Lie detectors

In pursuit of the truth, crime investigators dream of a foolproof way to spot suspects' lies. The invention of the polygraph in the 1920s promised to make these dreams a reality. Today, however, many people question the value of this "lie detector," and more sophisticated technologies are being explored to supplement or replace it.

In a police station interview room, two detectives question a youth caught loitering in a parking lot. His replies are cool, confident, even cocky, and when the interview moves on to local car crime, his manner stays the same. But his posture changes. He folds his arms. When asked specific questions, he touches his lip. As the interview winds up, he leans back in his chair, crosses his legs, and puts his hands behind his head.

Showing him out, one detective mouths silently to the other: "He's our man." The police covertly keep watch on him, and a week later a CCTV camera catches the same youth stealing car radios.

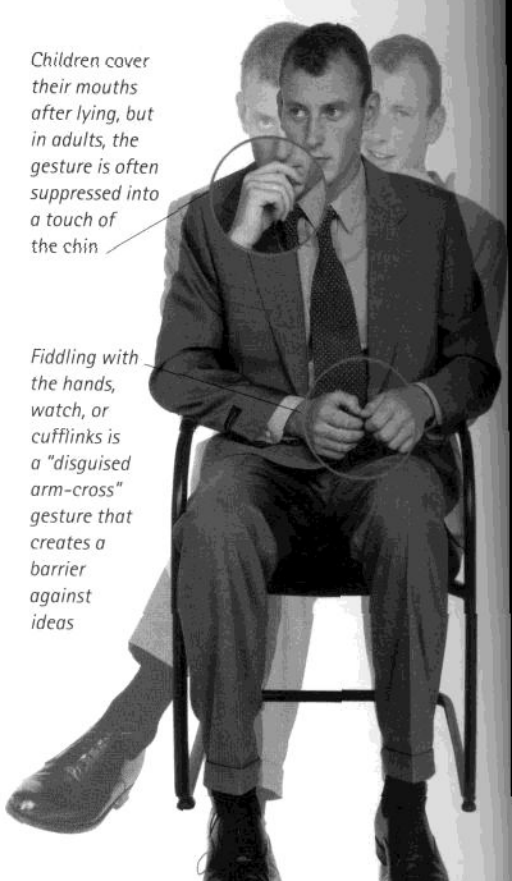
Body-language blunders

The two detectives simply used their experience and training to read the suspect's body language. His gestures said, "I'm not helping you," then "I'm lying," and finally "You won't get me, I'm smarter than you."

Reading a suspect's postures has always been a useful skill, but until the 1960s it was generally regarded as intuition. Then psychologists began research into nonverbal communication, and a 1971 book by Julius Fast popularized the subject. Today, it forms a standard part of interview-technique training.

Putting faith in the polygraph

Useful though body language is, it is subjective. The polygraph, by contrast, appears to be utterly objective, and produces a permanent record of a suspect's responses. The polygraph measures the body's response to stress. For example, we are all familiar with the "sweaty palm"



Children cover their mouths after lying, but in adults, the gesture is often suppressed into a touch of the chin

Fiddling with the hands, watch, or cufflinks is a "disguised arm-cross" gesture that creates a barrier against ideas

BODY LANGUAGE ▲
It can be easy to read body language; just look carefully at how people sit, and what they do with their hands.

◀ TESTING, TESTING!
An FBI recruit undergoes a polygraph test. Many US employers use the equipment to test and evaluate staff. In the legal arena, suspects may wish to take the test to prove their innocence.

A POLYGRAPH TEST

1. *A pair of plates attached to the subject's fingers measure skin resistance. Lying causes sweating, which lowers this resistance.*
2. *A rise in blood pressure and increased pulse rate both indicate stress, so the polygraph examiner wraps a sphygmomanometer cuff around the subject's arm to measure these.*
3. *Heavy breathing also betrays anxiety, and a couple of pneumographs strapped around the chest measure it. Data from this and the other sensors is fed to an interface box.*
4. *A portable computer charts the results of the test and correlates the subject's responses with the questions.*

sensation experienced when under pressure. Perspiration lowers the skin's electrical resistance, and the polygraph gauges this using electrodes on the fingers. The machine also measures depth of breathing, pulse rate, and blood pressure, plotting each of these stress measures on a paper trace or, increasingly, as a graph on a computer screen.

To administer a polygraph test, the examiner must first ask the subject a series of innocent questions. These determine a baseline for each measurement, against which to compare the subject's responses to later questions about the crime itself. In theory, their body will betray them when they answer falsely, leading to a peak on the chart.

Polygraph problems

In practice, subjects' responses are not so clear-cut. Many physical factors, such as drug and alcohol use, and even hunger, can mislead the machine. Pathological liars can cheat it, and simple techniques such as self-inflicted pain—perhaps by biting the tongue—can send readings awry. Results can also be misinterpreted if the examiner fails to establish a reasonable baseline, due to poor training.

Without supplementary evidence, a polygraph test cannot overcome "reasonable doubt," so it is rarely used as evidence in court. However, suspects fear its reputation, and some change their plea to guilty either after failing a test or in anticipation of one.

Crime on the brain

Newer technologies may succeed where the polygraph has failed. Some of the most promising use the electroencephalograph (ECG), used by researchers since the 1930s to study the electrical waves that surge through our brains when we think.

Most of the researchers working on this technology concentrate on one wave in particular: the P300, which surges when we see something we recognize.

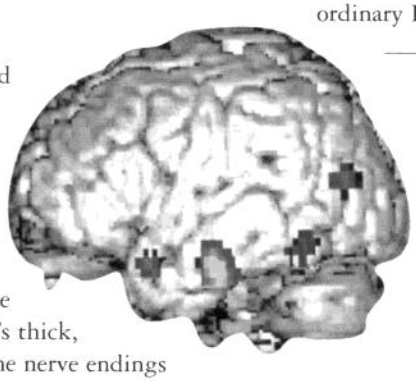
One organization has worked with the CIA and the FBI to develop and formulate a test nicknamed "Brain Fingerprinting." This test works by monitoring the P300 wave as the suspect looks at images or phrases associated with the crime scene, and at unconnected images and words. The spark of recognition, so-called "guilty knowledge," triggers a change in the brain wave, which ECG equipment detects. Wrongly accused suspects who were never at the crime scene should show the same response to all images.

Though this test sounds similar to the polygraph, it is not as susceptible to cheating. People with guilty knowledge cannot stop themselves from reacting, so there are no false positives.

Magnetically minded

ECG is a comparatively old technology, and there are now more sophisticated ways to monitor brain activity, such as magnetic resonance imaging (brain scans or MRI). This highlights areas of the cerebral cortex—the brain's thick, thinking "skin"—where the nerve endings spark most vigorously. This technique may one day allow forensic scientists to probe the criminal mind. So far, however, MRI has defied attempts to untangle complex brain activity to produce a standard, easily administered truth test.

Ironically, a simple new lie detection technique may eventually replace the polygraph. Research at the University of Michigan suggests that liars briefly hesitate before responding to a question. Even with training they cannot hide the pause. The technology is still incomplete, but as one researcher puts it, it is a "cheap and easy way of doing the guilty knowledge test: all you need is an ordinary PC, and no electrodes."



◀ BRAIN ON FIRE
This false-color positron emission tomography (PET) scan highlights the areas of the brain triggered during image recognition.

THE HEADBAND OF TRUTH ▶
Brain fingerprinting involves fewer invasive sensors than the polygraph. Terminals on a headband pick up the ECG waves, and the subject's responses are monitored on a computer.

A PATTERN OF LIES

Can the sound of your voice betray your lies? That is a question for forensic phoneticians. These experts train for eight years in the field of linguistics and phonetics (language and speech science) before helping to solve legal cases. They have been known to deduce a suspect's age, sex, and race from their voice, as well as matching different recorded telephone calls to a particular caller.

Voice spectrography, popularized in the 1960s, used a graphic representation of sound: a "voiceprint." The voiceprint below shows the sound made by someone saying "baby." The graph measures amplitude—the strength of sound over time—and shows the two different syllables as bursts of lines on the graph. But forensic phonetics is not solely about voiceprints. Trained experts must use their strong academic background to interpret the prints in combination with phonetic analysis and acoustic measurement.

Experts have argued about the value of voiceprints, but most agree that the psychological stress evaluator, a device that uses tremors in speech as a measure of stress, is not a reliable way of detecting lies.