

Deborah Adler's grandmother



# TIME

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## How to Spot a Liar

THE U.S. IS POURING MILLIONS INTO NEW LIE-DETECTION TECHNOLOGIES, PEERING INTO MINDS IN WAYS THAT COULD MAKE ANYBODY NERVOUS

By JEFFREY KLUGER, COCO MASTERS

Few things are easier than telling a lie, and few things are harder than spotting one when it's told to us. We've been trying to suss out liars ever since Cain fibbed to God about murdering Abel. While God was not fooled--hearing the blood of Abel crying out from the land--the rest of us do not have such divine lie-detection gifts.

But that doesn't mean we're not trying. In the post-9/11 world, where anyone with a boarding pass and a piece of carry-on is a potential menace, the need is greater than ever for law enforcement's most elusive dream: a simple technique that can expose a liar as dependably as a blood test can identify DNA or a Breathalyzer can nail a drunk. Quietly over the past five years, Department of Defense agencies and the Department of Homeland Security have dramatically stepped up the hunt. Though the exact figures are concealed in the classified "black budget," tens of millions to hundreds of millions of dollars are believed to have been poured into lie-detection techniques as diverse as infrared imagers to study the eyes, scanners to peer into the brain, sensors to spot liars from a distance, and analysts trained to scrutinize the unconscious facial flutters that often accompany a falsehood.

At last they may be getting somewhere. Next month No Lie MRI of San Diego, a beneficiary of some of that federal largesse, will roll out a brain-scan lie-detection service it is marketing to government and industry. Another company, Cephos of Pepperell, Mass., hopes to follow within a few years.

Even as those outfits ramp up, however, civil libertarians are sounding warnings. It's one thing for airport screeners to peek inside your shoes or squeeze your toothpaste tube. It's another when they pull you aside for questioning because you set off alarms on some scanning device whose reliability could be shaky. And who knows what techniques are already in use at Guantánamo and other extralegal holding pens?

"First, we need to determine how good this science is," says Stanford

University law professor Hank Greely. "Then we must decide what it can be used for."

For a technology that so many people dream of improving, lie detection has been advancing at a glacial pace. It was 85 years ago that the venerable polygraph was introduced, and while its results are still not admissible in most criminal courts, it is at least based on a sound premise. Most of us lie easily, but we don't lie well, particularly when the truth could land us in hot water. Fibbing causes the heart to pound, breathing to accelerate and sweating to increase, and the polygraph measures all those things.

Sometimes the machine works fine, but often the experience of being wired up to a piece of gadgetry and asked questions by an unfriendly stranger can produce the same symptoms as a lie. Moreover, the best liars tend to be the least troubled by their dissembling and produce the fewest outward clues. Polygraph advocates like to say the technology is 85% to 90% accurate in criminal investigations, but just three years ago the National Research Council of the National Academy of Sciences dismissed the machines as useless. Says University at Buffalo social psychologist Mark Frank: "Even the greatest technology used at gunpoint is worthless."

The inventions that could end the polygraph's long, imperfect run are not yet ready for wide use. Some of them, however, are getting tantalizingly close.

## MAGNETIC RESONANCE IMAGING

No matter how cool your body is during questioning, your mind could still rat you out. Brains require blood to operate, and the harder they work, the more they need. Many regions of the cortex are thought to be recruited for a lie, but three stand out: the anterior (front) cingulate, which reconciles goals and intentions; the right orbital/ interior frontal, which processes the sense of reward; and the right middle frontal, which helps govern tasks requiring more than ordinary thought. Functional magnetic resonance imaging (fMRI) looks for such busy, well-oxygenated areas. Get a hit in all three zones, and you may have a liar. That is what No Lie MRI and Cephos claim they can do, with an accuracy of 90% to 93%.

## ELECTROENCEPHALOGRAM

Blood flow isn't the only way your mind can blow your cover; electrical activity can too. Your brain emits signals called event-related potentials (ERPs) that can be tracked with a high-density electroencephalogram (EEG) machine and 128 sensors attached to the face and scalp. Telling the truth and then a lie can take from 40 to 60 milliseconds longer than telling two truths in a row, because the brain must shift its data-assembly strategies. In theory, if a subject truthfully answers a question related to intention (say, "Are you traveling to Miami?") and then answers a more relevant question about intention (say, "Do you plan to detonate a bomb?"), the ERP patterns might reveal if the answer is honest. Psychologists working on the technology believe it is 86% accurate.

## EYE SCANS

The stress that creates the clues picked up by polygraphs also boosts blood flow in capillaries around the eye. A new application of thermal-imaging technology, called periorbital thermography, uses a high-resolution camera to detect temperature changes as small as .045°F (.025°C). Endocrinologist James Levine of the Mayo Clinic in Rochester, Minn., co-authored a paper in the journal *Nature* in 2002 in which he claimed a lie-detection accuracy of 73%. Investigators at the Department of Defense Polygraph Institute (DODPI) in Fort Jackson, S.C., tell *TIME* they have reached 84%.

Scientists at DODPI have also become expert at tracking the motion of the eyes. When the eye takes in a series of images of faces, objects or scenes, it spends less time on familiar elements because the brain needs less processing to interpret them. DODPI has developed an infrared camera that can track eye movement and an algorithm that can interpret it, providing clues as to whether a suspect recognizes, say, the face of a kidnapped child. Tests have reportedly achieved an 85% to 92% success rate.

## MICROEXPRESSIONS

The best poker players say tics and flutters in an opponent's face--the so-called poker tells--can telegraph when a player is bluffing. Scientists agree that the face tells tales we may wish it didn't. San Francisco psychologist Paul Ekman has codified 46 facial movements into more than 10,000 microexpressions in what he calls the Facial Action Coding System (FACS). He and Frank, who helped devise the catalog, say they can detect deception with 76% accuracy. According to Ekman, thousands of people have been trained in FACS, including Transportation Security Administration personnel. While similar behavioral screening has been used in British airports for several years, FACS is only now being rolled out as a terrorist-screening tool in a dozen U.S. airports.

Each of these systems comes with uncertainties and limitations. Researchers working with EEGs, for example, concede that not all truths read the same way in the brain. A truthful answer about where you were born may produce a quicker--seemingly more honest--signal than an equally truthful one about how you spent your last birthday. Moreover, your brain and someone else's may not answer the same question at the same speed. Each test must thus be painstakingly calibrated for each subject. Not only is that impractical, but it also introduces a whole new level of variability--like trying to diagnose a fever if all of us had a different basal body temperature.

The shortcomings of fMRIs may be more serious. Physical anomalies such as evidence of a stroke or tumor can interfere with the scan's accuracy. And the test is administered in a decidedly unnatural way--with the subject lying down inside a giant magnet. Since speaking aloud activates regions of the brain that could swamp lie-detection results, subjects are asked yes-or-no questions and then instructed to push a button to answer. Maybe the brain operates the same way with a push-button fib as with a verbal one--but

maybe it doesn't. And because we all do a certain amount of self-censorship--telling white lies to avoid hurt feelings, for example--signs of activity in the relevant brain regions do not necessarily make you a criminal. "All fMRI lie-detection studies report findings in parts of the anterior cingulate," says University of South Carolina psychologist Jennifer Vendemia. "Well, that's good because if you don't have activation there, you're probably dead."

And don't even get critics started on the shortcomings of reading faces or heat around the eyes. The same honest anxiety that can produce false positives on a polygraph can also increase blood flow in the periorbital region. Facial analysis is problematic, since there's no way to standardize the skills of human analysts, and nobody can say for certain if cooler liars give up fewer clues than nervous ones. "It's not as simple as a Pinocchio phenomenon," says Frank.

The biggest problems, however, may be ethical and constitutional. For now, improved lie detection is likely to have broad public support. But what about when it reaches more surreptitiously into our lives? Biophysicist Britton Chance of the University of Pennsylvania has explored ways to use infrared light projected from a distance to penetrate the skull, looking for signs of stress similar to the ones fMRIs detect. Both that and remote periorbital thermography could be used undetectably in airport lines to spot high-stress passengers. Whether that stress is caused by the bomb you're concealing or the fact you're running late can't be known until you're pulled from line, searched and interrogated.

Several groups have raised questions about the new technologies. The American Civil Liberties Union filed Freedom of Information requests in June, seeking to learn more about lie-detection research the government is conducting and whether the techniques are already being used in the field. This fall a leading--but as yet undisclosed--science journal will publish the results of a paper it solicited from Stanford's Greely and other legal experts and scientists exploring the ethics of lie detection. The authors are not expected to smile unreservedly on the science or on the way they believe it may already be in use--perhaps, according to some reports, in Iraq. Frank has helped train people in facial analysis, but he will say only that some of them have been sent to work in "regions of interest."

Private companies like No Lie MRI face legal hurdles too. So young a technology has almost no chance of clearing the admissibility bar in criminal cases, limiting its value to potential customers in law enforcement. And the Employee Polygraph Protection Act of 1988, which restricts the circumstances under which current or prospective employers may use existing lie-detection technology, will probably apply to fMRIs too.

For now, the new lie-detection techniques are likely to remain in the same ambiguous ethical holding area as so many other privacy issues in the twitchy post-9/11 years. We'll give up a lot to keep our cities, airplanes and children safe. But it's hard to say in the abstract when "a lot" becomes "too much." We can only hope that we'll recognize it when it happens.

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