THE PATHWAY OF YOUTH?
New insights into the body’s aging-control system
Patrolman Joseph Cunningham and I are hunting for criminals. Not just any crooks but home burglars. And not just anywhere: although the city of Memphis covers 315 square miles, our search area has been narrowed to just a few square blocks of low brick apartment buildings in a crime-plagued part of town. The search date and time, too, have been tightly defined—Thursday, between 4 P.M. and 10 P.M. The shift begins now. "I don't anticipate any car chases tonight, but if one happens, be sure to put your seat belt on," Cunningham says as we pull out from the station.

In squad car number 6540, Cunningham and I reach the area that his report has flagged. We are scouting for would-be burglars in general—"I'm looking for people who look like they don't have a place to go," Cunningham explains—and one suspect in particular: a man named Devin who may be behind a recent spate of break-ins in the area. Cunningham pulls up Devin's picture on a dashboard-mounted touch screen. We roll slowly into the parking lot of one of the buildings. A
man walking by looks up, notices us and hurriedly ducks into an interior courtyard. Cunningham stumps on the gas, and we whip around three sides of the complex, screeching to a halt just in time to intercept the man walking out from the other side. Cunningham hops out of the car and runs up to the man. "Hold on," he says.

Any good cop knows his precinct's honeypots, the places where crime is most common and arrests easiest to make. But Cunningham's street savvy is being aided tonight by a crime forecast made by sociologists, investigators, mathematicians and a roomful of computers. The partnership between the Memphis Police Department (MPD) and the University of Memphis is called Blue CRUSH (for Crime Reduction Utilizing Statistical History), and the campaign is credited with helping to slash the numbers of major property and violent offenses by 26 percent city-wide since the initiative was launched in 2006. Car break-ins, muggings and murders have plunged by 40 percent.

Number crunching is nothing new in police work—witness the New York City Police Department's widely imitated CompStat program, which provided officials with frequently updated maps of high-crime areas when it launched in the mid-1990s. In the past few years, though, so-called predictive policing has grown ever more sophisticated. The most ambitious criminologists are no longer content to analyze data from the past—they are trying to predict the future.

Predictive policing is one of the hottest topics in law enforcement today, with more than a dozen experimental efforts under way in the U.S. and Europe. The dirty secret of the futuristic approach, though, is that nobody knows for certain that it works. The causes of crime are multifactorial and complex, making it difficult to pinpoint which strategies are best to combat it. Criminologists are only beginning to separate the effects of predictive police work from the myriad other factors that lower crime, such as the aging of the American population. All the experts know for certain is that police are doing something right. Across the U.S., crime is down to its lowest levels in four decades.

When Cunningham returns with the man's driver's license, the picture looks virtually identical to the one of Devin on the touch screen. But his name does not match—a case of mistaken identity—so Cunningham steps out of the car again to go send the man on his way. "It's his lucky day," he says.

**THE SCENE OF THE CRIME**

Predictive policing sounds like it belongs to the ominous future as imagined by writer Philip K. Dick, and indeed his 1956 short story "The Minority Report" (later adapted into a Steven Spielberg film) describes a future in which the police department intercepts criminals before they strike. In real life, the approach relies on crime analysts and computer software rather than the visions of mutants who sit in a darkened room. It also does not tell you who is likely to commit a crime. Instead it produces best guesses for everything else: what type of crime and where and when it will happen. "Some people say you can't predict what is going to happen in the future," says John Williams, crime-analysis manager for the MPD. "Well, we say, 'Yes, you can.'"

Dystopian overtones aside, though, the practice is merely a dramatic example of a field called predictive analytics, which, unlike the jet packs and rocket cars also envisioned in the Eisenhower era, is commonplace today.

When Amazon recommends books using taste-guessing algorithms, that is predictive analytics. Credit-card companies use soothsaying computer programs to flag restless customers and offer them better rates before they jump ship to another card, whereas Blue Cross hopes to predict what medical services individual policyholders will need years down the road.

Humanity has traditionally relied on expertise and instinct to divine the future. People can be good at these intuitive forecasts, too, as Malcolm Gladwell illustrated in his popular 2007 book *Blink*. But advocates of predictive analytics say that the volume of information we generate every day with our cameras, computers and smartphones has grown incomprehensibly large. "Business and government datasets are being measured not in megas- or gigabytes but in tera- and even petabytes (1,000 terabytes)," writes Ian Ayres in his influential 2008 analytics book *Super Crunchers*. The anti-*Blink* hypothesis, then, is that we are adrift in a sea of information too vast for any human mind to intelligently navigate. Enter the visionary machines.

In police work, every call for service, traffic stop, sidewalk interview and arrest generates data that tantalize analysts with the promise of actionable leads—if only they could be mined from a mountain of informational rubble. Investigators historically have read the statistical tea leaves by hand, pulling batches of dusty records from file storage or simply by sensing that something suspicious is happening. CompStat introduced regular, semi-automated data analysis to policing, but what has changed since the early days is not only the amount of information being recorded but also the computer-aided swiftness with which it can be analyzed. "We used to look at our crime statistics every year and say, 'Wow, look what happened,'" says Captain Sean Malinowski, who leads analytics efforts for the Los Angeles Police Department (LAPD). "Then we started looking monthly, weekly, daily and now in real time."

The headquarters for predictive policing in Memphis is the Real Time Crime Center, which, in suitable fashion for a crime fighter's redoubt, is hidden on the fourth floor of an unassuming office building downtown. Williams walks me past a dozen analysts sitting in stadium-style tiers and tapping away at computers. Projection screens showing icon-dotted maps of the city and the feeds from surveillance cameras cover the front and side walls. A news ticker runs across the top of one screen with the latest reported crimes, such as "Theft from Motor Vehicle, 12:30:46 P.M."
In a conference room Williams introduces me to W. Richard Janikowski, a University of Memphis criminologist who was one of the original visionaries of Blue CRUSH. The seeds of the project were planted when police sought his help in battling the city's sexual assault rate, which for two decades had ranked first or second highest in the nation. Janikowski convinced victim focus groups and personally visited assault locations. But the most powerful insights came from the reams of police report data—times, locations, descriptions of the assaults—from some 5,000 rapes. The analysis revealed that many victims were being assaulted under similar circumstances; when they left their homes to use pay phones mounted outside convenience stores at night. The police told convenience store owners to move their pay phones indoors, and sure enough, the rape level in Memphis soon dropped.

This was essentially an example of Predictive Policing 1.0. Using analytical software to gain insights about what had happened in the recent past, Janikowski and company rightly assumed that similar crimes would happen again in the near future. Since then, forecasting techniques have grown even more powerful, allowing police to divine the patterns hiding in much larger data sets—up to hundreds of thousands of records—a process of separating the signal from the surrounding noise that would overwhelm the typical human investigator.

The methodology has also become more sophisticated. The future does not always mirror the past, so criminologists must identify individual factors and tease out their influences alone and in combination. P. Jeffrey Brantingham, an expert in predictive policing at the University of California, Los Angeles, explains the fundamental challenge: “Given a cluster of crimes today, can we build a mathematical model and say what, in a probabilistic sense, the crime pattern is likely to look like tomorrow?” he asks.

Predictive Policing 2.0 thus looks like what happens in Richmond, Va., which, as is the case in Memphis, uses analytical software developed by IBM. Police computers analyze each crime by time of day, day of the week and day of the month. Offense locations are parsed by street address, as well as proximity to places such as ATMs, parks and bars. The computers are supplied with the paydays of major local employers such as Phillip Morris and the schedules at local concert and sports venues. Everything from the timing of gun shows to the weather and phase of the moon is deemed potentially important.

Evaluating how all these factors might influence future crime requires a partnership between people and machines, with each bringing different strengths to the table. Computers are better at flagging statistical trends, but cops still have to interpret them, says Lt. Col. Howell Starnes of the MPD. “Until you get that street officer who knows his ward, you won’t know what’s causing the crime,” he says. “That’s what you’ve got to look at. Not that you’ve got a problem—what’s causing the problem.”

The process of predictive policing often starts with a cop’s hunch, such as that muggings tend to rise near ATMs around payday. Computer analysis can ascertain whether that hunch is valid and add nuance to the theory. For example, it might turn out that muggings around a particular subset of ATMs go up the most on paydays, so that is where officers should preferentially be stationed. In Richmond the police had a feeling that violent crime went up after there had been a gun show in town. The computer analysis proved them mostly right—violent crime risk peaked not the weekend after the show as expected but two weeks later.

Computers, though, far outstrip humans working alone because of their phenomenal processing power and their advantage of not being blinded by human preconceptions. In the 2007 book Data Mining and Predictive Analysis, author and former police officer Colleen McCue describes a counterintuitive discovery made by criminologists in Virginia who were crunching the numbers on what types of people become rapists. “Not surprisingly, prior offense history reliably emerged as the most predictive variable,” McCue writes. “What was a shock, however, was that a prior property crime actually was a better predictor for a stranger rapist than a prior sex offense.” In particular, it was criminals who had broken into homes before but had stolen little to nothing who were likeliest to later rape. They were probably scouting for a victim, not looking to steal. So in the future, when computers flagged a rash of home break-ins in which nothing was taken, residents needed to be alerted to watch out for a rapist in their midst.

Predictive software does not even need to start with a theory from human overseers, although that can be helpful; the computers can instead troll an ocean of data and devise predictive algorithms automatically, a process known as rule induction. Feed the computer a set of data, and the software will trace combinations of factors that lead to crime, prompting guesses about how novel combinations influence overall future risk. For example, what might happen when there is a gun show scheduled on the same weekend that the weather forecast calls for a heat wave or when there will be a full moon the night of an upcoming payday?

The police in Richmond can essentially throw predictive
Criminal Aftershocks

Recent work in criminology has shown that crime shares much in common with earthquakes. Certain areas—be they tough neighborhoods or fault lines—are more likely to suffer. And in the same way that earthquakes spawn aftershocks, a crime will tend to be followed by a temporary upick in crime rates in nearby areas. Researchers have used this insight to create maps of where crime is likely to happen in the coming days and weeks. They take yesterday’s crime reports, build aftershock maps that reflect the increased likelihood of criminal activity in areas close by, and add these aftershock spikes to a background map of typical criminal activity. The police then use the resulting map to dispatch officers to the locations most likely to rumble.

SOothAYER DETECTIVES

THE LATE JACk MAPLE, then a New York City transit police officer, launched modern data-driven policing in the 1980s by plotting violent subway crimes with crayons and pushpins on maps. He called them “Charts of the Future.” It was a catchy name, redolent with Disneyesque visions of a brighter tomorrow, and a prescient one, too: today, nearly two decades later, maps are still the key tool of predictive policing even if the analysis they reflect has grown far more sophisticated.

In Memphis I attended a weekly Blue CRUSH TRAC—that is, Tracking for Responsibility, Accountability and Credibility—meeting. In a large conference room, the city’s eight precinct commanders took the podium in turn to discuss the latest crime in their areas. The projection screen behind them displayed maps marked with crime-symbolizing icons—fists, broken windows and little thiefin one each one representing a single offense in the past week.

Predictive-policing methods make use of far more variables than the times and locations of recent crimes, however. In Memphis an analyst might first pull up a map showing recent burglaries. He could then display the home addresses of all the students that the school district had reported as being recently absent. A third layer of data would indicate which of the truants had past convictions for burglary. When everything lines up—burglaries near the home of a truant student with a criminal record—it is time to hit the street and try to catch the thief in the act. Or show up at the truant’s house. “You go to do a knock and talk, and, lo and behold, you find stolen stuff stacked all around the building,” says John Harvey, manager of the Real Time Crime Center.

These algorithms have also begun to integrate the latest theories of criminologists. For example, conventional wisdom holds that savvy criminals do not return to the scenes of their crimes. But successful burglars do exactly that, according to U.C.L.A.’s Brantingham and George O. Mohler, a mathematician at Santa Clara University, who analyzed thousands of burglary incident and arrest reports from the LAPD to arrive at their findings. “From the offender’s point of view, going back to the house you broke into yesterday is a good strategy,” Brantingham says. “You know what’s in the house. You know how to get in and out quickly.” What is more, they found, the burglary risk also goes up considerably for other neighborhood houses because they often have similar layouts and types of possessions, making them attractive targets.

Brantingham and Mohler have since discovered a repeat-victimization effect for muggings, gang violence and grand theft auto. They determined how far the effect extended—about two miles in the case of burglary—and how the risk levels changed over the days and weeks following the original offense. They then developed predictive algorithms that include these findings, creating a predictive model that has been shown to be 10 to 20 percent more accurate at forecasting future crimes than a classic model that assumes the future will look exactly like the past.

At the Blue CRUSH TRAC meeting in Memphis, each of the precinct maps is marked with two to three “focus areas” where crime is expected to be heaviest in the coming week. Bullet points list what particular crimes to watch out for and when. That is how patrolman Cunningham and I were tipped off to be on the lookout for burglars in the Greer Street area that afternoon between 4 p.m. and 10 p.m.

The forecast is also how we know to be cruising later that
night in another high-risk zone, the Orange Mound neighborhood, when we get a call for assistance. Two other squad cars, roof lights whirring, hem a black Nissan into the curb when we arrive. The man sitting in the back seat has nearly two ounces of marijuana on him, a few hundred bucks and a scale cleverly disguised as an iPhone. When one of the officers asks him what the scale is for, the suspect is helpfully open about his trade as a drug dealer. If not respectful of his own Fifth Amendment rights, “Sometimes my customers think I’m trying to cheat them, so I have to weigh the product,” he says.

GUilty OF PRE-MURDER

THE POT DEALER is cuffed and quiet in the back of the car. We are transporting him to the county jail when a call crackles over the police radio: “6011 Apartments, Ridgeway and Hickory Hill. Report of a shooting.” The next morning I go online and read about the incident. The victim’s name is Claude Brake, a 56-year-old army veteran now working for Papa John’s Pizza. He had just made a delivery when two teenagers approached him and demanded money. He refused. One of the teenagers shot him. He died.

Murder is infrequent, even in a big city like Memphis. The city had 25,324 reported thefts in 2010 but only 90 murders, enough of a statistical rarity to make it impossible to generate an algorithm reliable enough to catch killers before they strike. Brake’s murder had happened outside the focus areas that Cunningham was policing, and the weekly report made no attempt to predict such a violent crime. Even a believer like Janikowski is quick to point out that guesswork, however high tech and well educated, can take you only so far. “I prefer to describe what we do as ‘crime forecasting’ rather than ‘crime prediction,’” he says. The science is imperfect.

Yet even if the cops cannot predict where a murder is likely to happen, some researchers believe we can do a better job establishing who is likely to commit a murder. Richard Berk, a professor of criminology at the University of Pennsylvania, has developed an algorithm that estimates the probabilities that someone on parole or probation will kill. The algorithm is based on a review of tens of thousands of cases and includes variables such as age, gender, type of offense and date of first offense. “The people who will shoot, the algorithm correctly forecasts those outcomes about 75 out of 100 times,” Berk says.

Such powerful crime-prediction techniques raise a troubling question: Are we judging people guilty before they ever commit a crime? Researchers such as Brantingham say that is not the case with programs like Blue CRUSH. “This is not about predicting the behavior of a specific individual,” he says. “It’s about predicting the risk of certain types of crimes in time and space.” The police forces employing his analytical tools are not locking up free citizens before they commit a crime; instead they steer extra patrols to the areas where the most potentially dangerous people are.

Berk’s work, meanwhile, would seem to state closer to the ethical line. Parole boards are being influenced by Berk’s findings about which prisoners are too potentially dangerous to release. Yet making judgments about future criminality is exactly what parole boards are supposed to do, Berk says. The only difference is that they are now using computer analysis to augment what they formerly did almost solely from the gut.

BEYOND A REASONABLE DOUBT

In the five years since the MPD began to augment its gut instincts with computer analysis, serious property and violent crimes have dropped an impressive 26 percent. Yet despite all the apparent evidence in favor of predictive policing, it is hard to know just how much of the drop in crime seen in Memphis and elsewhere is a result of the software. Most other American cities around Memphis’s size have also reported significant drops in crime, and not all of them have implemented campaigns similar to Blue CRUSH.

Also, as any crime statistician knows, the year you select for your baseline—the one all future gains will be measured against—plays a critical role in how impressive your results look. For Memphis, comparing back to 2006 makes sense because that was when Blue CRUSH was rolled out citywide. But 2006, as it happens, was the highest crime year for the entire decade, which had the effect of making all the years that followed look good by comparison. An alternative way to look at the stats would be to compare the average crime rate for the five Blue CRUSH years from 2006 to 2010 with that for the five previous ones, from 2001 to 2005. Viewed that way, what happened in Memphis is not nearly so miraculous: property crime went down a modest 8 percent in the second half of the decade, whereas violent crimes were actually up by 14 percent.

It is no coincidence, nor attempt at statistical trickery, that Blue CRUSH was launched when crime was peaking, Janikowski says. “[In 2006] we knew that crime had been going up for the past two years and that nothing we were doing was working,” he says. “We had to try something new.” He points out that many of the methods that were part of the Blue CRUSH campaign, such as hotspot policing, have, in fact, been validated in rigorous, large-scale studies and that crime went down in each of the years since 2006. But “is the predictive stuff all by itself yet scientifically proven?” he asks. “That, you can legitimately raise questions about.”

With people throughout law enforcement looking for answers, the National Institute of Justice has gotten into the act. It recently issued grants to seven American city police departments, including those in Boston, Chicago, New York, Los Angeles, and Washington, D.C., to evaluate the effectiveness of predictive policing in carefully controlled tests. The LAPD and Brantingham, for instance, will compare the crime rates in areas of the city that use his repeat-victimization models with areas that do not. To bolster impartiality, the results from all the cities’ studies will be additionally reviewed by Rand Corporation. Brantingham is cautiously optimistic: “We’re on the cusp of a new era of policing,” he says. Soon he will get to prove it.