



A1 The Future of Forensic Science: Reflection of the Last Thirty Years of Criminalistics

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After attending this presentation, attendees will better understand the accomplishments in the field of Criminalistics over the last thirty years and what new technologies that may impact the field in the future.

Forensic science has made great strides within the last few decades. No one would argue that great accomplishments have been made in every discipline within the field, but the technological innovations which had the greatest impact may have been in criminalistics. Twenty years ago crime laboratories were not performing DNA analysis. Today, DNA analysis is a highly effective routine tool for forensic scientists. The impact of STR technology along with the use of databases has transformed crime laboratories from service organizations to investigational agencies with a much more effective crime-fighting role. The development of capillary electrophoresis (CE) theory and instrumentation in this period has also played an important role for DNA analysis becoming a rapid, sensitive, and routine tool in the forensic laboratory. In addition, the development of mitochondrial DNA has led to missing persons databases that have become effective in identifying unidentified remains.

While DNA technology was grabbing almost everyone's attention perhaps the most overlooked technological development in criminalistics is the development of the union of microscopy and spectroscopy. Over the past several decades the ability to perform spectrophotometry and spectroscopy on very small samples has dramatically improved. The improvement of microspectrophotometry and a host of other similar instrumentation has provided trace evidence examiners an arsenal never envisioned by Edmond Locard. The technological developments in the laser field have brought the technique of raman spectrophotometry onto the list of tools for the criminalists. The ability of raman spectrophotometry to analyze small samples and also analyze materials such as drugs directly through the packaging without disturbing the actual sample has had a significant impact in both trace evidence and drug analysis. In addition, the development of portable hand-held instruments is bringing more analytical chemistry to the crime scene than ever before. The ability to immediately preliminarily identify unknown substances, such as anthrax and explosives provides crime scene investigators with information that took days and weeks in previous years.

The maturing of hyphenated techniques has also significantly impacted the forensic science field. In particular, the availability of affordable table-top gas chromatograph/mass spectrometers has given the majority of crime laboratories world-wide the ability to reduce or even eliminate the drug and toxicological analysis backlogs that many faced in the 1980's and early 1990's. Gas chromatography/mass spectrometry (GC/MS) has replaced gas chromatography-flame ionization detection (GC-FID) for the analysis of fire-debris samples. Other hyphenated techniques such as liquid chromatography/mass spectrometry (LC/MS), gas chromatography/infrared spectrophotometry (GC/IR), and tandem mass spectrometry techniques (LC/MS/MS and GC/MS/MS) once only

found in academic research laboratories have now become routine instrumentation in the modern well-equipped drug and toxicology laboratories. Other hyphenated techniques such as inductively-coupled plasma/mass spectrometry (ICP/MS) are also impacting the crime laboratory because of the affordability and simplification of operation.

Forensic applications using techniques such as matrix-assisted laser desorption ionization (MALDI), surface-excitation raman spectroscopy (SERS), isotope ratio mass spectrometry (IRMS), terahertz reflection spectroscopy, ion-mobility spectrometry, DART Mass spectrometry, CE/MS and CE/MS/MS are already appearing in the literature. These techniques and other technology such as nanotechnology, and miniaturization such as chip technology, will have a major impact and reshape the analytical chemistry in forensic laboratories in the coming years. The future looks bright and exciting in the field of Criminalistics!

Forensic Science, Criminalistics, Analytical Chemistry