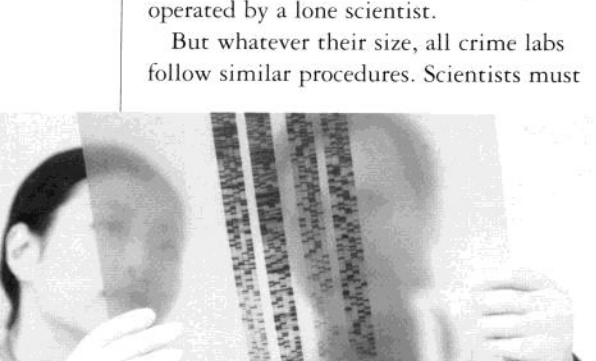
The crime lab

Inside the forensic laboratory, mundane evidence yields up vital secrets. An apparently spotless comb identifies its owner. A maggot's gut reveals the poison that killed its human meal. Hidden fingerprints glow clearly beneath ultraviolet lights. Today's crime lab technicians use amazing technology to analyze evidence that connects suspect to crime.

A large national crime lab brings together under one roof almost all the disciplines of forensic science. It may employ multi-skilled technicians, who do a range of jobs, or specialist scientists who focus on complex fields, such as DNA. Some labs are attached to universities or busy police departments; others are independent. A lab serving a small town may be equipped for only the most common tests and may be operated by a lone scientist.

But whatever their size, all crime labs follow similar procedures. Scientists must ensure that an item of evidence entering the lab never comes into contact with anything that could contaminate it. Each item is carefully stored and logged so that its progress through the lab's departments can be traced if necessary.



COMPARING DNA SAMPLES ▲
Crime labs must use a standardized DNA analysis technique so that their results can be compared directly with national databases.

Testing the evidence brought to the lab usually begins with the most simple diagnosis ("is this stain actually blood?") before continuing to more costly, but more precise, tests ("whose blood is it?"). Tests that destroy samples are always carried out last of all.

What's inside?

All crime labs boast an identification unit for revealing and enhancing fingerprints. This is needed because it isn't feasible to perform many of the most sensitive techniques at the crime scene. Fume enclosures, where superglue fumes can reveal hidden fingerprints, line the walls of the lab shown on this page. This lab also houses the special lights needed to reveal developed prints (see p. 46). Tire marks and shoeprints end up here, too.

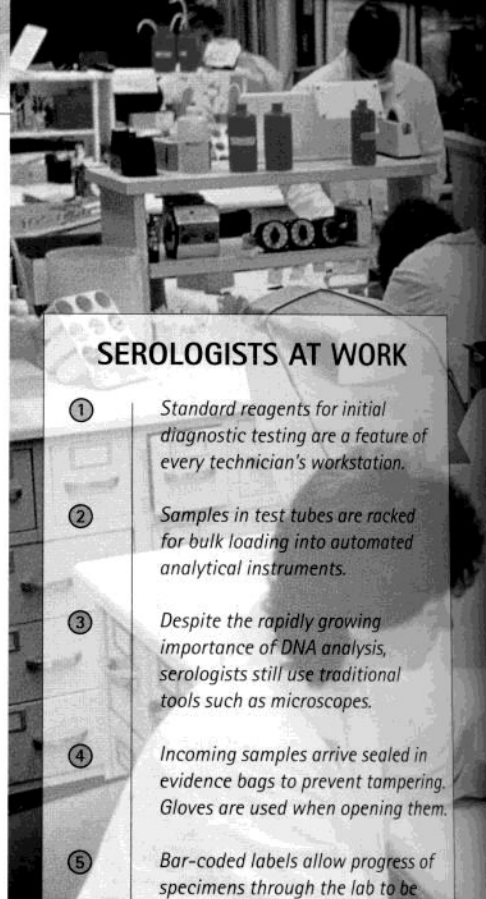
Similarly, a trace evidence unit also forms a central part of most labs. Staff here look for clues in samples of hair, fiber, fabric, and dust. Their expertise may also be needed for checking forensic dentistry and skeletal remains.

Chemistry set

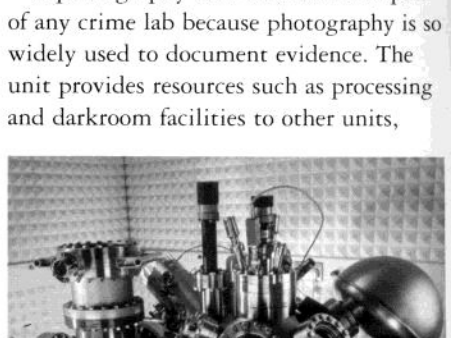
Bristling with test tubes and complex analysis equipment, a chemistry unit resembles any general science laboratory. Here, toxicologists test urine and blood samples for poisons, drugs, and alcohol (see p. 82). They also analyze synthetic samples, such as dyes, stains, and medicines. Chemistry labs rely heavily on technology, using gas chromatographs, microscopes, and mass spectrometers to identify telltale chemical signatures (see p. 88).

The serology unit analyzes blood and other bodily fluids. DNA sequencing increasingly dominates this work. Recent advances have brought the most common DNA test, polymerase chain reaction, within the scope of even small labs. The more specialized test on mitochondrial DNA (see p. 63) is the preserve of larger facilities.

A photography unit is an essential part of any crime lab because photography is so widely used to document evidence. The unit provides resources such as processing and darkroom facilities to other units,



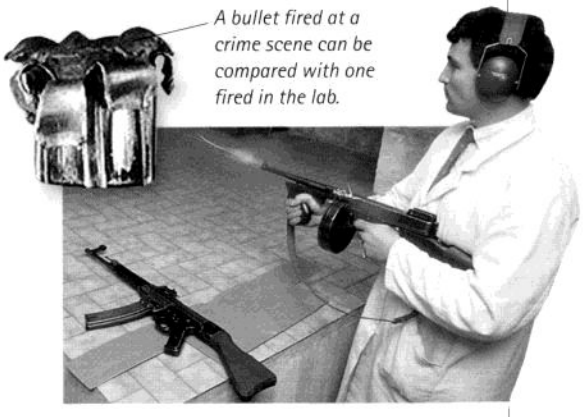
FBI SEROLOGY LAB ▲
Serology means the study of blood serum, but forensic serology units, like this one, analyze all bodily fluids, including semen and saliva.



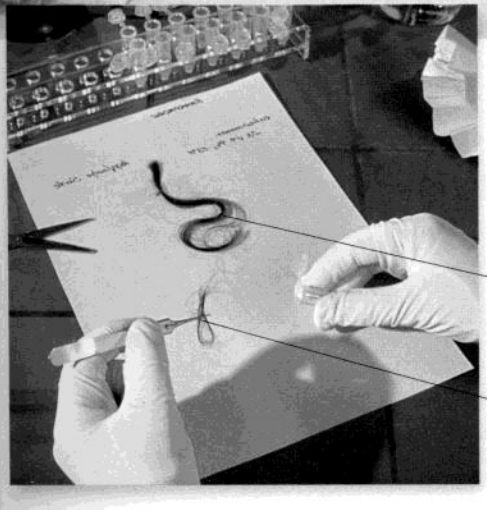
ELECTRON MICROSCOPE ▲
Scanning electron microscopes are used to magnify objects, such as hair, fibers, dust mites, and fungal spores, for analysis by the relevant specialist.

TESTING FIREARMS

Firing suspect weapons gives ballistics experts spent cartridges and bullets to compare with examples in firearms databases, such as the FBI's Drugfire index. It also provides other useful information—the pattern in which cartridges are ejected, for example, can reveal where an assassin was standing to fire a weapon, and the spread of shotgun pellets gives a rough indication of range.



A bullet fired at a crime scene can be compared with one fired in the lab.



◀ HAIR TESTING FOR DRUGS
As a suspected drug abuser's hair grows, it locks up drug residues. By analyzing fragments, toxicologists not only identify the presence of any drugs, but also get a calendar of their use. The same can be done with fingernails.

This hair sample is lying on a record sheet, which the technician may sometimes seal with wax to prevent tampering.

The hair is cut into half-inch pieces corresponding to specific dates. The drugs and drug metabolites are then extracted by solvents and identified by gas chromatography and mass spectrometry.

supports crime-scene teams, and gives expert testimony on the authenticity of photographs. Specialists may need to be called in for services such as surveillance and aerial photography.

Materials, guns, and software

A materials unit analyzes alloys, ceramics, paints and other coatings, soil, and wood to trace the criminal, or to link a suspect to the crime scene. Biological materials, such as seeds, are analyzed by the biology unit.

A firearms unit integrates precision science with the clatter of shooting baths. Testing weapons means firing them—to study characteristic marks on a target, bullet, or cartridge case. Large labs may also include teams that specialize in arson and explosives, and units that analyze computer data, documents, photographs, and audio and video recordings—though outside specialists are available for the smaller labs to use.

Collaboration

Every forensic lab needs scientists to do the tests, but they also need support staff to check in, prepare, and store evidence. They maintain and run the lab, and they help calibrate the complex testing instruments.

Collaboration goes beyond the walls of individual labs. The results of an isolated test may be useful, but comparison with similar tests gives them far greater value. Analysis of marks on a crime-scene bullet, for example, can prove it was fired from a suspect's gun, but matching the marks with records on a national database might link the weapon to a dozen other crimes. So at the elbow of most forensic specialists is a computer that enables them to make these essential comparisons and searches.

SAMPLING BLOOD
To test dry bloodstains, technicians scrape off samples, or moisten with water and sample with a swab.