

Body Codes

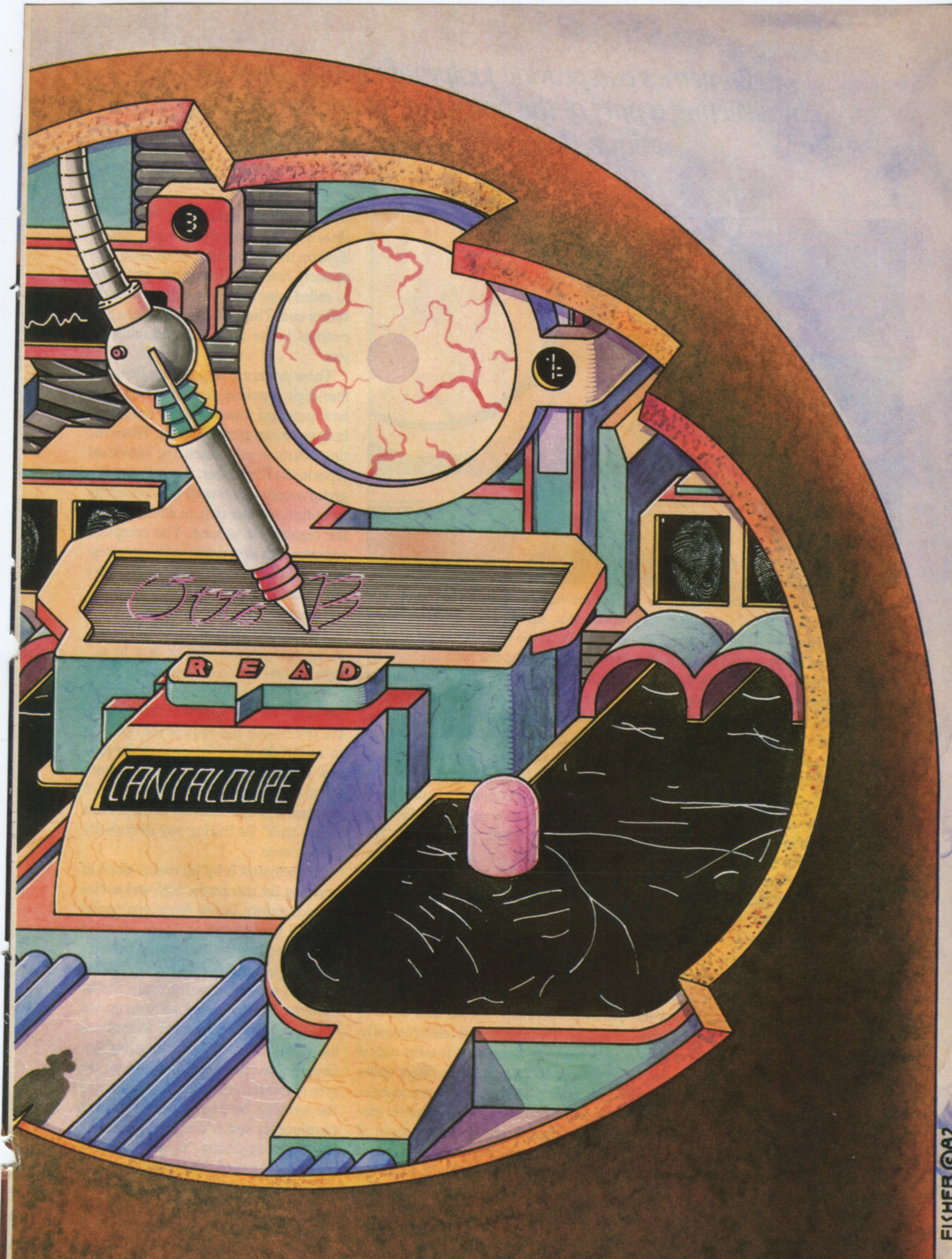
ID cards can be forged and secret codes cracked, but the pattern of blood vessels in your eye, the creases in your palm, and the squeaks in your voice are strictly your own.

*by John Sedgwick
illustration by Mark Fisher*

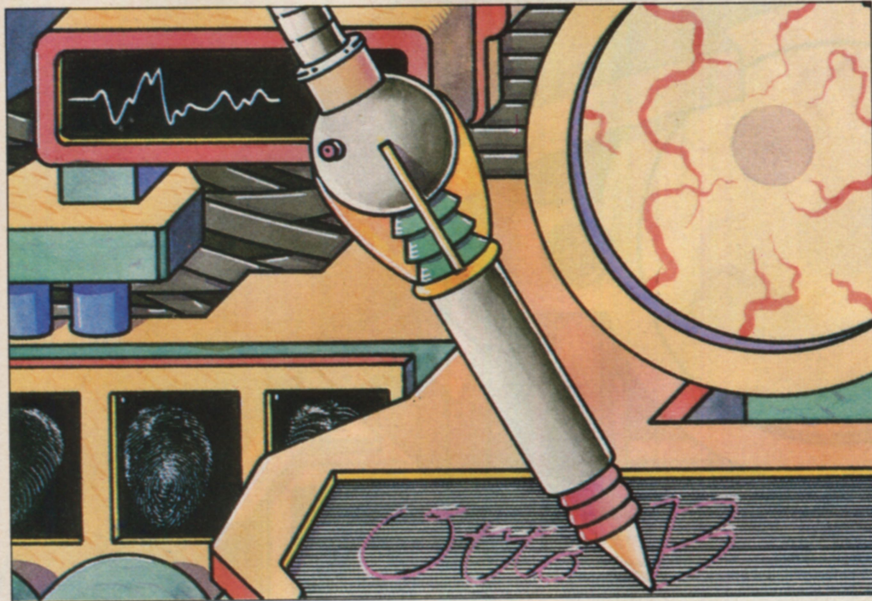
In 1978 a pudgy computer whiz named Stanley Mark Rifkin dropped a dime into a pay phone, dialed the wire transfer room of Los Angeles's Security Pacific National Bank, and wired himself \$10.2 million. It was to date the largest bank theft in history. Yet the only authorization he had to provide was the day's supposedly secret code, which Rifkin, posing as a security consultant for the Federal Reserve, had coaxed out of a naive employee moments before on a tour of the transfer office.

Computer crime is that easy. Not so surprisingly, it is the country's fastest-growing form of larceny, according to the FBI, and it is the subject of growing numbers of articles in the national press. With last year's Wells Fargo embezzlement by a bank employee and a pair of





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by selecting a part of the body that is unchangeable,
unique, and easily examined.*



boxing promoters, the record haul is now up to \$21.3 million. But it's not just bank computers being hit. The government has discovered names added mysteriously to computerized welfare rolls. The Defense Department is worried about leaks of national security information. And corporate computers are regularly being lightened of such valuable trade secrets as geological survey data, salary levels, and intended construction bids.

Spurred on by the need for tighter computer security, a number of companies are developing a new technology they hope will confine the Stan Rifkins of the world to legitimate enterprise. Called biometrics, it involves the minute measurement of an individual's physical characteristics. By selecting a part of the body that is unique, easily examined, and unchangeable, the system can provide a method of foolproof verification, say its backers, that is ideal for industrial security requirements—and possibly many others besides. With today's computer technology and precision scanning equipment, physical characteristics can be analyzed automatically with high reliability in a matter of seconds, at a cost per system that ranges from a high of \$50,000 to less than \$1,000.

In the view of the emerging biometrics companies, the security problem stems directly from the widespread use of passwords—as was the case with the Security Pacific robbery—to gain clearance for essentially anonymous yet highly sensitive computer transactions. As biometric security expert George H. Warfel points out, such codes can be easily stolen—without the loser's knowing they're gone. And other common security paraphernalia are just as vulnerable: Security badges can be faked, photographic IDs can be falsified, and magnetically encoded cards can be pilfered.

But fingerprints don't change hands quite so easily, and that's the principle used by one of the leading firms in the new field, Fingermatrix. With its system, an individual seeking access to the wire transfer computer—or any other restricted operation—would first have to register his fingerprints electronically with a central computer. It takes only a few seconds. One presses a finger down on a glass platen. A microprocessor—the soul of all these new biometric machines—then directs a slender beam of laser light to shine from underneath and delineate the patterns. Light from the print's "ridges" is reflected to a photore-

ceptor, while the light in the "valleys" is absorbed. The microprocessor, which digitizes the optical data, zeros in on particularly revealing fingerprint areas, the so-called minutiae where ridges either divide or end. That pattern of divisions and endings is the unique, nonduplicable you.

These prints are tagged with three- or four-digit numbers similar to the ones now provided customers for automatic cash machines at many banks. When the time comes to gain access, the individual types in the ID number, then places a fingertip snugly into a small slot containing an optical scanner that, in effect, repeats the registration process. The computer compares the new prints to the ones registered to that number. If they match, the individual can go ahead. If they don't, the machine indicates an alarm.

"We absolutely guarantee that the guy at the computer is who he says he is," says Fingermatrix's marketing vice-president Harold Buchanan. As an extra provision for the wire transfer process, the system can also require the operator to reintroduce his fingerprint for any new transfer after he's gained clearance or after certain dollar amounts are reached. That provides an all-important "audit trail" for tracing any irregularity to its source.

Fingermatrix is by no means alone in pursuing the market for high-stakes biometric security. A few dozen companies are now working on products. Many of the competing devices also use a person's hand, in part because it's usually uncovered and can be presented easily. Stellar Systems has marketed an instrument measuring "palm geometry" to verify an individual's identity by the length of four fingers of one hand together with the degree of translucency of his fingertips and the webbing between his fingers. (The translucency test is designed to prevent the use of synthetic "forged" hands.) And Palmguard photographs four square inches of palm, recording creases,



skin tone, and swirls for minute computer analysis.

Refining the principle of the standard photo ID, other biometric companies rely on an individual's eyes and facial structure to establish identity. A company called Eyedentify is perfecting a method of examining the pattern of blood vessels within the retina; when viewed under infrared, the image is both striking and unique. The French have developed a system that records the size and shape of an ear, and other American firms are working on ways to measure the position of various facial features.

Fascinating gadgets, all of these. But are they practical? Most security researchers feel that when the devices are confined to industrial areas for use exclusively by employees, they'll flourish. But, they add, the companies will face resistance if they try to market the machines for use by the general public.

"Any identification system has to deal with the privacy issue," says Donn Parker, a senior consultant with SRI International in California. "And frankly, a lot of these biometrics raise a lot of questions about that." Like many other observers, Parker sees something un-American about electronic scrutiny in a public place. He notes that fingerprinting in particular carries associations with wrong-doing that many customers might find distressing.

The scanning apparatus may put people off, regardless of its uses. "People just don't want to put their hand in some slot," says Parker. He remembers a fel-

low researcher at SRI who was planning to attach electrodes to applicants' skulls in order to identify them by their brain waves. "I just looked at him," says Parker, "and said, 'Electrodes?' He said there might be some sort of special helmet to put on. And I said, 'Helmet?' After my wife has her hair done, she won't even go out in a strong wind, and she's supposed to pull a helmet on to record her brain waves? That attitude, though, seems to be widespread in the biometrics industry."

Others argue that even if the public accepts the machines in principle, they won't tolerate the likely frustrations of working with such sensitive devices. "With technology like this," says Joseph Lagana at Cullinane Database Systems, "you've always got to worry about the computer's 'down' time." And because the machines deal so intimately with the public's flesh, other researchers worry about the prospect of dirt fouling them up. Several cite the story of the weekend automobile hobbyist who, every Monday, comes up to the Fingermatrix machine with such grimy hands that the machine won't accept him until Wednesday. Such tales cast doubt on the machine's use in automatic cash dispensers. "Keep a customer away from his money falsely just once," says Don Miller, manager of technical security for the First National Bank of Chicago, "and he'll go to another bank. The public just has no tolerance for error."

A more recent generation of the verification technology, termed cultivated

biometrics, superficially more bizarre still, may well offer some solutions to these complaints. Rather than examine an individual body part, be it fingerprint or pupil, these systems scrutinize some characteristic behavior. Threshold Technology, for instance, puts out a system of voice analysis intended to safeguard telephone transactions that does not register the sounds one intends to make but the incidental grunts, squeaks, and gurgles that come out unintentionally with the words. Surprisingly, these features are unique and always repeatable. SRI International is developing a method of recording an individual's walk by the distinctive click-clack he makes ambling across a metal plate. The company is also investigating the possibility of identifying an individual by the rhythm of his typing at a keyboard.

Strange and extravagant as these identification techniques may appear, many experts regard them as the most promising for the commercial market because the analysis of the individual can be done so subtly—just by examining some activity, such as walking or talking, that one is doing anyway.

Consequently, the approach that analyst George Warfel calls "the identification method of the future" actually borrows the most from the past: You just sign your name. As with the speaker-recognition machines, the system does not examine the end product—the signature—at all, but rather the signing dynamics—speed, rhythm, and peculiar flourishes. IBM has developed a special wired pen containing an accelerometer to record this information; it works as well writing in the air as it does on paper.

Sycon has produced a sensitive tablet that measures the pen's acceleration, pressure, and velocity as it sweeps through the signature. As with the other biometric systems, a microprocessor then compares the information with filed data. Warfel believes Sycon's system is preferable because it lets one sign with one's own pen. "IBM's wired pen is demanding and cumbersome," he says. "Plus, you have to orient it left-right and up-down for the machine. With Sycon, the tablet does that for you."

This is not to say, however, that the system is problem-free. Existing only in prototype, the \$5,000 machine is still

quite expensive—although the price should drop to \$1,000 once production starts—and it's largely unproved. When Dan Rather tried out an early Sycon device for a CBS report, he couldn't get the machine to recognize him because he grips his pen so far up the shaft. And Sycon president Harry White admits that when he first tried to "sign in" with the machine, he was so self-conscious he couldn't get his signature to come out right. "Signing your name is like tying your shoes," he says. "It's got to be a natural action. If you think about it, you just can't do it."

Yet assuming people can relax with the machine, the bugs are gotten out of it, and the price comes down, George Warfel believes the idea is unbeatable. "Short of recording you on a Betamax," he says, "a forger has no way of knowing how you write your name, the speed or the rhythm. Seeing the machine, a forger isn't even going to try. He's going to go after another target."

Besides the usual applications in data security, physical access, and bank transactions, Sycon's White sees a big future for his machine with the credit card companies, which he claims are now losing almost half a billion dollars a year because of stolen cards and fraud.

"We've got lots of things going for us," White says. "There's no discomfort associated with signing your name. It's easy and fast. The average signature takes five and a half seconds, and we don't use any awkward apparatus. Plus, the use of signatures is fairly universal. Even those Third World countries that don't have signatures per se still use personal marks of some sort. And we've found that three Xs work just as well as a name."

That's certainly a cheery picture of ease and convenience. Perhaps biometrics will make everyone's life simpler even as it makes it more secure—lightening pockets of key chains, wallets of ID cards, and heads of multidigit code numbers. But as with all developing technologies, it's best to wait and see. As Donn Parker points out, "Any security device that's made by humans can be beaten by humans." Just ask Stan Rifkin.

John Sedgwick is the author of Night Vision published by Simon and Schuster.



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