CSI – Texas: The Science of Sleuthing

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Texas Department of Public Safety

Crime Laboratory Service
William L. Ginn, Manager-Headquarters Lab
THE CAPTURE OF AMERICA'S MOST WANTED
HOW MEXICO NABBED A NOTORIOUS DRUGLORD--AND SHIPPED HIM TO A U.S. JAIL
By KEVIN FEDARKO

Jan. 29, 1996
IN THE TOWN OF VILLA JUAREZ, just south of Monterrey, 15 Mexican drug agents spent most of Jan. 14 crouched outside a walled ranch house. The agents had received a critical tip. Juan Garcia Abrego, one of Mexico's most powerful drug dealers, was inside. At 7 p.m., the team moved in. They smashed through the front gate in a minivan, taking Garcia Abrego and two bodyguards by surprise. As the druglord dashed out a back door and tried to launch his portly frame over a fence, agents grabbed him by the shirt. Twenty minutes later, the man who had shipped perhaps a third of the cocaine consumed in the U.S....
Objectives of the Texas DPS Crime Lab

- Scientific examination and analysis of evidence
- Supervision and management of technical programs
- Assistance in scientific investigations
- Expert testimony
Texas DPS Crime Laboratory System

- Headquarters and 12 Field Laboratories
  - Headquarters - full service forensic lab
  - Field - from drugs only to near full service
Austin Headquarters - Lab Services

- DNA
- Toxicology
- Controlled Substances
- Forensic Photography
- Trace Evidence
- Firearms
- Combined DNA Index System (CODIS)
- Automated Fingerprint Identification System (AFIS)
- Latent Prints (e.g. fingerprints)
- Questioned Documents
Evidence Control

Evidence is stored in controlled access areas under proper seal.
Latents Prints / Fingerprint ID

- A variety of techniques to identify and match prints:
  - carbon powder dusting
  - super-glue and ninhydrin spray techniques
  - amido-black visualization
  - argon laser

- AFIS (Automated Fingerprint Identification System): computerized system that stores characteristics of >4.4 million individuals in DPS Crime Records

- AFIS performs computer searches of unknown fingerprints by optically scanning a print and comparing it with those on file
Latent Prints

- Latent Prints Movie 1
Latent Prints

- Latent Prints Movie 2
Automated Fingerprint Identification System (AFIS)

- AFIS Movie
DNA (Nuclear)
DNA Technologies

Restrictive Fragment Length Polymorphism

Polymerase Chain Reaction (PCR)

Short Tandem Repeats

Single Locus Analysis
How PCR works

- DNA strand separates when heated (denaturing)
- Primers attach (annealing) when cooled, and enzymes create a complement strand (extension) when warmed
- Cycle is repeated approximately 30 times
Evidence Screening for Trace and Serological Evidence

- Evidence Screening Movie
Combined DNA Index System (CODIS)

- Began in Texas in 1995 with House Bill 40
- Currently 130,000 profiles in Texas DNA database (as of 10/04)
- Used to identify suspects in crimes where blood, other bodily fluids, or hair evidence is left by the perpetrator
- Future of CODIS depends on legislative mandate
National DNA Index System (NDIS) Participants
September 2004 - 50 States, US Army, the FBI, and Puerto Rico
Forensic Photography

- Crime scene photography and reconstruction using specialized forensic photographic techniques (e.g. Luminol for blood visualization)
- Photograph latent prints
- Details of crime scene evidence for presentation in court and for teaching
- Digital Image Enhancement
Forensic Firearms

- Projectile and cartridge case comparisons
- Comparison to other fired cases and projectiles
- Comparison to known weapons
- Determination of caliber and make of unknown weapon
- Ammunition identification
- Distance determination
- Toolmarks
- Obliterated data
A gun barrel is produced by boring a hole down the length of a steel blank.

“Rifling” is imparted to the inside surface of a gun barrel by drawing a broach or button through the bore.
Weapon Manufacturing

- Rifling gives the projectile gyroscopic stability during flight
- Making a gun barrel produces toolmarks on the inside of the barrel, which are imparted to the projectile during its passage down the bore

Cross section of inside of bore after broach has been drawn through
Weapon Manufacturing
Breech Marks

Breech face

Primer area of fired cartridge
Forces (during gun firing)

When cartridge discharges, bullet and cartridge case experience opposite forces.
Through the Microscope

Breech marks left on cartridge head during firing

Extractor marks made by auto-loading weapon
Firearms Test Shots

- Firearms Test Movie
National Integrated Ballistics Imaging Network (NIBIN)

Database of fired cartridge cases and projectiles

- Collection and interagency sharing of forensic data and imagery
- Rapid, comprehensive searching of local and regional firearms evidence files
- Remote electronic comparisons of digital images
- Linking unsolved shootings to other incidents and/or confiscated firearms
- Linking repeat offenders to crimes, and expediting their identification
National Integrated Ballistics Imaging Network (NIBIN)

- NIBIN Movie
TOOLMARKS

Individualized characteristics of cutting surfaces of tools from their manufacture and use
Questioned Documents

- Examines original handwriting specimens from checks, wills, suicide and threat letters, forgeries, voter fraud, etc.

- Also examines:
  - typewriters (paper fiber transfer, wear patterns, and fracture patterns)
  - photocopier and ink comparisons
  - fraudulent tickets
  - documents
  - rubber stamps
  - head lamps/turn signals
  - trash bag comparisons

- Computer data recovery
Visual Spectral Comparator (VSC) shows modifications to original document
Latent Writing Impressions

Oblique lighting

Electrostatic discharge device
Detection of differences in inks

IR Luminescence detects differences in ink chemical composition
Trace Evidence

Locard’s Exchange Principle: When two objects come into contact there is always transfer of material from one to the other. Such material may be small or large, may be difficult to detect, nevertheless it occurs.
Trace evidence can be used to associate a suspect, victim, weapon and crime scene.
Trace Evidence Analysis (Criminalistics)

- Hair, fiber, paint, glass, soil, and gunshot residue from a variety of types of crimes

- Specialized techniques include:
  - polarizing microscopy
  - Microspectrophotometry
  - X-ray diffraction pattern analysis
  - Inductively Coupled Plasma (ICP)
  - emission and infrared spectroscopy
  - gas chromatography
  - refractive index determination
Trace Evidence
Caucasian Head Hair
Discharge of Gunshot Residue by Revolver
Handswab Analysis
for Gunshot Residue

- Barium
- Lead
- Antimony

Samples from a subject should contain 5 swabs:

- Left and right palms
- Left and right back
- Control
Plastic Trash Bag Comparison

Note die lines and “arrowhead” alignment across perforation
Drug Analysis
Analytical Methods

- Spot Tests – preliminary only
- Microscopic or microcrystalline
- Thin layer chromatography
- Instrumental Analysis
  - UV-Visible Spectrometry
  - Chromatography
  - Mass Spectrometry
  - FTIR
Automobile Paint

Collect known paint sample from damaged area

Compare to paint on victim’s clothing
Non-Instrumental Tests

Spot Tests
- Marquis test for opiates
- Scott test for cocaine

Microcrystalline Tests
Thin Layer Chromatography

Here, marihuana components (THC, Cannabinol, and Cannabidiol) can be visualized using Fast Blue B as a locating reagent.
Gas Chromatography
Controlled Substances

Heroin

Cocaine

Marihuana
Marihuana
Microscopic View

Glandular hairs

Cystolithic hairs
Opiates

Dried Opium Poppy Pods

“Latex” from pod contains opium
Stimulants - Methamphetamine

Clandestine Meth Labs

Finished product

Waste
Hallucinogens & Club Drugs

LSD

Ecstasy (XTC)

Ketamine
Case of Juan Garcia-Abrego

18,360 lbs Cocaine HCl

Juan "La Muneca" Garcia-Abrego

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Case of Garcia-Abrego
Case of Madalyn Murray-O’Hair

The Murray O’Hair Family

FEDERAL AUTHORITIES CONFIRM REMAINS OF MURDERED O’HAIR FAMILY

March 15, 2001
Case of Madalyn Murray-O’Hair

O’Hare hip with serial number
Juvenile Murder Case

Juvenile Murdered by Neighbor
Juvenile Murder Case

- Paint chip found on victim’s body matched detect in wall (caused by serrated knife blade)
Juvenile Murder Case

Use of Luminol

Hallway

Living Room
Case of Roger Scaggs

Austin American-Statesman

Scaggs guilty of murder

Life term possible in slaying of wife

BY LEAH QUIN
American-Statesman 1997

Moments after a Travis County jury found him guilty of murdering his wife, Roger Scaggs embraced his daughter, Sarah Scaggs, laying his head on her shoulder in a gesture of grief that prosecutor said he never displayed after the death of his wife of 18 years.

Jury deliberated 90 hours before deciding Saturday that the software executive and former Sunday school teacher bludgeoned and stabbed Penny Scaggs in their home near Barton Creek Square mall in March 1996.

Software executive Roger Scaggs and his daughter, Sarah Scaggs, embrace Saturday after a Travis County jury found him guilty of murdering his wife in March 1996 in their Austin home. Sarah Scaggs maintains her father's innocence. She plans to testify in the punishment phase of the trial, which will begin Monday. Story, A13.
Case of Roger Scaggs

Suspect's print on inside of glove

Victim's blood on outside of glove
Texas Department of Public Safety

Crime Laboratory Service
William L. Ginn, Manager-Headquarters Lab
William Ginn earned a Bachelor of Science in Chemistry from The University of Texas at Austin in 1971 and began his career with the Texas Air Control Board (now part of the Texas Commission on Environmental Quality) as a chemist from 1971-1973. He was responsible for the development and validation of wet chemical methods for the analysis for gaseous air pollutants. He then went to work for the Texas Department of Public Safety’s (DPS) Crime Laboratory in 1973, where he received training at the Headquarters Lab in various areas of forensic analysis, including drugs, trace, serology, blood alcohol, and firearms and was then transferred to the Garland field laboratory. At that time, many forensic analysts were “generalists” and did not specialize in any particular area.

In 1984, Ginn became the Supervising Criminalist for the Headquarters laboratory’s drug analysis section, where he was responsible for section operations, analysis of evidence, clandestine laboratory processing, training new analysts, and providing instruction to police officers. During his 18-year period as a bench analyst and section supervisor, he has provided testimony in County, State, and Federal courts both within and outside Texas over 800 times.

In 1991, Ginn became the Assistant Manager of the DPS Field Laboratories where I was responsible for the operations of 12 crime laboratories. In 2000, he became the Manager of the Headquarters Crime Laboratory, where he supervises approximately 70 forensic scientists. In addition to his responsibilities at the Department, he also serves as a volunteer inspector for the American Society of Crime Laboratory Directors/Laboratory Accreditation Board, the nation’s largest forensic laboratory accrediting body.