



The Ethics Of Forensics in the Legal System

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Research Question or Driving Question

How have advancements in forensic science influenced the criminal justice system and historical criminal investigations?

Introduction

Add your information, graphs and images to this section.

Forensic science is the application of scientific principles to legal matters, using science to help investigate crimes and present evidence in court. It involves a wide range of disciplines, including DNA analysis, fingerprinting, toxicology, and more. Forensic scientists analyze evidence, testify in court, and can work for law enforcement, the prosecution, or the defense.

Methodology

Forensic science has made remarkable strides, evolving from basic fingerprint dusting to sophisticated molecular and digital techniques. Modern advancements – notably DNA profiling and computerized evidence analysis – have vastly improved investigators' ability to identify perpetrators and exonerate the innocent. These methods, together with standardized laboratory procedures and centralized databases, are now integral to law enforcement, fundamentally shaping investigation strategies and judicial outcomes.

- **Fingerprint analysis:** One of the oldest identification methods. The first criminal conviction based solely on fingerprints occurred in 1898. By the early 1900s, many countries had adopted fingerprint classification (for example, the UK Belper Committee in 1900 recommended routine fingerprint records). Today, Automated Fingerprint Identification Systems (AFIS) digitize prints and enable rapid matching across local, national, and international databases.
- **Ballistics (firearms analysis):** Forensic ballistics began in the 1800s. In 1835, Henry Goddard conducted the first known firearms toolmark comparison, matching a bullet's unique imperfection to a suspect's gun. Modern ballistic labs use comparison microscopes and computerized imaging (e.g. NIBIN) to link spent bullets and casings to individual firearms, often connecting crimes across regions.
- **DNA Profiling:** Introduced in the mid-1980s, DNA "fingerprinting" revolutionized identification. The first police case (1986) used DNA to exonerate a suspect and pinpoint the real perpetrator. Current methods (PCR/STR analysis) allow matching minute biological traces with high certainty. National DNA databases (e.g. CODIS in the U.S.) now store millions of profiles, enabling investigators to link disparate cases through shared DNA evidence.
- **Forensic Genetic Genealogy:** A very recent innovation (2018–present) that combines DNA analysis with genealogy. Investigators use broad genomic data (SNP profiles) from consumer DNA databases to identify likely relatives of an unknown suspect and trace family trees. This approach has yielded leads in hundreds of cold cases (e.g. the Golden State Killer case), solving decades-old crimes when traditional DNA matches failed.
- **Digital Forensics:** With the ubiquity of computers and smartphones, digital evidence has become crucial. By one estimate, digital evidence is now a factor in roughly 90% of criminal investigations. Forensic analysts recover and examine data from hard drives, mobile devices, cloud storage, and networks. Techniques include file recovery, analysis of internet activity, and encryption bypass. These methods require specialized training and have created new standards for collecting and presenting electronic evidence in court.
- **Analytical Chemistry and Toxicology:** Advances in laboratory instrumentation have greatly expanded chemical analysis. Modern crime labs use methods like gas chromatography–mass spectrometry (GC-MS) and liquid chromatography–mass spectrometry (LC-MS) to detect drugs, poisons, and trace chemicals with high sensitivity. Forensic toxicology now routinely identifies novel psychoactive substances and low-level toxins in biological samples. Likewise, forensic chemistry can match fibers, paint, glass, and other materials using spectroscopy and microscopic comparison.

Quick Info

Misapplication of Forensic Evidence: Contributed to nearly 24% of wrongful convictions later overturned by DNA evidence.

Forensic Innovations: Advancements in surveillance, wiretapping, and financial forensics have been pivotal in dismantling organized crime.

Legal Milestones: Landmark cases, such as the Commission Trial of 1985-1986, showcased the integration of forensic evidence in securing convictions. Historical Significance: Fingerprint analysis became a cornerstone of personal identification in the U.S. legal system in the early 20th century.

Systematization: Development of classification systems enhanced the efficiency of criminal identification processes.

Legal Integration: Courts began accepting fingerprint evidence as a reliable form of identification, influencing case outcomes.

Recommendations/Conclusion

- Higher case resolution: Forensic innovations have enabled law enforcement to solve many crimes that would otherwise remain unsolved. Studies note that improved data-sharing and technology lead to "more solved crimes" and "fewer wrongful identifications". Modern methods (DNA, ballistics, etc.) routinely provide the "smoking gun" evidence needed for indictments.
- Correcting miscarriages of justice: Perhaps the most profound impact is on wrongful convictions. Post-conviction DNA testing has overturned hundreds of convictions. For example, the Innocence Project reports over 375 DNA-based exonerations in the U.S. to date. These cases highlight forensic science's power to correct errors – nearly 43% of exonerations involved faulty forensic testimony or analysis.
- Solving cold cases: New techniques have reopened historic investigations. Genetic genealogy and improved forensic analysis have identified perpetrators and victims in decades-old cases, providing closure that was previously unattainable. This ability to revisit cold cases extends justice and helps verify or overturn old verdicts.
- System and policy changes: The success of forensic evidence has driven changes in criminal procedure and policy. Legislatures have funded laboratory upgrades (e.g. DNA backlog elimination programs) and established quality standards for forensic work. Prosecutors and judges now routinely consider forensic findings in charging and plea decisions. In short, the justice system has become far more evidence-driven, relying on scientific validation to guide outcomes.

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Portfolio

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Names



We investigated...

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Conclusion

Methods/Materials

Acknowledgements