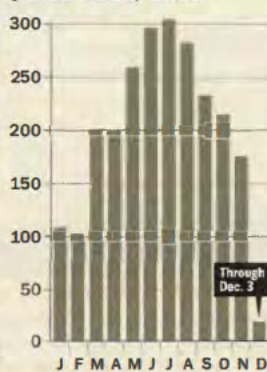
AFTER 31 MONTHS OF FIGHTING IN IRAQ, the U.S. still can't say for sure whom it is up against. Each week coalition forces kill hundreds of insurgents, but there is no end of replacements. U.S. commanders believe that as many as 20,000 fighters are in the field on any given day, a figure that has remained constant for almost two years. Many insurgent groups have become more tactically sophisticated and more lethal, and around 2,000 attacks are launched each month. Training facilities are dotted across Iraq; videos obtained by TIME show classes in infantry techniques and handling weapons. Abu Baqr, a former emir, or commander, of a nationalist militia in Baghdad who was recently released from a U.S. military prison and is rebuilding his team, tells TIME that "in the beginning, even I didn't know how to use most of the weapons, but I learned. We give out weapons from the old army, and the money that funds us comes from wealthy individuals."

Part of the insurgents' resilience comes

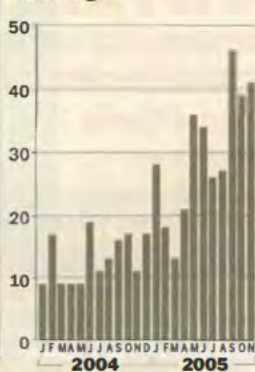
IEDs and car bombings that killed U.S. troops



Iraqi military and police killed, 2005



Multiple-fatality bombings



Sources: Department of Defense, Brookings Institution

Doubts About Iraq...

As the chaos in Iraq continues, Americans are split over what course to take. Nearly half want the troops home in a year, and a small majority says the war has made the U.S. less safe

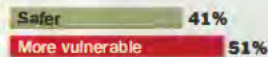
Which comes closest to your view on U.S. troops in Iraq?



How likely is it that the new Iraqi government will be able to build a stable and reasonably democratic society?



Have U.S. actions in Iraq made the U.S. safer from terrorist attacks or more vulnerable?



Was the U.S. right or wrong in going to war in Iraq?

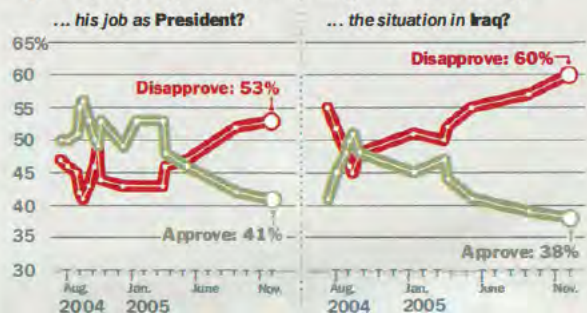


This TIME poll was conducted by telephone Nov. 29-Dec. 1 among 1,004 adult Americans by SRBI Public Affairs. The margin of error for the entire sample is ± 3 percentage points. "Don't know" responses omitted for some questions.

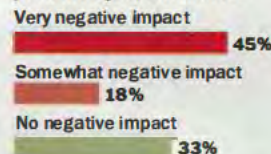
... Bring Doubts About Bush

Concern over the war is also dragging down President Bush's approval rating, and the country is divided over whether the Administration was truthful in making the case to attack Iraq

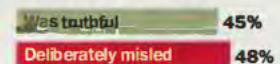
In general, do you approve of the way George W. Bush is handling ...



Have President Bush's policies in Iraq had a negative impact on how you rate his job performance?



Do you think President Bush was truthful and honest, based on the intelligence he was given, when he presented the case for war in Iraq, or do you think he deliberately misled Americans to build his case for war?



WORLD

from their fluidity. "The U.S. is not fighting an army," says Abu Mohammed, a strategist for a prominent Islamic nationalist group. "We hit and move. We're more like groups of gangs that can't be pinned down and can't be stamped out." The vast majority of those groups fall into a category the military dubiously refers to as Sunni "rejectionists." Mostly Baathists, nationalists and Iraqi Islamists, they oppose the occupation and any Baghdad government dominated by Iraqis sheltered from Saddam by foreign-intelligence agencies, such as Iran's or the U.S.'s. But they don't oppose democracy in Iraq. Many voted in the Oct. 15 constitutional referendum and have plans to participate in the Dec. 15 election. Few see a contradiction between voting and continuing to battle U.S. forces. "I voted in the referendum, and I'm still fighting, and everybody in my organization did the same," says Abu Marwan, the Army of Mohammed commander. "This is two-track war—bullets and the ballot. They are not mutually exclusive."

U.S. military intelligence believes that were it not for al-Zarqawi, the nationalists

would have developed a political identity by now. Differences in means and ends have long caused friction among the odd bedfellows of the resistance. From the beginning there have been two wars fought in Iraq, one of liberation and one of global holy war. "Insurgency and terror are two different things," says Khalilzad. The divide

The U.S. is pursuing bargains that may induce Iraqi nationalists to split from al-Qaeda

was evident in Fallujah last year, when al-Zarqawi's foreign fighters dominated the city and the insurgency at large. They took over local militias' checkpoints and neighborhoods, even "arresting" leading Sunni insurgent figures. When the local clerical body, the Association of Muslim Scholars, refused to endorse his suicide bombings and beheadings of Western hostages, al-

Zarqawi branded the association's leader, Harith al-Dhari, a coward. "In Fallujah [al-Zarqawi's] leaders were foreigners who'd come to be martyred," says Abu Marwan. "What did they care about the political process? Nothing."

Though al-Zarqawi's shadow still looms over the broader insurgency, the battle of Fallujah last November forced him to give his organization an Iraqi face. "Among the foreign fighters some dispersed, some were killed, some were captured," says Abu Marwan. And over the past year, U.S. operations against al-Zarqawi's organization have chipped away at its leadership structure and squeezed its sanctuaries. As a result, Iraqis who joined as low-level cell members have risen up the leadership chain. Abu Marwan says al-Zarqawi's aides told him their boss's three top lieutenants are all Iraqis. Another Iraqi operative is Abu Abdullah, who had worked on the security detail for one of Saddam's inner circle and joined an insurgent group formed from the Republican Guard following the U.S. invasion in 2003. After he was captured by the U.S. and sent to Abu Ghraib

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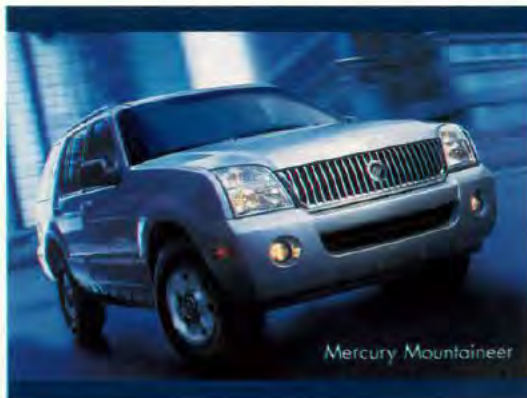
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prison, Abu Abdullah enrolled in a prison-yard madrasah, or religious school; by the time he was released, he identified himself as a holy warrior for Islam. Today he is what the military calls a tier-two al-Qaeda leader, commanding cells in and around Baghdad.

It's through midlevel al-Qaeda operatives like Abu Abdullah, who retains ties to some of his former Baathist comrades, that nationalist groups have newfound influence with al-Zarqawi. "What he's now having to do is balance the hard-line ideology with the softer line of the Iraqis within his group," says Abu Marwan. Sunni insurgent leaders say it was their insistence on voting in the October referendum that discouraged al-Zarqawi from disrupting the poll. For now, the nationalists say they will be voting again on Dec. 15, and they expect al-Qaeda to once more hold its fire. But so far no announcements have been made, and nationalist commanders are worried that al-Zarqawi may decide to go for broke this time. "The debate is being had," says Abu Baqr, the Baghdad insurgent commander. "But soon the orders have to be given."

TALKING WITH THE ENEMY

WHAT DOES THAT MEAN FOR THE U.S.? Ambassador Khalilzad says, "There is a reaching out to non-criminal Baathists." Evidence of shifts within the insurgency in some ways presents the U.S. with its best opportunity since the occupation began to counter parts of the Sunni resistance. Adopting the long-standing attitudes of secular Baathists, some Sunni leaders tell TIME they have lost patience with al-Zarqawi and would consider cutting a political deal with the U.S. to isolate the jihadis. "If the Americans evidenced good intent and a timetable for withdrawal we feel is genuine, we will stand up against al-Zarqawi," says Abdul Salam al-Qubaisi, spokesman for the Association of Muslim Scholars. "We already stood up against him on the Shi'ite issue, and if he doesn't follow us, it will be a bad path for him." Baathist insurgent leader Abu Yousif, who has met with U.S. intelligence officers, says, "The insurgency is looking for a political outlet—once we have that, we could control al Qaeda."

U.S. officials are actively exploring political bargains that might induce nationalists to split with al-Qaeda, including an easing of restrictions on former Baathists' involvement in the new government. Khalilzad says it's time for the "excesses" in the de-Baathification process to be reversed, a call echoed by military-intelligence officials. According to Khalilzad, the U.S. believes that Baathists who committed crimes under the former regime should be tried and senior regime members barred from political office. "As far as the rest are concerned, the time has come to reintegrate them into the political process," he

cal solution could easily crumble if the next government in Baghdad fails to improve conditions in Sunni areas and clamp down on sectarian excesses by Shi'ite militias. And even if the U.S. can lure some guerrillas to the negotiating table, it still faces a seemingly inescapable quandary: so long as U.S. troops are involved in combat in Iraq, there's every reason to believe the insurgency will be able to recruit sufficient numbers of motivated new fighters to do battle with them. Rhode Island Democratic Senator Jack Reed, a former Army paratrooper who was briefed privately by military officials during a visit to Iraq in



ROUNDUP In Husaybah a Marine detains an Iraqi man for questioning while his family looks on

says. Moves have already begun to bring back the guts of Saddam's army, disbanded in the first months of the occupation. "We're reaching out to officers and non-commissioned officers that we're going to put in place in the new Iraqi army," says a U.S. military-intelligence officer, although he adds that the new army will be more "reflective" of Iraqi society than Saddam's was. Having the men they are fighting enter the government will be hard for some U.S. battle commanders to accept, the officer says. "But we're trying to shape an end state."

That's still a long way off. The willingness of moderate Sunnis to pursue a politi-

October, says U.S. commanders are striving for what some describe as "minimal compliance": establishing just enough stability so that "the country is not going to collapse [and] you're not going to have areas that are havens for terrorists" if U.S. troops begin to leave in large numbers. But merely getting to that point may require the sacrifice of more U.S. lives than most Americans are willing to bear. Says Reed: "One of the problems with an insurgency is that every time you turn a corner, there's another corner." The U.S. will have to turn a whole lot more enemies into friends before it begins to see the way out. —With reporting by Douglas Waller/Washington

NEVADA

1

THE PILOT

2

THE
DIRECTOR
OF
OPERATIONS

3

THE
SENSOR
OPERATOR

LONG-DISTANCE WAR

From a base outside Las Vegas, an Air Force squadron fights real-life war games

By **SALLY B. DONNELLY**
NELLIS AIR FORCE BASE

SIX DAYS A WEEK, SHANNON ROGERS kisses his wife and two young kids goodbye and wheels his battered 1989 Chevy Cavalier out of the driveway of his suburban Nevada home. The houses here are cookie cutter, done in beige stucco. Like most of the other dads and some moms in this traditional middle-class community, Rogers heads down Interstate 215, toward his job near Las Vegas, using the 30 minute drive to make the mental transition from family man to workplace professional. But Rogers will end up in a place far different from that of his fellow commuters: when he arrives at work, he will be at war in Iraq.

Rogers, an Air Force major and experienced fighter pilot, is part of an elite group of U.S. troops playing a crucial role in the wars in Iraq and Afghanistan from the U.S.'s

most notorious playground. From Nellis Air Force Base, outside Las Vegas, Rogers controls a Predator, a flimsy drone that has been transformed from a spy plane into one of the wars' most lethal weapons. Predators played a key part in catching Saddam Hussein and have killed al Qaeda suspects in Pakistan and Yemen. In September a Predator tracked 11 insurgents who had attacked a U.S. base in Iraq, then killed them as they fled.

What makes the Predator mission—and Rogers' job—so unusual is the 7,000 miles between pilot and plane. Basing the crew members at home rather than at the front keeps them out of harm's way and saves the military money. Still, "for us, it's combat," says Rogers, 34, who has been deployed to battle zones twice, most recently Iraq this summer. "Physically, we may be in Vegas, but mentally, we're flying over Iraq. It feels real."

Certainly the decisions they face are life and death, as TIME observed when it

was recently granted exclusive access to operations of the Air Force's 15th Reconnaissance Squadron, which commands 25 Predators from Nellis. It was 10:30 p.m. in Nevada, 9:30 a.m. in Iraq, and after two hours of watching insurgents fire a pickup-truck mounted .50-cal. machine gun at U.S. troops in western Iraq, Rogers and the sensor operator with whom he works were given the command to shoot the truck. Both developed a case of what Rogers calls the "trembles"—the nervousness of wanting to kill the enemy but injure no one else, combined with the enormity of taking human lives. Just as Rogers pushed the button to let fly one of the Predator's Hellfire missiles, a car appeared and started to drive toward the pickup. His partner's job is to keep the missile locked on target or, if necessary, divert it to a place where it would cause as little damage as possible. "What do we do, sir?" the partner asked in a shaky voice. "Stay on the target and hope he

REMOTE-CONTROL WAR

- 1 Captain Matt Buehler controls the Predator's flight from 7,000 miles away with a joystick and a computer keyboard; he also fires its missiles
- 2 Lieut. Colonel Matt Bannon oversees the entire Predator operation of the 15th Reconnaissance Squadron
- 3 Airman 1st Class Kimberly Mendoza works the craft's camera and laser targeting device and keeps the missile on track after it's fired
- 4 The flimsy, lightweight Predator flies low and slow but is one of the military's most potent weapons



has a tiny, propeller-driven engine—adapted from a snowmobile's—with a decidedly unimpressive top speed of only 150 m.p.h. Rogers' previous craft, the supersonic F-15 jet fighter, can fly up to 900 m.p.h.

The Predators commanded by the 15th Reconnaissance Squadron are launched and landed by troops at the front, but while they are in the air, up to 24 hours straight every day, they are controlled by Air Force crews sitting in six grounded cockpits at Nellis. Each cockpit consists of

two large armchairs set in front of banks of computer screens with keyboards, control joysticks and live video images. Video is relayed from a camera mounted on the bottom of the Predator not only to Nellis but also to troops on the ground, commanders in the region and the Pentagon. The crew consists of a pilot who flies the plane and

launches missiles and a sensor operator who controls the camera and the laser targeting device for the two Hellfires. The crew members communicate with troops and commanders in the war zone through secure instant-messaging systems as well as radio transmissions routed through a mission controller who sits in a command center at Nellis and issues orders to the crew.

The conflicts in Iraq and Afghanistan have proved the worth of unmanned aircraft—which are cheaper and, because there is no pilot to be shot down, politically more palatable than traditional airplanes. The thousand-plus UAVs in the military's arsenal range from tiny craft that can fit in a soldier's palm to ones the size of business jets. Military analysts are predicting that within two decades, UAVs may even take over

the jobs of pilots flying fighter jets. It makes economic sense; the \$4 million Predator is a bargain compared with the Air Force's newest fighter, the \$354 million F-22.

The effectiveness of the Predator in war zones, however, has translated into stresses in an unlikely place: back home. The operational tempo puts intense pressure on the small group of men and women who deliver death from a distance. The 180-person Nellis unit runs 24 hours a day, seven days a week, with no holidays. The unit has logged more flight hours than any other squadron in the Air Force yet is only 65% staffed. Crew members are so tightly scheduled that when on duty, they have to ask permission to go to the bathroom and cannot leave their chairs unless there is someone to replace them. The troops call the Predator compound Shawshank because it reminds them of a prison. The schedule demands that the men and women change shifts—days, evenings and overnights—every three weeks, which makes fitting into normal civilian life off base nearly impossible. Morale, say many crew members, is suffering. Crew members are experiencing more problems in their personal lives, including separation and divorce.

One may expect that being home would be a plus for the troops, but actually it's often a complication. Soldiers in the field have to cope with danger, but at least they live in one world, whereas their counterparts at Nellis commute daily from war to civilian life. "How many people can say they went to work today and killed or captured a few terrorists?" says Lieut. Colonel John Harris, commander of the 15th. "Our people are proud they contribute to the war from home. But being at home brings some additional stresses. We're very close to a crisis."

Rogers says he feels pulled in two directions, between spending more time helping with the war effort and being an integral part of his family. He rushes home after his day shift to jump in the pool with his kids. "At least I get to sleep in my own bed," says Rogers. But he says being deployed in Iraq was easier because he was isolated from the daily errands and the emotional demands of family life. His wife Laura feels differently about his being home. "It takes the edge off being a pilot's wife," she says, "that at least I know I won't be getting that phone call in the middle of the night telling me my husband has been shot down." ■



MIXED BLESSING For Rogers, with daughter, being home is fraught

43



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DANIAL WILLIAMS

A witness told detectives Williams was "obsessed" with the victim. He was the only suspect until his DNA didn't match



JOSEPH DICK JR.

Living with Williams and his wife, Dick was brought in by police after the crime-scene DNA didn't match Williams'



DEREK TICE

Identified by Dick in a Navy yearbook, Tice confessed but later refused to plead guilty and lost in trial twice



OMAR BALLARD

Detectives were given a letter Ballard wrote admitting to the murder. Only his DNA was found at the crime scene

True Confessions?

Three sailors once confessed to murdering a Navy wife. But another man's DNA is linked to the crime. Is this another case of innocents in prison?

By **BRIAN BENNETT**

IN THE EIGHT YEARS SINCE CAROL Moore's daughter Michelle was brutally raped and murdered in Norfolk, Va., the holidays have always seemed to shine a spotlight on that empty chair at the table. This Thanksgiving was one of the worst. Just two weeks before the feast, three Navy sailors who had confessed to killing her daughter and are serving life sentences filed a petition maintaining their innocence and requesting a full pardon. Wounds Moore had hoped were slowly closing were ripped open again. She went through the motions of the holiday like a zombie, forgetting things, unable to focus, crying. She can't imagine those men going free. She knows they did it, because she heard them—as she listened to their taped confessions at the trials—describe the gruesome things they did to her daughter. "They're guilty. Guilty. Guilty. That's it," Moore told TIME over the phone last week. "How could someone confess to something like that if they didn't do it?"

But giving a false confession is precisely what the three sailors say they did do. In

their Nov. 10 petition to outgoing Virginia Governor Mark Warner, Danial Williams, Derek Tice and Joseph Dick Jr. claim that after Norfolk homicide detectives subjected them to hours of harsh and manipulative questioning, they fabricated elaborate details of a rape and murder that they had absolutely nothing to do with. The three were only part of a larger group of eight men who, over the course of a two-year investigation and three trials, were charged with the 1997 murder of Navy wife Michelle Moore-Bosko. Five of the men at one time or another confessed, but just one, Omar Ballard, had any material evidence linking him to the scene of the crime. (One of the men, Eric Wilson, was convicted only on charges of rape and released earlier this fall after more than seven years in prison; charges were eventually dropped against three others.)

Over the past year, a team of lawyers, approached by the nonprofit Innocence Project, spent thousands of

THE MERCY FILE After granting clemency for a death-row inmate, Virginia Governor Mark Warner could weigh three convicted murderers' request for a pardon

pro bono hours conducting interviews, gathering documents and asking experts to compare the confessions of the sailors with the crime-scene evidence. What the

team compiled was a laundry list of inconsistencies that it hopes will be enough to sway Warner just as the Governor is about to leave office and possibly make a run for the Democratic presidential nomination.

Warner just last week



TIME, DECEMBER 12, 2005

spared the life of death-row inmate Robin Lovitt, citing the destruction of DNA evidence that might have cleared his name. But with no looming execution date for the Norfolk Three, their request could fall to Warner's successor, Tim Kaine.

Hard as their story may be for Carol Moore and others to believe, the Norfolk Three's case is just the latest instance of judicial reappraisal in which DNA evidence seems to contradict previous criminal confessions. In recent years, new DNA sequencing technology has allowed the American justice system to right more than 150 wrongful convictions—and almost a quarter of those had been based on a false confession. The most high-profile example is the 1989 Central Park jogger case, in which five teenagers who had confessed to raping a woman were cleared 13 years later after DNA analysis of evidence couldn't link them to the crime scene.

A 2002 study from Northwestern University showed that 59% of all miscarriages of justice in homicide investigations in Illinois—where a year later Governor George Ryan commuted all death sentences—involved false confessions. But despite such evidence, few confessions are ever thrown out. According to Richard J. Ofshe, a social psychologist at the University of California, Berkeley, and an expert in false confessions, only recently have juries been allowed to hear testimony about the phenomenon, which can occur as a result of coercion, exhaustion or mental impairment. The juries in the Norfolk trials were not among those. Many experts say the solution is to require police to videotape all interrogations and confessions of suspects in capital cases, as is the law in Minnesota, Illinois, Alaska and Maine.

Moore Bosko's murder resonated in Norfolk, a Navy town, because sailors' wives are often left at home alone while their husbands are at sea. The 18-year-old newlywed was slain in the early-morning hours of July 8, 1997, in her apartment in a low-rent brick building. She had been expecting her husband Billy, a Navy signalman, home that day from his weeklong tour of duty. After Billy discovered her body, stabbed in the chest, on the bedroom floor, the local police were under enormous pressure to solve the crime quickly. By the second day of the investigation, the clues seemed to be falling nicely into place; a witness had identified Moore-Bosko's neighbor Williams as having been stalking her.

Williams went to the police station, thinking he was summoned just to answer a few more questions, he told TIME by phone from prison last week. Since he trusted the police and believed in his innocence, he says, he didn't ask for a lawyer. He maintained he had been in bed the entire night of the rape and murder, with his wife Nicole, who days before had had a hysterectomy. (Williams says the detectives never asked Nicole what she remembered, and she died of ovarian

didn't need to look any further. But six months later, Williams' DNA evidence didn't match blood or semen found on the scene or the skin found under Moore-Bosko's fingernails. The detectives' conclusion was that Williams hadn't acted alone. So they brought in Joseph Dick Jr., who had been living with Williams and his wife at the time. The night of Moore-Bosko's murder, Dick told the detectives at first, he was on duty, a fact they never checked. (Navy senior chief Michael Ziegler, who was Dick's direct supervisor, confirmed to TIME that Dick had been scheduled for duty.) Still, after hours of interrogation, Dick too confessed. His father, who says Dick has been slow since getting hit in the head by a swing when he was 3, believes the police could "convince my son to sign anything." But again, his DNA didn't match, and Dick gave the police more names, one of which led to Tice. "In the light of day, you say you wouldn't confess," says Tice over the phone from prison, "but in that room with [the detectives] standing over you, you get worn down."

In March 1999, detectives finally got a DNA match after Omar Ballard, a convicted rapist and onetime acquaintance of Moore Bosko's, confessed in a graphic letter to a friend that he had killed her. In his first audiotaped confession, given after just 20 minutes of questioning, Ballard described the rape with previously undisclosed details from the crime scene and said he had acted alone. Ballard changed his story at the behest of the detectives, the petition says, claiming he had perpetrated the crime along with four other men. In the petition, Ballard stands by his original claim that he had acted alone.

Still, even Ballard's testimony won't necessarily be able to turn back the clock. While Tice firmly protested his innocence through two separate trials, both Williams and Dick ended up pleading guilty. The reason may be understandable in retrospect—both their lawyers told them to stick to the story to avoid the death penalty—but the fact that they affirmed their confessions doesn't help their case. No wonder prosecutor D.J. Hansen, who put the men behind bars, says there is nothing new in the petition that wasn't tested in the normal judicial process. "Justice was done," he says. But as Carol Moore has learned the hard way, in the age of CSI and DNA, justice is never truly done, even if it appears as if the truth has already spoken. ■

"They're guilty ... How could someone confess to something like that if they didn't do it?"

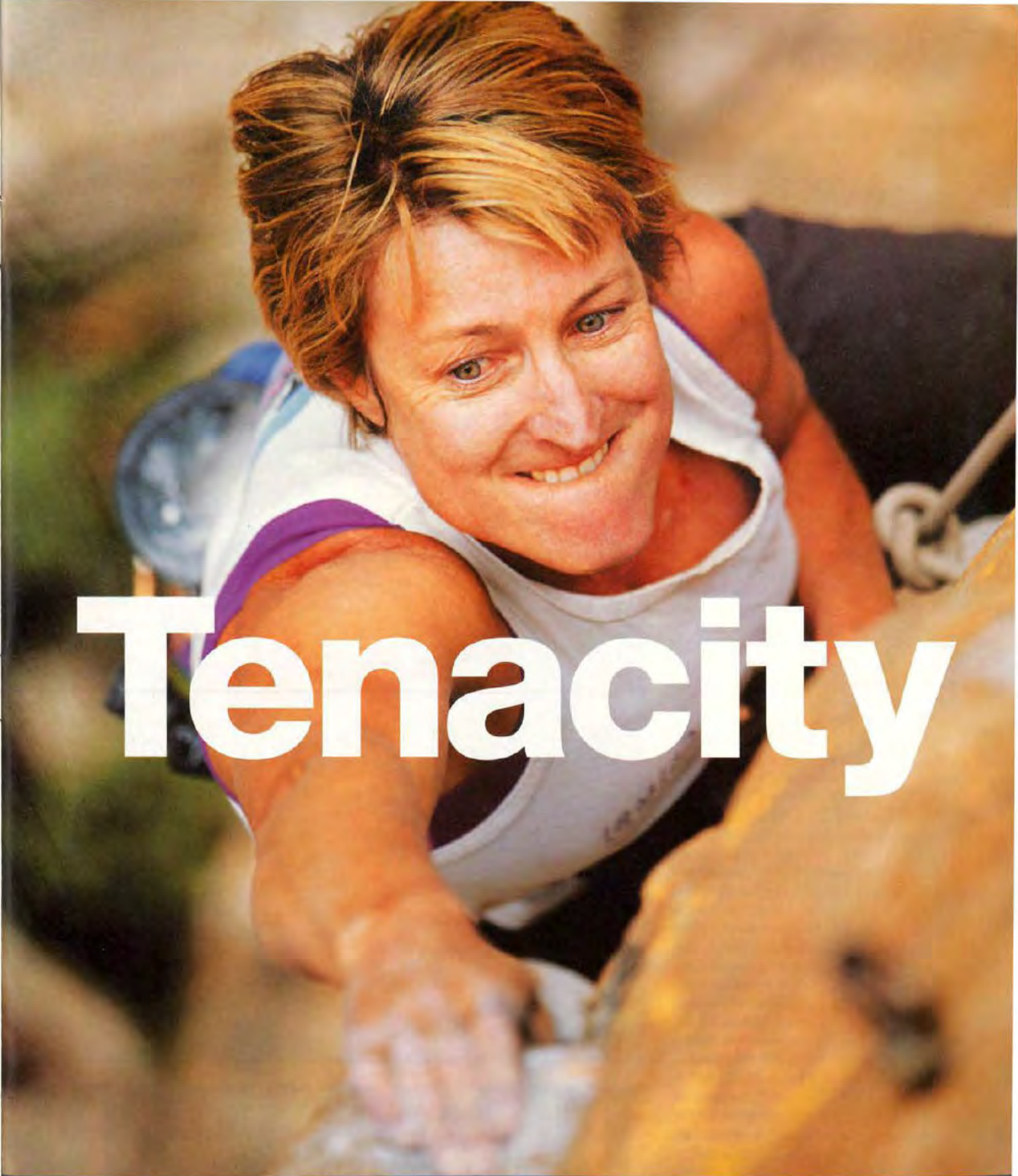
—CAROL MOORE,
mother of the murder victim



THE VICTIM Michelle Moore with her future husband Billy Bosko at their high school prom

cancer three months later.) But it was at the station, in a windowless room, that the detectives began to browbeat Williams, and he began to, as he now puts it, "question my own memory." By his account, they told him they knew he was obsessed with Moore-Bosko and had raped and killed her. They told him they had an eyewitness who saw him leave the victim's apartment. (No such witness existed.) They told him that unless he confessed and cooperated, he would face the death penalty. Williams asked to take a lie-detector test, which he passed, but he says the detectives told him he had failed.

After close to 13 hours, the detectives had his confession and, in their minds,



Tenacity

If you're not prepared to hang in there you'll never make it happen. rbs.com

Make it happen



DNA Genotek Inc. Exhibit 2005 Page 51
Spectrum Solutions L.L.C. v. DNA Genotek Inc. IPR2022-01347

By DANIEL KADLEC

AFTER 28 YEARS AS A FLIGHT ATTENDANT, the last few of which brought pay cuts totaling 30%, John Battelli decided it was time to move on. So last week he quit U.S. Airways—with an uncertain pension, mounting credit-card debt and hopes of growing his fledgling personal-trainer business. “My fear is that my ability to earn has fallen by the wayside,” says Battelli, 53, of Westminster, Colo. As Christmas approaches, all that weighs heavily. “Come hell or high water,” he says, “I’m going to make sure my children have the same holiday magic that I had as a child.” He’ll pay for the snowboard his teen son wants through “sheer will,” and takes comfort in knowing he has a backstop of untapped home equity.

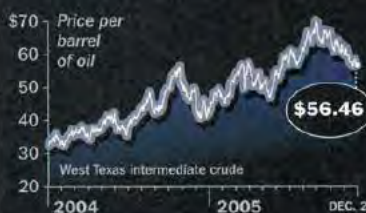
Yes, it’s that time of year again, when the most prolific shoppers—and woeful savers—on earth, Americans, run amuck in stores as if they were Kris Kringle with his elves on strike. It matters little that shoppers are already neck-deep in debt or that even those doing well have cause for stress, given that sky-high home-heating bills are just a month away, inflation and interest rates are rising and the housing market is slowing—all of which is eating into most budgets or soon will be.

Yet shoppers are tossing aside such concerns, seduced by their image of what the holiday season should be, a buy-now-pay-later culture and price cutting that is so aggressive that when all is said and done, retailers may have sold a record number of things and still not made a dime. Heavy discounting is a dicey strategy, sapping profits and exhausting shoppers. An expected sale of \$18 billion in holiday gift cards promises to keep the malls full in January. But then, says Ken Goldstein, an economist at the Conference Board (which tracks the marketplace), “we’re in for a long winter’s night.”

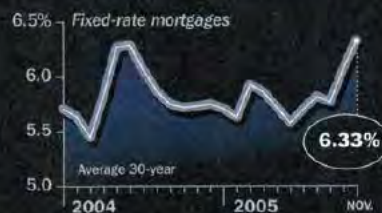
For now, discounting is bringing shoppers out in force—literally. When a Wal-Mart in Cedar Hill, Texas, opened at 5 a.m. the day after Thanksgiving, known as Black Friday, Brittany Price, 19, was nearly trampled as she angled for a \$68 DVD player. “I had to climb a display and hang on,” she says. “It was funny watching people get so worked up over spending money. How often do you see that?” More and more often, it turns out.

“There is a large number of people, mainly women, who do not play sports or see much point in watching professional sports,” says John Quelch, a professor of marketing at Harvard Business School. “They have a com-

Energy costs are draining our budgets ...



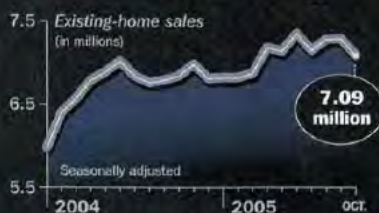
... mortgages and other rates are on the rise ...



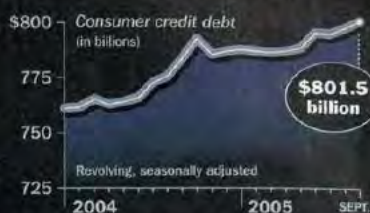
THE MIND OF

Why we're filling the malls even as backbreaking en

... the housing market is beginning to cool ...



... and credit card debt is at an all-time high ...



Sources: Department of Energy; FreddieMac.com; Realtor.org; Federal Reserve Board

petitive spirit that manifests itself on Black Friday." Adding to the mayhem, says Lars Perner, a marketing professor at San Diego State University, is that "people are tired and frustrated" after skimping for months to pay higher gasoline bills. "It's like the people who diet," he says, "and then Christmas comes, and they overeat."

The bingeing began with a bang the day after Thanksgiving. The pace has since slowed, and the register isn't ringing much at stores like Nordstrom and Saks, which are struggling to project value and pizzazz. Not that they aren't trying. Nordstrom is offering to take your list over the phone, wrap every item and give you the whole bundle curbside. But service goes only so far when others are competing on price, says Paco Underhill, president of retail consultant Envirosell, who estimates that "10% to 15% of customers are walking out the doors of the mass merchants empty-handed."

Adding to retailers' worries is the fact that most shoppers aren't sure whether they should pop a cork or a Xanax. According to a TIME poll, 27% of respondents think the economy will deteriorate next year, while 26% feel it will improve. Some 38% said they are spending less this season, while 15% said they are spending more. Those mixed messages have economists puzzling over just what's making the consumer tick this holiday season. But they learn more about the science of shopping all the time, and a close look reveals how we are mustering the fortitude to spend our way through the economy's cross-currents:

JOBS. Some folks are strapped after years of a jobless recovery. But this year nearly 2 million jobs have been created in the U.S., and wages and salaries are on the rise. The momentum was reinforced last Friday, when the Labor Department reported 215,000 new jobs in November. "There is a huge disconnect between the headlines and reality," says economist Ed Yardeni at Oak Associates, an investment firm. "It's a prosperous world." But in the consumer's mind, nothing trumps job security. Reuben Kuruvila, 26, of Atlanta, plans to spring a fur coat on his wife. "I really can't tell what the economy will do," he says, but adds that he expects a decent raise after completing management training at the hotel company where he works.

STOCKS. Have you checked your 401(k)? The balance may be below where it was five years ago. But it's moving up. The Dow Jones industrial average has gained 6.5% over the past six weeks, is in positive territory for the



... so what makes us spend like crazy?

Doors opened early at Wal-Mart stores like this one in Renton, Wash., where shoppers battle over discounted clothes and DVDs

MEGHAN E. JONES—KING COUNTY JOURNAL/PA

A SHOPPER

energy costs and other ills shrink our spending power

TIME, DECEMBER 12, 2005

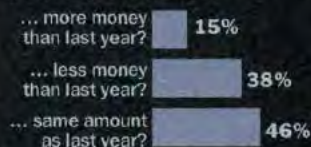
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TIME POLL

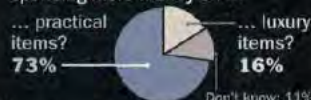
■ How would you rate economic conditions in this country today?



■ On your holiday shopping this year, are you spending ...



■ This holiday season, are you spending more money on ...



WAKE-UP CALL : Shoppers show their fervor for deals by lining up predawn on Black Friday for hyped sales at Circuit City, above, Best Buy, left, and Target, below



BUSINESS

year and is within striking distance of its all-time high of 11,723. Fueling the rise: companies are flush with profits, buying back shares and raising dividends. "I don't factor it into decisions like shopping," says Scott Fuselier, 32, a sales manager in Atlanta, of his rising 401(k) balance. "It's so long-term." Yet that is measurable wealth for the half of the population that owns stocks. Confident in his net worth and prospects, Fuselier is renovating two rooms in his home for Christmas.

ENERGY. The high cost of oil, electricity and natural gas is the greatest economic worry for Americans, according to the TIME poll; 69% call it a major concern. But it's not as much of a drag on spending as you may think. Yes, consumers will spend \$24 billion more on energy this quarter than in the same period last year, a 21% jump. That hardship is prompting some to rethink holiday splurges. But prices have come down from their post-Katrina highs, far enough to spur a spike in consumer confidence. For a while, says college student May Rashid,

22, in Fort Worth, Texas, "gas prices were taking all my money," and she planned to cut holiday spending. Now, with gas prices falling, she figures the crunch will be manageable and is enticed to keep shopping because "I keep finding things that I know people would really want."

INFLATION AND INTEREST RATES. Gold hit \$500 per oz. last week, the first time it's reached that mark since 1987, a sign that inflation may be heating up. To avoid that, the Federal Reserve has been boosting rates for two years, making all borrowed money more expensive. That troubles Jodi Legge, 41, of Hudson, Wis., who expects that her home-equity debt is going to cost more every month. So she and her husband Ed are sticking to the holiday budget they agreed on. Still, "we haven't cut back," Jodi says, although she's redirecting money to more practical places.

HOUSING. Everyone is worried about a bubble that could burst as interest rates

rise, forcing millions with floating-rate mortgages to come up with more cash each month or sell. Yet when it comes to shopping right now, such troubles are a distant concern. Lucy Garrett, 55, an analyst for the Denver Public Schools Retirement System, has been in her house for 28 years and upon selling her deceased aunt's home this year realized how much equity she has built. So if she inadvertently busts her careful Christmas Club budget, she says, "I know it would be O.K. because I have money in other places."

Next Christmas, though, may be a different story for many as the impact of higher costs for food, fuel, medicine and mortgages comes home to roost. And by then, says Mark Zandi, an economist at Economy.com, home prices may be stagnant or edging lower. That's when the "home ATM will shut down," and with it, possibly, the spending urge. —With reporting by Jeremy Caplan/New York, Sarah Sturmon Dale/Minneapolis, Greg Fulton/Atlanta, Rita Healy/Denver and Adam Pittluk/Fort Worth

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9/05 HURRICANE KATRINA

*This chapter took me
to the Gulf Coast.*



Angela Peters
Red Cross Volunteer
Raleigh, NC



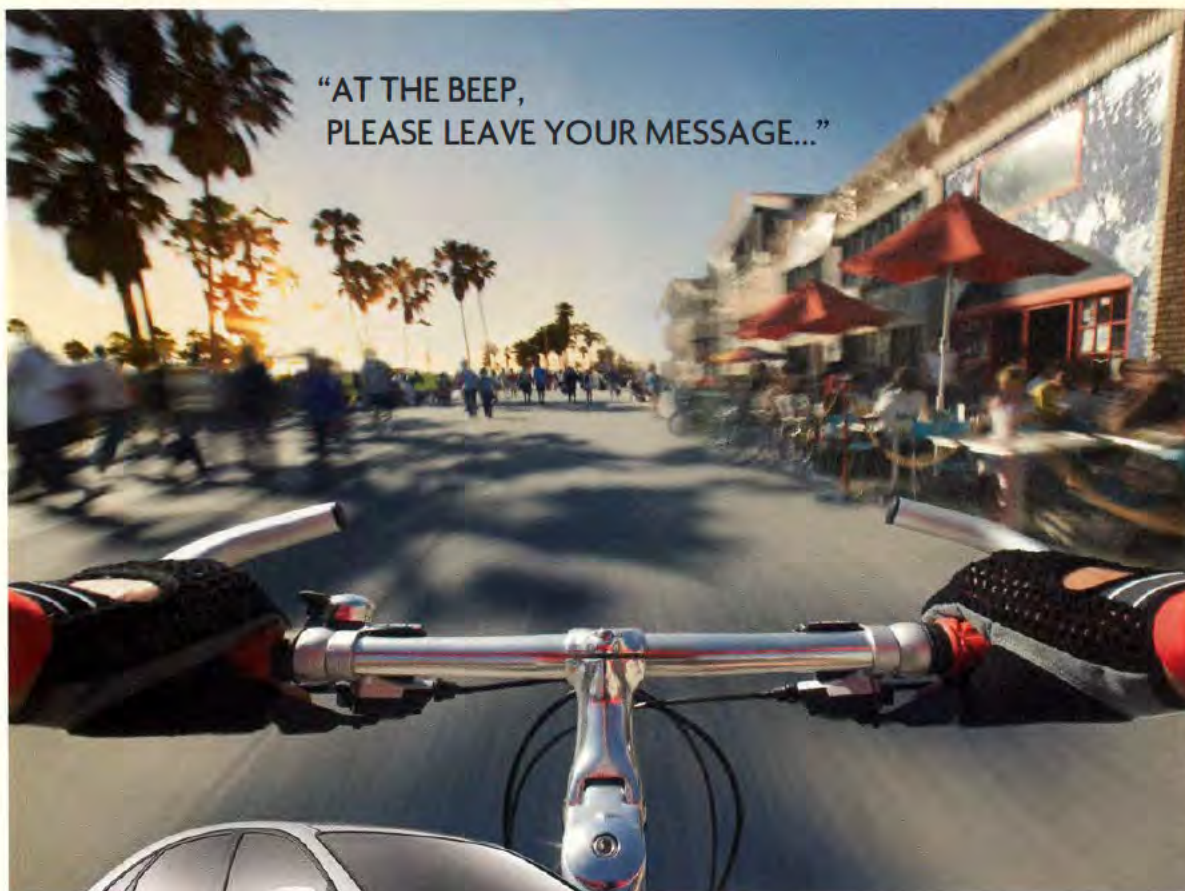
When you help the Red Cross, you help America.

Immediately after Hurricane Katrina hit, I joined others from my chapter and headed for the Gulf Coast. We delivered food and water, provided shelter and even counseling.

At its core the Red Cross is a network of local chapters supported by their communities, prepared to respond to local, national and even international needs. Sometimes that means helping one victim of a house fire, other times that means helping hundreds of thousands of disaster victims.

I HOPE you will volunteer your time and donate money to your local Red Cross chapter—so we can be there for another chapter.





"AT THE BEEP,
PLEASE LEAVE YOUR MESSAGE..."



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JANUARY 2006
GLOBAL BUSINESS

TIME
BONUS SECTION

A Flash of the Future

TIME unveils the World
Economic Forum's Tech
Pioneers, who are changing
our lives in amazing new ways



TIME
ONLINE EDITION

For a complete list of the
companies that earned the
World Economic Forum's
Technology Pioneers
citation, please go to
time.com/techpioneers

Photograph for TIME by
Andreas Pohlmann

Markus Brehler, CEO of
EnOcean, with his company's
wireless sensors, which can
be run on vibrations

DNA Genotek Inc. Exhibit 2005 Page 57
Spectrum Solutions L.L.C. v. DNA Genotek Inc. IPR2022-01347

NOT THAT WE NEEDED IT, BUT 2005 REMINDED US AGAIN THAT fossil fuels are finite and that poverty and terrorism seem to be inexhaustible. The World Economic Forum Technology Pioneers this year include entrepreneurs who are working to alleviate pain at the pump as well as human suffering. They produce energy-sparing new approaches to solar power, nanolighting and even a handheld haz-mat detector. Others are doing amazing work in creating synthesized disease killers, minting silver bullets for pathogens or using stem cells to cure heart disease. On the security front, there are new analyzers, sensors and antivirus hardware that could make our cities and computer networks safer. Finally, someone invented a way to clean up the e-waste left over when all that technology goes out of date in the next minute and a half. —By Bill Saporito

Trogolet lets loose some of AgION's silver-based bug-busting powder, which is baked into polymer pellets



ASIA KEPNA FOR TIME

DAVID WALDORE FOR TIME

"It's a brand-new technology. We're going to do something that has an impact on people's lives."

—Conrad Burke

JEFFREY TROGOLO
AGION TECHNOLOGIES
WAKEFIELD, MASS.

Hygiene's Silver Bullet

WE LIVE IN A DIRTY WORLD. MICROBES FILL the air, crowd our pores and carpet everything we touch. Shake a hand or open a door, and you leave with a menagerie of hitchhikers and parasites—yeast, bacteria—clinging to your palms. As any hypochondriac will tell you, cleaning up is a quixotic quest. The only hygienic surface is one that sterilizes itself. And how many such surfaces exist?

Lots of them, if AgION Technologies has its way. The privately held firm produces an antimicrobial material that gives anything in which it is embedded an enduring resistance to bacteria, yeast, algae and mold. AgION, which has raised \$40.5 million in capital, works with manufacturers up and down the



Burke, standing above the East Bay near Oakland, Calif., believes his nano-silicon crystals will light up the future

CONRAD BURKE
INNOVALIGHT
SANTA CLARA, CALIF.

Let There Be Nano

EINSTEIN EXPLAINED IT A CENTURY ago and won a Nobel Prize. Now we make use of it every day—inefficiently. It's called the photoelectric effect: light can produce electricity. Electricity produces light. But solar energy still costs more than the fossil-fuel variety. And our lightbulbs and fluorescent tubes waste half their energy.

InnovaLight Inc. wants to help. The company's process for reducing silicon to nano-size, light-sensitive crystal dots could revolutionize solar energy and lighting. The start-up, which just moved to Santa Clara from St. Paul, Minn.,

claims it will be the first to market with a silicon nanoparticle solvent—silicon “ink”—that would mean lower-cost printing of silicon nanoparticles on polymer sheets. That, in turn, would mean lower-cost solar energy because nanosize silicon is a more efficient converter of solar energy to electricity than previously used materials. It could also mean a nanoparticle light “bulb” that would outlive you. What's more, silicon (as in sand) is abundant and harmless. “It's brand-new technology,” says InnovaLight CEO Conrad Burke, 39. “We're in a leading position. We're going to do something that has an impact on people's lives.”

Any lighting technology on a silicon platform could “drive volume economics and mass market,” says Mario Paniccia, director of Intel Corp.'s photonics technology lab. Researchers in business and academia are scrambling to create such flexible solar cells because existing solid silicon solar panels are heavy and unwieldy. Flexible, or conformal, solar cells could wrap around surfaces and pack easily for transport. A solar-cell liquid could even be painted on.

InnovaLight is exploiting the work of Brian Korgel at the University of Texas in

supply chain to incorporate its bug-busting stuff into everything from water filters to doorknobs and even the casing of a cell phone, the Motorola i870.

AgION's microbicide is silver, a metal long known to have potent anti-infective properties yet lacking the tendency of many organic agents to generate resistance. Trouble is, silver atoms have to be in an ionic (charged) state—as they are in solutions of silver salts—to kill microbes. Pure silver doesn't release enough ions to pack much disinfecting punch. Its salts, on the other hand, wash away too easily.

AgION worked around those difficulties by encasing silver ions in a type of powdery ceramic called zeolite. Each grain of zeolite is riddled with submicroscopic tunnels that are stuffed with silver ions. It releases the ions only in exchange for others—say, sodium ions in a salty drop of sweat. So ion-rich liquids, in which bugs often thrive, activate AgION's microbicide. “The ceramic delivers enough silver to be effective,” says AgION

CEO Jeffrey Trogolo, “but not so much that it loses effect over its lifetime.”

Though AgION did not invent the ceramic—a Japanese firm did that—the company has unleashed its powers since licensing the technology in 1997. It has engineered 14 grades of the material to meet various needs, from coating frequently washed factory floors to shielding intravenous catheters. One AgION customer, Wellman International's polyester unit, has infused fibers with AgION's compound and is testing ideas like germ-resistant T shirts, air-conditioner filters and pillows. “We believe it fills a need that exists in the marketplace,” says the unit's business manager, David Whitley. “It has value—and, bottom line, it works.” AgION, for its part, is working with 60 companies, including DuPont and Reebok. “We're not introducing any new chemicals to the world,” Trogolo points out. “We're just using silver contained in what is essentially sand.” Only it's the sort of sand he'd like to see getting into everything. —By Unmesh Kher

🔬 This material is less toxic than table salt and less irritating than talcum powder. 77

Jeffrey Trogolo

TIME BONUS SECTION, JANUARY 2006

A3



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KEN XIE
FORTINET INC.
SAN JOSE, CALIF.

Walling Off Computer Viruses

IN THE FIGHT AGAINST COMPUTER VIRUSES, Ken Xie, 42, has made himself the first line of defense. It's a familiar role for the 6 ft. 5 in. Xie, who was a professional volleyball player in his native China before immigrating to the U.S. in 1989. Instead of stuffing spikes at the net, he deflects attacks on computer networks. His defensive techniques have revolutionized the network-security industry. "I think that the Internet is exciting and always changing," says Xie. "With each new application, there are new viruses. There are constantly new threats, and I wanted to get into the new stuff."

While working with software-based firewalls—layers of protection that block junk e-mail and attacks on computers from hackers and viruses—Xie noticed that those programs slow down networks. So, like a true Silicon Valley entrepreneur, he retreated to his garage in his spare time and started working on a new approach. He envisioned a remote piece of hardware that screened Internet content and didn't inter-

Fortinet CEO Xie says computer viruses must be stopped before they enter networks

fere with application software. In 1997 Xie, an engineering graduate from Tsinghua University in Beijing, launched the network-security company NetScreen, which was eventually acquired by Jupiter Networks. That success allowed him to raise venture capital in 2000 to found Fortinet Inc., of which he is CEO.

Since then, his company has developed the FortiGate security system, the only ASIC (application-specific integrated circuit) accelerated network-based anti-virus firewall system. As viruses attack a computer network, the FortiGate system, like a bouncer at the entrance to a popular nightclub, screens out the rogue operators before they can get to the computers. "Computer viruses are like the avian flu," Xie says. "You can vaccinate each person against the flu, or you can stop the virus before it gets there."

Fortinet, which is shorthand for Fortify the Internet, proved so popular with network administrators that to date, the company has shipped more than 100,000 FortiGate appliances, ranging in price from \$500 for units designed for personal use to \$300,000 for devices meant for large enterprises. With that kind of sales record, Xie plans to take the company public soon.

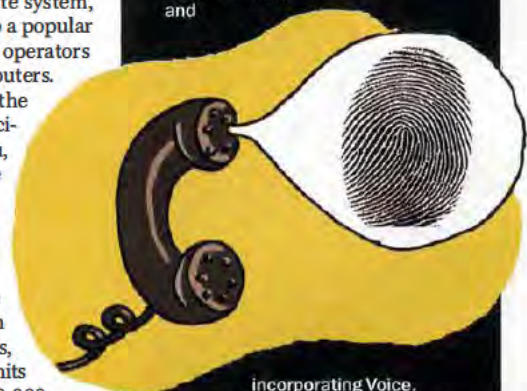
As attacks on computer networks become more sophisticated and dangerous, security solutions continue to be a priority for Xie. His company is working on the next generation of security devices, which will deal with evolving threats, including spam e-mail, spyware and worms (self-replicating computer programs that, unlike viruses, do not need other programs to propagate themselves). It seems that Xie still hasn't completed his career as a blocker. —By Matt Brown/San Jose

The Voice Of Internet Security

In 2000, Michael Kramer, a former fashion-industry executive, was the victim of a hacker who stole his identity and went on a shopping spree with his credit card info. It was one of his first encounters with the wilds of the Internet. Kramer, 43, whose background is in marketing, saw opportunity in the crime. "The initial idea was to set up voice authentication to avoid that kind of thing again," he says.

Now he is the CEO of Voice.Trust AG, which aims to eliminate that kind of identity theft. He teamed with engineer Raja Kuppuswamy to create a system that uses a combination of a password or PIN and voice authentication to securely establish ID.

The idea is hot enough to entice IBM into taking a 5% stake in the company and

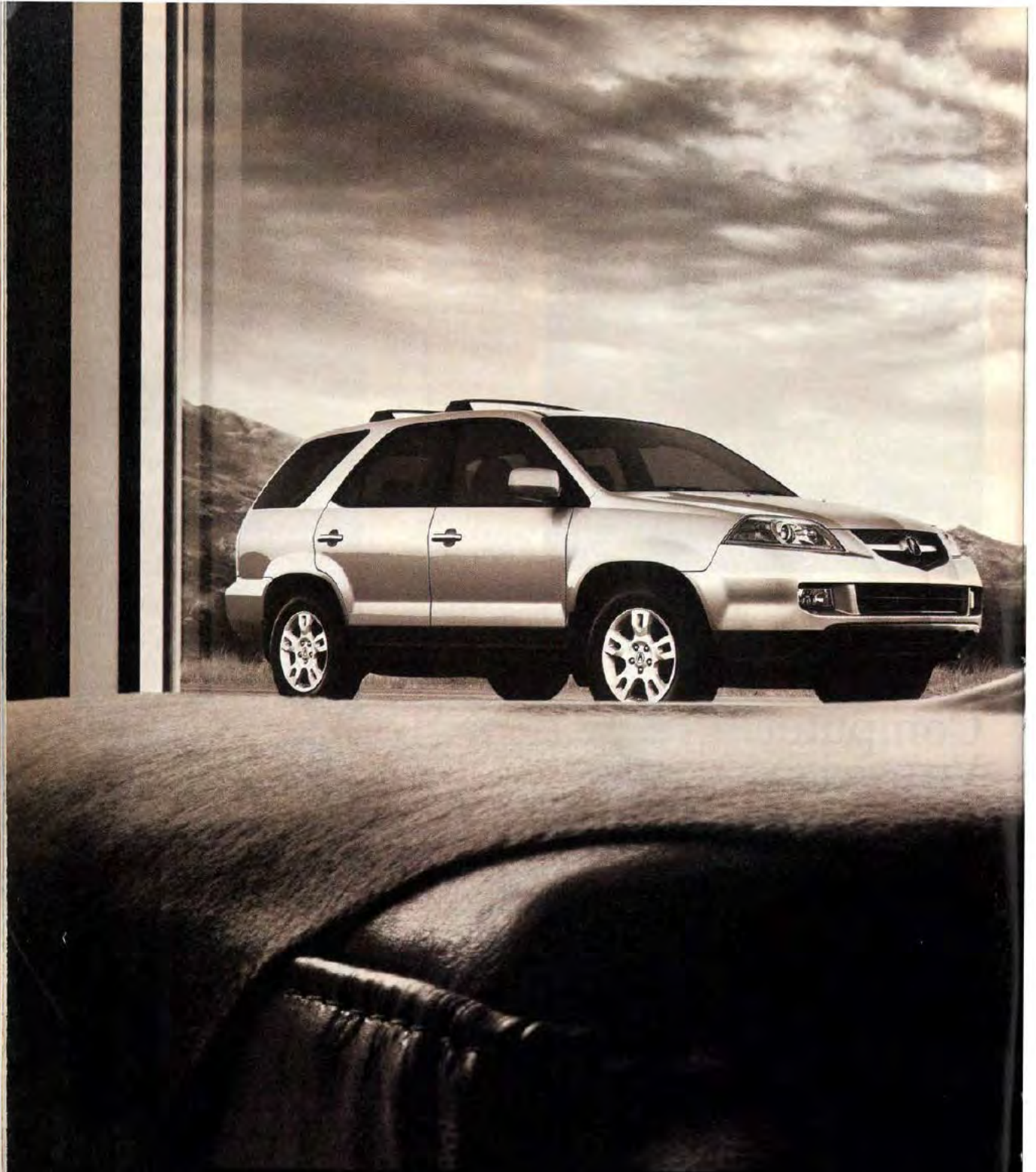


incorporating Voice.

Trust into its online-commerce platform. Other big customers include Microsoft and HSBC. Voice.Trust is being used within corporate networks for employee verification.

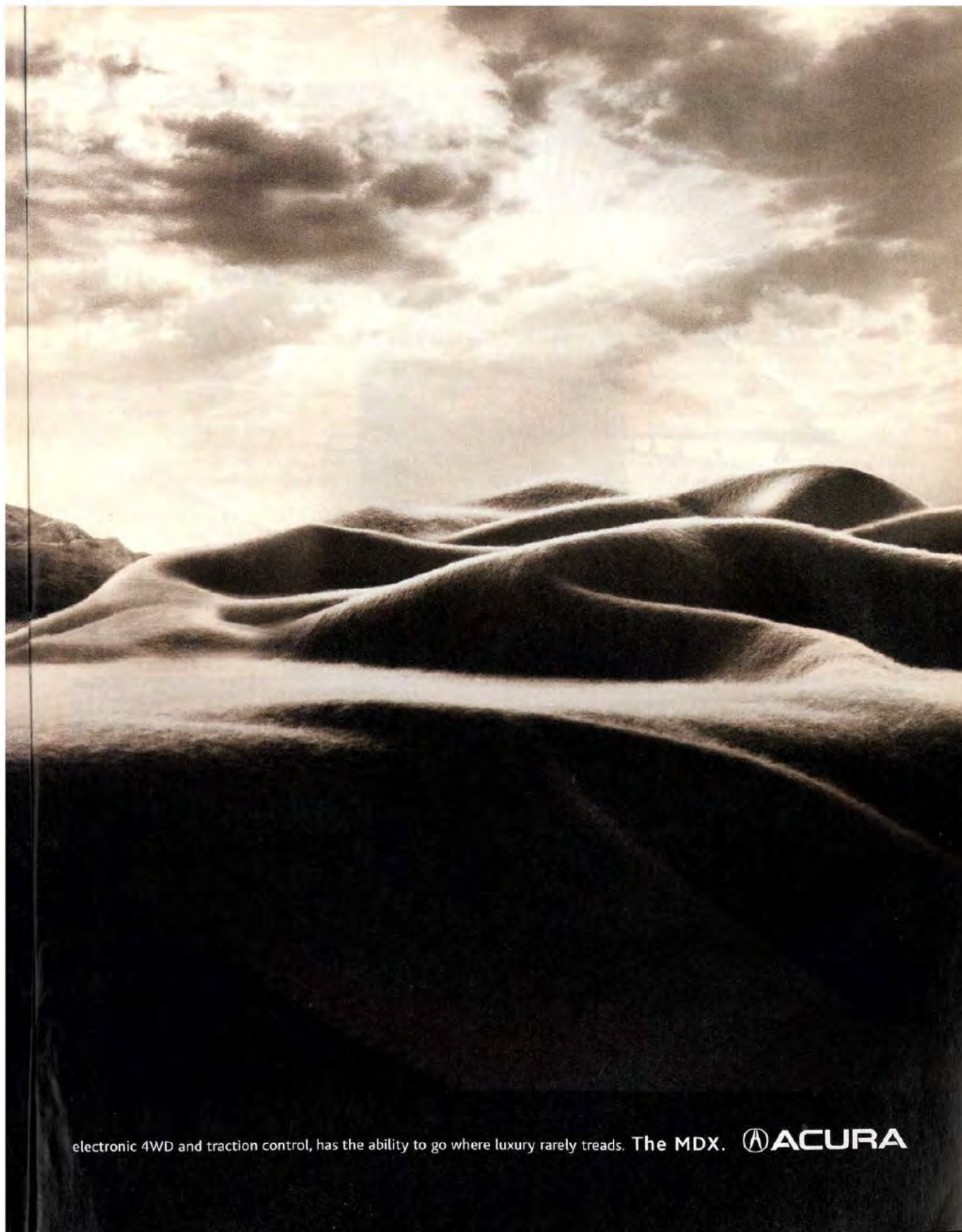
The company has also targeted online commerce, teaming with Internet telephone service Skype to test Internet-based voice authentication that verifies transactions on the fly for the likes of Amazon and eBay. Your plastic may still be vulnerable, says Kramer, but "no one can steal your voice." —By William Boston/Berlin

ILLUSTRATION FOR TIME BY MARC ROSENTHAL



At one with both worlds. Don't be deceived by its finely sculpted lines and elegant demeanor. The Acura MDX, with

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electronic 4WD and traction control, has the ability to go where luxury rarely treads. The MDX.  **ACURA**



imageRUNNER 6570



imageRUNNER 5570

The entire department heard Bob exclaim, "Cool!" as he used the Web browser on the new imageRUNNER 6570 to access and print his company's 4th quarter sales results.

Bob's company isn't doing business as usual. What about your company? While "cool" definitely applies to the new Canon imageRUNNER® 70 Series, "groundbreaking" is more apt. Both the imageRUNNER 6570 and imageRUNNER 5570 have the industry's first embedded Web access function – in other words, a full-size user interface panel that actually lets you call up Internet or intranet data without the use of a PC, right from the device. Once you've done that, you can print the forms and documents you need to work more efficiently and productively. Of course, there are a host of other great features that help expand the potential of your workday. And that's definitely not business as usual.

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DARYOOSH VAKHSHOORI
AHURA CORP.
WILMINGTON, MASS.

Name That Powder

IT STILL HAPPENS IN MAIL ROOMS AND AIR-ports: a suspicious unidentified substance turns up, and activity freezes for hours until a haz-mat team can make a safety assessment. But Ahura Corp.'s FirstDefender—a handheld instrument that recognizes thousands of chemicals—can give cops and firefighters an immediate analysis of just about any substance.

FirstDefender uses lasers and a type of optical analysis known as Raman spectroscopy. "It shines a light on an object and looks at the scattered light coming back, which carries the optical signature of the material, whether it's a liquid or a solid," explains Ahura founder and president Daryoosh Vakhshoori. "You can read



Vakhshoori's handheld gadget can identify substances from arsenic to explosives to zinc

the substance as if it had a bar code, observing if the white powder you see is sugar, aspirin or something more dangerous."

In its current form, FirstDefender is a portable, 4-lb. box that costs about \$30,000, which means you won't find it in every cop car quite yet. But Ahura plans to slim the device to the size of a cell phone and reduce its cost with advances in technology to make it a more practical everyday tool for emergency responders.

FirstDefenders have already been used in the post-Katrina cleanup to identify sludge and in law-enforcement and terrorism investigations. They have even shown up on the television show *CSI*. The instrument could also soon test for counterfeit pharmaceuticals that might otherwise be hard to detect. "It's another eye you can use to see the material around you," says Vakhshoori, "like Superman looking right through a wall." —By **Jeremy Caplan**

Locking Up Your E-Mail: A New Approach to Encryption

Having helped Sergey Brin and Larry Page edit their initial business plan, which turned into some company called Google, Guido Appenzeller knows a fair amount about start-ups. Although he passed on an opportunity to join his Stanford buddies in taking their venture public—what's a couple of billion dollars between friends?—Appenzeller, 34, has followed their lead, co-founding Voltage Security, a fast-growing firm that has more than 150 clients.

Voltage provides encryption software to banks and health-care providers to safeguard financial and medical records. The company also works with government agencies and ran trials with the Department of Homeland Security and Department of Defense to develop secure methods of transmitting and storing government

information more quickly and cheaply than current encryption systems allow.

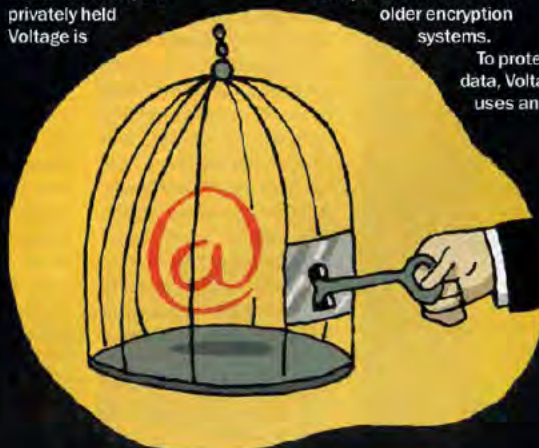
With clients that include California's department of health services, the privately held Voltage is

increasing its revenues some 30% every quarter. One advantage the small company has is speed. It takes just days to deploy Voltage software, compared with months for older encryption systems.

To protect data, Voltage uses an

identity-based encryption developed by one of Appenzeller's Stanford professors, Dan Boneh. The prof also taught Rishi Kacker and Matt Pauker, both of whom helped found Voltage—stop us if you've heard this one—while working out of their Stanford dorm rooms in 2002.

Voltage isn't fail-safe, nor does it claim to be. "If attackers spend a million dollars to break into a hospital, we can't prevent records from being stolen," says Appenzeller. But, he says, "we make it much harder for them to access private information digitally." E-mail and data protection is just a start. With growing concern about identity theft, Voltage is developing new methods for securing instant messaging and voice-over-Internet-protocol telephone calls. —J.C.



TIME BONUS SECTION, JANUARY 2006

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BILL GROSS
ENERGY INNOVATIONS
PASADENA, CALIF.

A Web Vet Gives Solar A New Shine

BILL GROSS'S AMBITION TO TRANSFORM solar power faces an obstacle so insurmountable that his team is all but resigned to working around it: the Earth's rotation. "Using solar energy would definitely be easy if the Earth weren't turning," Gross says. "The Earth's turning is the real problem."

The planet's spin is partly what makes solar-generated electricity as inefficient as it is expensive. Think of those unsightly, bulky panels that hippies, Hollywood stars and even the President have affixed to their dwellings. They can soak up peaklight only at noon, when the sun is highest in the sky. Why not design a system that captures that much sunlight all day long?

Energy Innovations, launched in 2000,

designed a generator that uses 25 mirrors to bounce light toward a silicon collector that is smaller than a square foot. A microchip continuously analyzes the light hitting the collector and repositions the mirrors to catch the most photons.

Gross's first customers, all businesses with idle roof space, will test the system next year. Gross can't compete economically with utilities burning coal or natural gas. But installing the Sunflower costs about half as much as conventional solar, or about \$4.50 a watt, with a minimum order of 100 kilowatts. If that price drops to half that within five years and production scales up, Energy Innovations could be positioned to sling stones at King Coal.

Few people know the difference between a great idea and a great business model as intimately as Gross. As the founder of Idealab, the technology incubator, Gross has become a multimillionaire by funding such Internet start-ups as CitySearch, now owned by Ticketmaster, and Overture Services, the Web marketing firm that Yahoo! bought in 2003 for \$1.6 billion. Idealab productions that, painfully, seemed great at the time—Petsmart.com and eToys.com—failed in two of the most dramatic flameouts in the dot-bomb collapse.

Yet everything in the solar market is poised to explode: capacity, sales and competition. Michael Rogol, a solar analyst with the brokerage CLSA, says solar sales will expand from about \$12 billion this year to \$40 billion in 2010. There are hundreds of start-ups that, like Energy Innovations, have yet to make a dime. "If they can get their costs down, they have a very promising commercial appeal. But that's a very big if," he says.

There's always Plan B, a daunting cosmic hurdle. Says Gross: "I don't know if we can get everyone to run in the direction of the Earth's spin to stop it from turning." —By Eric Roston

The 25 mirrors on Gross's Sunflower direct light to a silicon collector, which converts rays to power

The Cloud's Polk is banking on Internet phone service, VOIP, to expand his wi-fi empire

GEORGE POLK
THE CLOUD
LONDON

Producing Static for the Competition

GEORGE POLK HAS RATTLED CELL-PHONE carriers once before. The American, 42, runs a network of wi-fi hot spots called the Cloud that allows laptop and gadget users to surf the Web for around \$8.50 an hour or \$17 a month at 7,500 cafés, hotels, pubs, airports and other public places in Britain, Germany and Sweden. That's a service that cell-phone companies like Vodafone and Orange are struggling to sell via their 3G mobile-phone networks. Wi-fi, which uses low-cost, wireless Internet connections, has stolen some of the thunder. "I wanted to build a broadband wireless business for the



JOE PASTOR



MARKUS BREHLER
ENOCEAN GMBH
OBERHACHING, GERMANY

Smart Sensors, No Batteries

AT A TRADE FAIR FOUR YEARS AGO, MARKUS Brehler found himself in an enviable position for someone contemplating the launch of a company. To investigate demand for a sensor that can generate its own power, Brehler pretended he already had a company. "We were curious to test the response, so we just created a virtual company," says the founder and CEO of EnOcean GmbH. "But the response was overwhelming, and suddenly we had customers and had to form the company."

Tough break. EnOcean's technology is creating a lot of buzz among people in diverse industries, from automation to automobiles. It's a spin-off from electronics giant Siemens AG. While attempting to create wireless switches and transmitters for trains and cars, Siemens developed a sensor that requires such a minuscule amount of energy to transmit a radio signal that it can create its own power from the slightest movements or vibrations.

The sensor is surprisingly simple and maintenance free. It converts ambient energy into electrical energy using, say, a tiny solar cell, vibrations from a spinning tire or even the movement of a light switch. Then an extremely low-power sensor does its job and sends radio signals to a receiver that collects the data. The sensors can be used to adjust shades on a window, measure air pressure in a tire or regulate temperature

Brehler's wireless sensors are creating a battery-free buzz across several industries

ANDREAS FOELMANN FOR TIME

"I wanted to build a broadband wireless business for the last 10 years. When wi-fi came around..."

—George Polk

last 10 years, and when wi-fi came around four years ago," says Polk whose varied experience includes running the Latin American unit of Global Wireless holdings, a company backed by investor George Soros—"wi-fi" looked like it would do it."

It did. Now he's warming up for his next disruptive act, hitting mobile operators where they really hurt: in the voice business. Polk is prodding consumers and businesses to make cheap Internet-based VOIP (voice over Internet protocol) phone calls through the Cloud's hot spots. VOIP has already eaten into the traditional fixed-line business. It's now poised to do the same thing to mobile operators, threatening to take a chunk of what London research firm Informa Telecoms & Media says will be a \$550 billion mobile-voice business by 2010. Polk volleyed in July, when he partnered with VOIP champion Skype (now part of eBay) to allow Skype software users to call anywhere from hot spots through headset-equipped laptops. If just some of Skype's 66 million registered users connect via the Cloud instead

of a mobile network, mobile operators will lose revenue. The Cloud could siphon off even more mobile dollars next year when handset giants Nokia and Motorola start selling dual-mode phones that let users call via the Net or mobile networks, without Skype's software.

Polk is outfitting hot spots to handle the wi-fi function of those phones, forcing the hand of mobile carriers. "If they don't embrace these things, they'll lose the game," he says. That's a peace offering wrapped in a warning. He could take them head on, but he would gladly partner with mobile operators as the behind-the-scenes technology provider, wrangling wi-fi phone traffic that a mobile-phone company would front. Next up: the games and entertainment sector. In November, Polk struck a deal with Nintendo that lets owners of the wi-fi-equipped Nintendo DS game machine play networked games for free at the Cloud's hot spots. Guess whose business stands to get disintermediated? Forecast for the mobile-phone industry: partly Cloudy. —By Mark Halper/London

TIME BONUS SECTION, JANUARY 2006

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and humidity in a building. When the city of Dresden began renovating the Baroque Semper Opera House, it wanted to monitor humidity. But regulations protecting historical buildings prohibited opening the walls to lay cable. So Thermokon, the company that provided the humidity sensors, installed 24 EnOcean-powered devices.

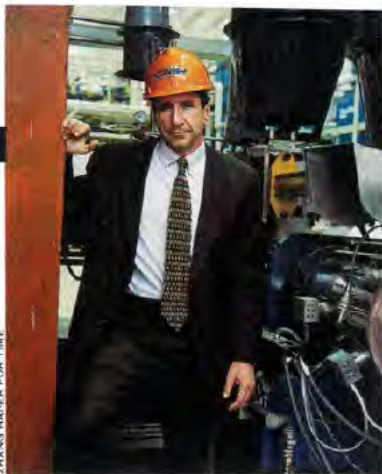
Remarkably, the sensor business was almost tossed aside by Siemens in 2000 during a corporate overhaul. "But I realized that this was an interesting enabling technology, and I was keen to do something on my own, so I told them I'd like to take the technology and spin it off," says Brehler, 42. On second thought, Siemens saw the light, and its venture-capital unit provided some start-up financing. EnOcean expects to become cash positive soon. "Today everybody's talking about smart homes and buildings. In this environment, our products are the eyes and ears of these intelligent systems," says Brehler. Good thing there's a real company to sell them. —By William Boston/Berlin

MICHAEL BIDDLE
MBA POLYMERS
RICHMOND, CALIF.

E-Waste Meets Its Re-Maker

MIKE BIDDLE HATES WASTE. AS A KID, HE was forever switching off lights at home to save energy. Years later, while working at Dow Chemical, he suggested that he focus on recycled plastics instead of high-tech composites. "We didn't hire a Ph.D. engineer to work on garbage," one of his bosses told him. When Biddle launched a company to recycle and sell plastic from complex waste streams like junked electronics and automobiles, he says, "a lot of people, including some of my board members, thought I was nuts."

Today Biddle's dream is finally taking shape—a mere 11 years after launch. MBA Polymers Inc. is the world's most advanced recycler of plastics used in durable goods. MBA raised \$30 million to develop its patented technology for extracting and recycling plastic from trashed computers, printers, mobile phones, TVs, VCRs, fax machines, refrigerators, vacuum cleaners



"We save the world incredible amounts of energy by making new plastics from scrap plastics." —Michael Biddle

and other forms of e-waste. Biddle claims he can recycle "anything with a cord" and then some.

That's good news, since e-waste, of which plastic is a significant part, is accumulating rapidly—choking landfills and creating toxic plumes when incinerated. Some 100 billion pounds of plastic are used in the U.S. annually, yet only 2% to 4% of complex plastics are recycled, compared with 95% for steel and aluminum. That's because it's difficult to

Biddle, in the company's new Guangzhou plant, says "anything with a cord" is recyclable

identify and sort engineered plastic by type and grade. At its 50,000-sq.-ft. Richmond plant,

MBA figured out how to do it more affordably and efficiently and on a mass scale. In November, MBA opened the world's largest commercial-scale plastic-recycling facility for durable goods, in Guangzhou, China. The plant can process

40,000 metric tons of plastic annually. Another plant is set to open in Austria next year.

With rising oil prices, a consumer push for greener products and the growth of take-back legislation—which pressures manufacturers to recycle their end-of-life products—demand for the less expensive recycled plastic exceeds supply. Which means that none of Biddle's new plastic will go to waste. That should make him happy. —By Laura A. Locke/San Francisco

Your DNA Analysis Is Only a Spit Away

A little Canadian company has done for DNA collection what Google did for Web searches: made it ridiculously simple and efficient. Ottawa-based DNA Genotek has developed a device that allows you to collect and store a sample of DNA by just spitting into a small plastic vial. Closing the lid on the gadget, called Oragene, releases a chemical that stabilizes the saliva, allowing it to be easily shipped and stored indefinitely. It's a huge advantage over getting a blood sample (inefficient) or swabbing the inside of the mouth (less stable).

DNA Genotek's main customers are medical researchers, Big Pharma



companies developing drugs that can be tailored to individuals, and researchers involved in large genetic studies. Chaim Birnboim, a research scientist and medical school professor who developed Oragene, knew there was demand for a

simple, noninvasive DNA-collection method, "and I thought, I can do that." The trick was discovering that saliva was a rich source of DNA that could be easily stabilized. The product could have important implications for law enforcement, forensic sciences and the military. Individuals may even want an Oragene kit to preserve a bit of a loved one—or themselves—if they fear that their remains may later need to be identified. On a more uplifting note, an Ottawa company, DNA 11, uses the kits to collect DNA that is then photographed and turned into personalized bio-art portraits. —By Steven Frank. With reporting by Laura Eggerston/Ottawa



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Standing in front of a photo of stem cells, Fulga, CEO of TheraVita, is promising big discoveries.



VALENTIN FULGA
THERAVITAE
KIRYAT WEIZMANN, ISRAEL

A Stem-Cell Prospect for Ailing Hearts

VALENTIN FULGA DROPPED OUT OF MEDICINE twice to pursue more-challenging research, but now it looks as though his change of heart could result in saving the lives of thousands—perhaps millions—of cardiac patients. Dr. Fulga, 47, is the scientific brain behind a new treatment for heart disease that is exciting the medical world even though it has yet to undergo full clinical testing.

More than 60 people in need of heart transplants or major surgery have been treated using the new procedure. That's a small number, but the results are nonetheless stunning: all of them improved. That's why TheraVita, the privately owned company set up by Fulga and his Thailand-based partner Robert Clark, is being hailed as a potential giant.

Fulga's treatment repairs damaged or inactive heart tissue using adult stem cells harvested from the patient's blood and processed outside the body by mimicking the body's environment. Unlike other stem-cell therapies, which make use of bone marrow or—more controversially in the U.S.—the blood of human embryos, Fulga believes the procedure patented by TheraVita is simpler, safer and less inva-

sive. "The patient is effectively treating himself with his own blood, so there is very little danger of rejection," says Fulga, an ophthalmologist. "It's the safest kind of stem cell you can get."

The procedure takes about a week, including the time needed to fly the blood to TheraVita's laboratories in Israel. There, a small number of natural cells are exposed to conditions that normally occur inside the human body. The process causes the stem cells to multiply and differentiate into cells that restore damaged heart tissue. The final product, called VesCell, is then injected into the patient's heart, where it appears to trigger the body's natural healing mechanisms, helping the heart tissue recover some of its function.

"We don't actually know the basis of the science," Fulga cheerfully admits, but his research team knows it is on to something. Soon it plans to reveal other discoveries made during its research that Fulga believes will open the way for the use of stem-cell therapy in more areas.

The company treats patients in Bangkok, where medical standards are top-notch and interest in high-tech treatment and medical tourism is booming. The process costs about \$30,000 per patient, plus physician's and travel expenses, but Fulga hopes the figure can be reduced to less than \$10,000.

And it's good business. Fulga and his colleagues are tapping into the estimated \$54 billion-a-year market of cardiac patients in need of treatment. The company projects that it will break even soon. "We want to be the Intel of cell therapy," says Fulga. —By Matthew Kalman/Jerusalem

PAUL RUSSO
SILICON OPTIX
SAN JOSE, CALIF.

Adjusting the Picture for HDTV

ELECTRONICS RETAILERS HAVE A DIRTY LITTLE secret about those pricey HDTVs: the pristine pictures on showroom models that wow consumers aren't what they will be watching at home. That's because most TV content is still delivered in standard-definition format. Result: *Seinfeld* reruns will look worse on a new \$2,500 HDTV.

Silicon Optix owns the fix. The firm, based in San Jose, Calif., has designed an advanced video-processing chip that cleans up video for all sorts of displays. The private company's secret sauce is its Realta chip, which enables real-time, pixel-by-pixel processing of HDTV, delivering Hollywood-quality video to consumers at a fraction of the cost. It's like having a "supercomputer on a chip," boasts Paul Russo, 62, Silicon Optix's fast-talking CEO. The Realta is truly industry changing because it's the first programmable video-chip processor. The video chips can be upgraded on site or over the Web, so they don't have to be replaced. Suddenly those old reruns are starting to look a whole lot better. —By Laura A. Locke/San Francisco



Silicon Optix's Russo believes his company's video chip is the key to HDTV perfection



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JAY KEASLING

AMYRIS BIOTECHNOLOGIES
BERKELEY, CALIF.

Using Fake Plants to Halt A Real Killer

JAY KEASLING LEARNED SOME IMPORTANT lessons growing up on a farm in Nebraska: that agriculture is hard work, that money isn't everything, that pigs don't appreciate either and that he really didn't appreciate them. "I wasn't so fond of pigs," he admits.

The porcine problem helped steer him off the farm and toward a degree in biology and chemistry. His farm-raised appetite for work—100-hour weeks are de rigueur—has led to rapid progress in his field. And his satisfaction with an academic salary means he prefers to use his innovations to help the poor rather than line his pockets.

Keasling, 41, has spent the past 13 years at the University of California, Berkeley, working out how to trick *E. coli* microbes into churning out synthetic and beneficial versions of plant products. He was particularly interested in molecules known as terpenoids, like artemisinin, which treats malaria; taxol, an anticancer drug; and prostratin, a potential anti-HIV compound.

Artemisinin is critical to fighting malaria, a deadly global problem that kills up to 3 million people annually. The compound is found in wormwood plants that grow in Southeast Asia but costs \$2.40 a dose. In developing countries, that might as well be \$2,400.

Keasling has enlisted 45 scientists at Amyris and U.C. Berkeley in his quest to generate synthetic, lifesaving plant products

That's where Keasling comes in. He's focusing his lab's work on producing synthetic artemisinin to drive down the price per dose to pennies. Keasling and his team at Berkeley have already worked out how to extract the genes responsible for making artemisinin and transplanted them into a harmless strain of *E. coli*. Now they're furiously working those 100-hour weeks to reroute the metabolic traffic in the microbe and produce oodles of artemisinin.

As pioneering as the lab work is the business triangle Keasling has forged linking the university; Amyris Biotechnologies, a company he co-founded; and OneWorld Health, a non-profit drug company. "This is one of those 'only in Berkeley' stories," says Keasling, laughing. "No one is going to make any profit out of this." Berkeley, which owns the rights to Keasling's technology, has agreed to give it away for nonprofit use. The Amyris staff is working to commercialize the technology. OneWorld Health hopes to be manufacturing the drug within five years.



"This is one of those 'only in Berkeley' stories. No one is going to make any profit." —Jay Keasling

Keasling's next project is to begin adapting his technology to produce taxol, prostratin and maybe even new sources of energy and ways to clean up the environment. "I guess when I go to my grave, I'd like to have helped come up with solutions for some of society's most significant problems," he says. Thank goodness he never liked those pigs. —By Amanda Bower/San Francisco

Is Your Phone the Next ATM?

Customers of ATMs long ago decided they could do without a teller. Now Steven Atkinson has a bolder idea: they can also do without the cash. His company mobileATM has developed secure software that allows cell-phone owners in Britain to check their bank balances using their handsets. That may sound trivial, but 37 banks in Britain,

including First Direct (the roughly \$12 billion phone and PC division of giant HSBC) and RBS (Royal Bank of Scotland), have approved it.

Why? Because, says Atkinson, consumers make 150 million balance inquiries every month using 55,000 traditional hole-in-the-wall ATMs. MobileATM wants to redefine convenience. "When

you ask the question 'Where is the nearest ATM?' I want the answer to be 'It's in your hand,'" says Atkinson, who was born in 1969, the year that Chemical Bank in New York City opened the world's first modern ATM.

If mobileATM is to provide a truly compelling service, shouldn't it also allow users to move cash



around? "You have to walk before you can run," says Richard Kimber, chief executive of First Direct, who notes that consumers will be able to buy top-up credit for pay-as-you-go mobile phones. He also envisions a day when British commuters might be able to purchase subway rides using their mobileATM, the next step in turning your phone into your wallet. —By Mark Halper/London

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