Sun Lifestyle

Leaving No Stone Unturned

Army Crime Lab Examiners Will Return to the Scene of the Crime in Pursuit of the Truth

BY LEE KOLB
Lifestyle Editor

One of the most advanced forensic science laboratories in the world operates from a modest warehouse on the clipped greens of Fort Gillem in Forest Park.

The USACIL-CONUS (United States Army Criminal Investigation Laboratory -- Continental United States) facility is organized into seven functional areas - the Firearms and Toolmarks Division, the Photography Division, the Questioned Documents Division, the Latent Prints Division and the Serology, Trace Evidence and Drug branches of the Chemistry Division.

Within these divisions, evidence from crimes commited by or against Army, Defense Department or other federal government personnel is scrutinized with the latest techniques available in forensics fields.

The work here is done in support of the Army's Criminal Investigation Command (USACIC). These examiners' testimony can help secure a conviction or absolve a suspect from guilt.

Though endowed with differing functions and responsibilities, each division works with the others to expedite the vast volume of cases -- some 2500 this year, involving over 5000 separate examinations -- just as the USACIL-CONUS Headquarters Command works with other forensic labs, military and civilian, to develop and standardize forensic procedures worldwide.

At Ft. Gillem are the headquarters and training grounds for examiners at two additional Army crime labs, one at Camp Zama, Japan and the other in Frankfurt, West Germany.

Each of the three labs handles casework from its region. To Ft. Gillem goes evidence from crime scenes in Central America and Puerto Rico as well as the continental U.S.

Evidence coming to USACIL concerns major crimes: significant property loss or damages, sexual crimes, assaults, fraud, economic and violent crimes.

Twenty-four military examiners and 36 civilians work at USACIL-CONUS. "It's a nice mix of people," said Lt. Col. Daniel F. Uyesugi, who assumed command of the lab Aug. 23. "They are as professional as they come."

Civilians are employed at USACIL-CONUS because oftentimes they possess special skills "which are not readily available in the military," said Uyesugi.

The military examiners are drawn from the enlisted or warrant officer ranks of the CID and are all qualified investigators before they begin the required two years of laboratory training, said Uyesugi.

Most examiner trainees bring a bachelor's degree in some forensic or technical science area to the lab. Because chemists already have an analytical background, their training period lasts only one year.

"They must be tested and certified at each stage of the training before they can be qualified as an examiner," Uyesugi said.

Examiners stay on the leading edge of their fields through 'sustainment training' after they have been certified.

They attend professional seminars and symposiums associated with the various forensic disciplines.

"Our people will present papers at conferences given by the American Association of Crime Lab Directors," said Uyesugi. USACIL-CONUS is the only Army facility to be accredited by that organization.

At the forefront of forensic science now is a procedure called DNA fingerprinting.

From human DNA (the nucleic acids found in the chromosomes of living cells that store hereditary information) taken from a body fluid stain, skin or hair cell, a characteristic fingerprint can be established.

"In serial crimes, we'll be able to associate an unknown suspect with multiple cases - we'll know that *someone* did this one, and that that same person did the next one and the next one. We may not know who that person is, but when we get an actual suspect we can analyze the DNA from his blood or semen or urine or hair samples and be able to say if it was that person or if it wasn't," said Uyesugi.

"The DNA fingerprinting is the way we'll all be going in the future."

Such evidence has been used in courts within the last year and is considered admissable.

USACIL examiners believe that the evidence speaks for itself.

They do not work necessarily to secure a conviction, but to sift the evidence impartially, thus working for both the prosecution and the defense.

Thousands of pieces of evidence are examined yearly.

The work is carefully reported. In many cases evidence is photographed, and graphic presentations of the evidence are prepared for courtroom juries.

"To present it in a clear and understandable way to the jury, it's very important to have a graphic presentation that makes sense," said Uyesugi.

Sometimes examiners are dispatched to crime scenes to collect the evidence firsthand. USACIL-CONUS is prepared to send a team, tailored to the circumstances of the crime, to any locale within its region within 24 hours with the equipment they need, he said.

Items needed for follow-up examination can be brought back with the team or packaged and returned later.

"We can even bring cars back. We have a vehicle processing area where cars can be taken completely apart."

In the Drug laboratory, questioned substances can be identified through infrared spectroscopy or mass spectrometry.

Molecules respond differently to infrared light. The molecules in a sample penetrated by it change wavelengths as the light is absorbed. No two molecules will react the same way, and these changes are recorded and then compared with other spectroscopic recordings of known substances in the computer's library. In this way an unknown substance can be identified.

"It is scientifically valid, and the courts will accept it," said Supervisory Drug Chemist Carrell Clemmons.

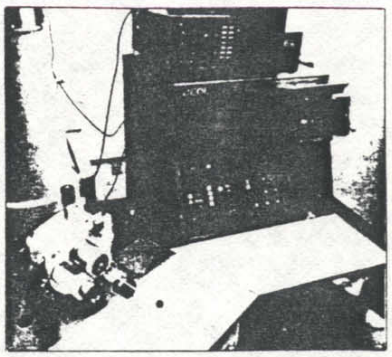
In the mass spectrograph, a questioned molecule is bombarded with electrons, converting it to ions which break apart upon contact with electric and magnetic fields. The reaction is recorded on photographic plates, and can be compared with as many as 40,000 other reactions in the computer's compound library.

"All molecules break apart differently," said Clemmons.

Therefore, a white powdery substance could be positively identified as cocaine if its molecules reacted the same way known cocaine molecules did in prior tests.

Much of the work in the Trace Evidence lab is based upon Locard's Exchange Principle, named in honor of an early forensic scientist who observed that "every contact leaves a trace," according to Supervisory Chemist Larry Flinn.

Clothing fibers, hair, paint or plastic particles may be exchanged between assailants and victims during a struggle.



Gateway To The Infinitesimal Universe

The electron microscope in the chemistry lab provides examiners with detailed information.

Analysis of such "contact transfer evidence" could confirm a suspect's guilt or vindicate him, according to Flinn.

"We're dealing with tiny bits of material," he said, displaying photographs of paint chips, hairs and fibers magnified up to 180,000X with the division's electron microscope.

The electron microscope can reveal whether fibers have been cut or torn, or if paint specks found at the scene belonged to a certain automobile. Such evidence usually cannot stand alone but can be important in a courtroom, said Flinn.

The lab could determine if particles or residue found on or with a suspect originated from the crime scene. For example, pollen grains found on a body or mud taken from a suspect's boots could be linked to a certain location.

The Trace Evidence lab also examines explosion, arson and gunshot residues.

Debris from a burnt building will reveal which combustibles were present. Excessive amounts of barium and antimony on a suspect's hand could indicate he fired a weapon.

"It's important to be at the scene," he said. "Experience is tremendously important."

Serology Division looks at body fluids; traces of blood, semen or hairs and skin cells found at a crime scene.

Most of these fluids will fluoresce under various lights and from them the blood types, race and hair color of their owners can be determined.

Dr. Steve Fletcher of England's Central Research Establishment, visiting USACIL-CONUS for one week to train serology examiners in enzyme-linked immunosorbent assay techniques (which detect blood types from body fluids) said certain types of proteins can be detected from very small amounts of body fluids.

A human hair could provide a layered history of body chemistry, said Fletcher. Traces of drugs and metals that have passed through the body are deposited in hair roots, and DNA extracted from hair, as well as other bodily proteins, can be used to construct characteristic fingerprints.

"DNA offers enormously good discriminations between individuals," he said.

These new methods stand better as evidence because subjective interpretations of data by human examiners are eliminated, said Fletcher.

When weapons are recovered from a crime scene, the Firearms and Toolmark Examiners must fire them to "make sure that they work," according to Examiner Richard Roberts.

In this division weapons, tools, safes, locks and other evidence is tested and examined.

Every gun leaves its own signature on bullets or cartridge casings, said Roberts. Here examiners can match striations on a bullet with the barrel of an individual firearm. A screwdriver found in a suspect's car could be positively identified as the one that was used to break into a safe. "Every gun barrel and every tool, like every fingerprint, is different."

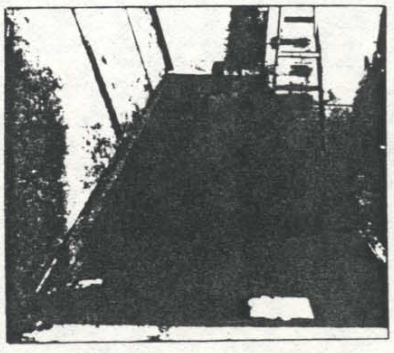
Crooks who file serial numbers from metal objects may not realize those numbers are still visible.

When a serial number is first stamped into an object, said Roberts, the jolt affects molecules well below the indentations. By sanding lightly over the area and applying a special acid, obliterated numbers re-appear.

A forensic comparison microscope brings two different objects into the same field of view, enabling examiners to match a questioned bullet to another fired by the same weapon, to determine if the questioned bullet was indeed fired through the weapon. Marks on a tool tip can be matched to marks on a safe.

Examiners can cut a safe up into easy-to-work-with pieces in their workshop.

Their division includes soundproofed firing range and a bullet water recovery tank. Slugs fired into water will travel only three of four feet, said Roberts, and can be collected and compared with others.



Firing Into Water

The bullet water recovery tank in the Firearms and Toolmarks lab stops bullets cold.

Fingerprints form in the third or fourth months of pre-natal development," said Latent Print Examiner Randy Upton.

Perspiration and dirt on fingerprints leaves print patterns on the receiving surface. In 1978 examiners at the Camp Zama, Japan lab were introduced to a technique of print recovery involving common superglue.

Non-porous surfaces holding prints are covered with a vaporized film of superglue, which "freezes" the patterns. Examiners can then transfer them to transparent surfaces where they can be dyed and superimposed over images of other prints.

Prints on porous surfaces are treated with a chemical called Ninhydrin, which reacts with amino acids and perspiration, causing the prints to stand out.

Components of fingerprints can be digitized electronically on the Analog Digital Image Processing System, a computer which assigns each small part of a print image values - and colors - and displays these colors on a screen.

Each shade of grey on print images entered into the machine is assigned a color value, and the prints can then be analysed in detail and compared with other prints in the database of the machine or FBI or GBI files.

"The human eye can distinguish from 16 to 30 shades of grey, but the digital image processing system can discern 244," said Upton.

Prints found at a crime scene - even if there are as yet no suspects - are entered into the database for later use, should their owner commit more crimes elsewhere.

Also prints of lips, feet, ears and noses have been used as evidence in court, said Upton.

"There are six basic groups of lips," he said.

Questioned documents and handwriting, suspected counterfeit currency and related evidence is handled in the Questioned Documents Division, said division chief Jim Lee.

Examiners here can trace a document back to the photocopier or typewriter where it originated, as well as detecting alterations or obliterations made in those documents.

Samples of a suspect's known writing are compared with questioned samples, on bad checks, for example, and can be enlarged and mounted on placards for presentations to juries, said Lee.

Questioned inks can be subjected to a technique of chemical identification known as Thin Layer Chromatography.

"Basically, what it does is separate out or show color bands on the different constituents that comprise an ink," said Questioned Document Examiner Marshall Reed.

The results are then compared for similarities or dissimilarities between a questioned and a known. "If the TLC's are different, it's conclusive evidence that the inks are different," said Reed.

This division can also date a document by analyzing the chemical content of the paper.

Photographers at USACIL-CONUS "serve to communicate to the jury what can be seen by the examiners," said Forensic Photographer Robert Sanders III.

The photographers put together graphic displays of other examiners' work so the juries can understand it.

"We provide visual aids to the other division so that they can communicate more effectively."

Eighty-five percent of the work done by the division is fingerprint photography, said Sanders.

The lab is also responsible for developing film found at crime scenes, and tracing film back to the camera that processed it.

The lab is just getting into time-lapse videos tapes, trying to make identifiable photos from bank camera videos and is looking at more sophisticated image-enhancement systems.

Presently USACIL-CONUS is working with the other USACIL labs, the FBI and several international laborstories to try to settle on specific examination procedures and standards, to facilitate cooperation in the forensic community, said Uyesugi.

Hopefully "forensic procedures can be standardized worldwide, so labs can exchange information and work with each other," he said. "Right now, we're trying to decide how we are going to accumulate the database and access it, so we can keep cross-referencing and identifying people."

"No lab can afford to do it on their own," said Uyesugi.