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Evidence Uncovered by 'Criminalistics'

Scientific Crime Detection Aided Warren Group

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For all its detailed descriptions of crime detection techniques, the Warren Commission Report only hinted at the vast scope of modern scientific crime detection.

This science, which has its own fancy name of criminalistics, has advanced so far and so fast in recent years that the names of the tools employed are enough to deter the would-be criminal: gas-liquid chromatography, X-ray diffraction, nuclear magnetic resonance, and neutron activation analysis.

No Two Exactly Alike

Essentially, each of these tools has a common aim—to reveal the fingerprints of a piece of evidence. The fingerprints can be chemical or mechanical. The evidence can be a single hair or fiber or a fleck of paint or flesh so small as to be beyond the sight of the most advanced laboratory microscope.

Because nature never repeats itself, no two objects are ever exactly alike. However, two pieces of the same original object can be enough alike, explains criminalistics professor Paul L. Kirk of the University of California School of Criminology, that "if one piece is of known origin, the origin of the other can be established."

This idea of being able to determine common origin—"pattern evidence" as it is called—is the keystone of modern scientific detection. Essentially, this is how FBI researchers were able to link a homemade paper bag and tape found on the sixth floor of the Dallas School Book Depository and thought to be the bag in which Lee Harvey Oswald carried a rifle into the Depository with paper and tape from the Depository's shipping room.

After several different tests, including fiber analysis and chemical fingerprinting with a spectroscope, the FBI told the Commission that the "questioned and known items were identical in all properties measured by these tests."

Microscopic Distinctiveness

Similarly, FBI ballistics experts could say that "a weapon's microscopic characteristics are distinctive, and differ from those of every other weapon, regardless of make and model."

The majority of the tools available to the modern crime laboratory are adaptations of tools being used in basic scientific research. Some of these tools are used by astronomers to determine the chemical composition of stars at the edge of the universe, while others are used by biochemists to define the structure of in-

For example, gas-liquid visible molecules holding the key to life.
chromatography, which has long been a basic tool in medicine and petroleum chemistry for separating a mixture into its various components, is now finding its way into criminalistics. Kirk notes that gas-liquid chromatography "is now used for identifying and separating many drugs and poisons."

Kirk further suggests that when coupled with pyrolysis—a heat method for decomposing organic substances—gas-liquid chromatography "promises to be a simple and very powerful method for identifying samples of organic materials of all types."

Other Techniques

Other, more exotic-sounding techniques are also finding their way into the criminal detection laboratory such as immunoelectrophoresis to help determine the individuality of blood and X-ray diffraction to provide information on the crystalline structure of otherwise invisible substances.

One of the newest techniques available to criminalistics expects and one used with inconclusive results during the Warren Commission study is called neutron activation analysis.

Essentially, a sample—as tiny as one-billionth of a gram — is drenched with neutrons in an atomic reactor. The trace elements in the sample are made radioactive and give off a specific and telltale gamma ray picture which is readily distinguishable.

Neutron activation analysis has already been used to help convict American criminals; to suggest that the 13th Century Swedish King Eric XIV was poisoned; and that Napoleon's death was aggravated by arsenic poisoning.

Analysis by Neutrons

In the case of Lee Harvey Oswald, the dubious paraffin casts from Oswald's cheek were subjected to neutron activation analysis. In previous experiments, neutron activiation analysis expert Vincent Guinn of General Dynamics was able to detect gunshot residue as tiny as 10-billionths of a gram.

In the case of Oswald's paraffin casts, however, neutron activation analysis was unable to provide a decisive answer. Nonetheless, law enforcement officials here and abroad are turning more and more to this new tool of nuclear science and find "pattern evidence" of tiny fragments left at the scene of a crime.

Though modern criminologists have come a long way from the time when Sherlock Holmes could confound Dr. Watson with his encyclopedic knowledge of London soils for spotting the soiled shoes of trespassers, the excellence of the scientific sleuth does not depend on the multiplicity of tools. Rather, as Kirk makes clear, this excellence depends upon correct interpretation of scientific results and upon absolute objectivity.