CHAPTER 1
Introduction, Historic development and Legal Roles in Forensic Science

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I. Introduction

Chapter 1: Introduction to Forensic Science: *Introduction, Historic Development, and Legal Roles of Forensic Science*

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Chapter 1.1: Introduction to Forensics Science

Introduction, Historic Development, and Legal Roles of Forensic Science

Science and the Law: From Ancient Times to CSI and Beyond.

Learning Goals and Objectives

Today, the role of science in the courtroom is undisputed. We rely upon the scientific analysis and interpretation of key evidence to both exonerate and convict. But this hasn’t always been true in history. In this chapter an introduction to the role that forensic science has and does play in criminal justice is presented. Also, the legal underpinnings of the admissibility, use, and limitations of scientific evidence and testimony are explored. In this chapter, you will need to understand the following concepts:

- What is meant by the terms forensic science and criminalistics;
- What is the difference between a basic and an applied science;
- What is the relationship between the law, basic science and applied science;
- How has forensic science developed throughout history to its present state;
- What is Locard’s Exchange Principle;
- How has fiction contributed to the development of forensic science;
- What features do fictional detectives and modern forensic scientists have in common;
- What is the CSI Effect and how has it influenced scientific evidence in the courtroom;
- What is meant by the Principle of Individuality;
- How do precedent cases pave the way for scientific evidence and testimony;
- What are the key features of the Frye and Daubert cases;
- How have the Joiner, Khumo and Melendez-Dias cases affected expert testimony.

Introduction to the Forensic Sciences

Why are we so fascinated with how “detectives” use science to discover hidden secrets that challenge our perceptions of the world? What is it that simultaneously repels and impels us toward investigations of crime and criminals? And why are we so obsessed with popular forensic science and what it can tell us, not only about how a crime was done, but more intimately, about why a crime was done? Certainly literature and, now, television have done much to fuel this interest for generations: there must be a more fundamental aspect of human nature that drives us to learn about crime and justice which our popular detective literature simply serves to exploit.

There are probably as many answers to these questions as there are people trying to answer them. It may be that by believing we can identify those who
commit crimes and then deliver fitting punishments, we gain a sense of security over the vulnerability and, to some extent, the sense of helplessness that we feel when confronted by seemingly random crime. It may also give us a chance to explore the darker sides of our human natures in a safe way, much as we enjoy thrill rides at amusement parks or scary movies. Our interest in crime may even arise from a desire to seek collective societal satisfaction and exact a moral judgment upon those who step outside the boundaries of our laws – our sense of fairness. A mutually agreed upon set of laws are, of course, what establishes a society in the first place. All sorts of people worldwide certainly know how to use both our fascination and fear of crime to help achieve their own ends.

It seems that people have always been inherently interested in mysteries and in finding solutions to puzzling problems. In fact, basic science itself seeks to fundamentally unravel the mysteries of the universe around us and to provide answers to the “hows and whys” of nature. This is an intrinsic need of human nature – the “curiosity killed the cat” syndrome. Forensic science takes this same sense of investigation and discovery and applies it to the practical need of providing answers to questions revolving around legal issues.

We have long looked to science to inform legal decisions. Historically, advances in forensic science have occurred not in small steps but in unexpected leaps in either the underlying science and technology or because of changes in legal policy and practice. Recent changes in forensic science continue to be revolutionary, rather than just evolutionary, in the way the field is remaking itself. The entire way that we look at the scientific analysis of evidence has changed and the fundamental concepts of the scientific method are now being applied widely to crime-related investigations. These changes in approach and process are providing a new and solid foundation for how science can provide amazingly detailed and accurate evidence of great use to legal deliberations.

Forensic science, by its very nature, lies at the point of convergence between our legal and scientific systems. While there are many regions of common purpose, there is, however, a basic and fundamentally unresolvable tension between these two systems – the law wants certainty – Col. Mustard did it in the hall with a lead pipe - but science can only establish the simplest of facts. While science can readily disprove an idea or exonerate a suspect, it cannot prove anything beyond simple facts and can often only provide information as to the probability that two events will occur in a specific fashion (seen in the famous scientific concept of the Heisenberg’s Uncertainty Principle in Chapter 12). Science can, therefore, tell us what are the odds of a particular random occurrence happening, such as the odds of a DNA 13-loci match between two unrelated and random
samples - about 1 in 5 trillion - but it lies with juries to ultimately decide what odds are sufficient to convict someone of a crime. All of this is made more difficult by the increasing technical complexity of scientific evidence that juries must try to understand to arrive at a fair and just verdict. It is important to also recognize that the goals of the two systems are somewhat different - our legal system primarily seeks justice while the scientific world looks for greater understanding. Therefore, while both science and the law are best served through “open-ended” investigations leading to greater understanding, science is perpetually revising its understanding of the Universe while the law has a fixed end-point in time when a verdict must be rendered.

But how can lay juries composed of a variety of lay persons sort out real science from pseudo-science? Until about 1923, each court could define for itself what it would allow as science in the courtroom. This resulted in essentially no discrimination between the quacks and true scientists in court – and the person who was most convincing to the juries (often the quack who could give “definitive answers”) typically won. In 1923, however, all this changed with the outcome of a case involving the admissibility of a lie-detector test (it was, by the way, found to be inadmissible but that’s irrelevant to what this case did for forensic science as a whole). After the decision in this so-called Frye case, the *bona fide* scientific world, instead of each individual court, was given the responsibility of determining what forensic evidence was based upon good, tried and true science and, therefore, allowable in court. This new approach generally worked rather well but it was very slow to admit the results from any new scientific methods, typically decades. Then, in 1993, a new standard, called the Daubert standard, that placed the responsibility for determining what constituted good admissible science with the judge, but with the guidance from the relevant scientific communities. This changed things dramatically by allowing a very rapid transition from a basic laboratory discovery into it’s application to the legal system. For example, in 1985, Alec Jeffries discovered that DNA samples taken from people could be used for their individual identification. It took all of 18 months before DNA evidence was first used to convict a criminal. But new standards not only allow scientific discoveries into the courtroom, they also help to filter out the pseudo-science, quack testimony, and poorly practiced science. Today, new standards of scientific practice are being applied to all areas of forensic science with the effect that the field is truly developing, across the board, into a defensible, rigorous scientific discipline.

Forensic science, as an applied science, has now developed a valuable relationship with basic research and exploration. It scours the basic research
fields and rapidly assimilates new discoveries into new forensic investigative tools. No discipline appears to be immune from this sharing – medicine, chemistry, physics, psychology, anthropology, entomology, and many others. It also means the effective end of the general, across-the-board criminalist – someone like Sherlock Holmes who himself knew the required aspects of all the necessary fields to solve a crime. Today, there is just too much to be known by any one person and the field of forensic science has evolved into a variety of complex forensic sub-specialties with expert specialists. But this does not mean that trained and intelligent investigators have a reduced role in crime solving – quite the opposite, crimes do not solve themselves. Someone must take all of the threads provided by forensic science and weave them into a correct solution to the mystery – something that takes skill, experience, knowledge, creativity, collaboration, and intelligence. But it also takes top-flight science to analyze and interpret the evidence properly. Just as you probably wouldn’t go to a thoracic surgeon for a toothache, you also wouldn’t go to a dentist for appendicitis – each expert has their own specific sphere of knowledge. Teams of experts may be needed to work together to solve a complex criminal problem: medical examiners, anthropologists, toxicologists, firearms experts, trace analysts, police investigators, lawyers, and many others many be needed depending upon the case.

Forensic evidence is often critical in criminal cases. But forensic science also provides equally valuable information in civil trials – although civil trials typically receive less press coverage that their criminal counterparts. Thus, the techniques and underlying science presented in this text cuts equally well across both criminal and civil applications.

Sometimes, however, our reliance upon the practice of forensic science has given us a sense of false security – science does have some very real limitations when it comes finding and analyzing evidence. A recent article has suggested that courts rarely eliminate forensic testimony by experts, even when their error rates are either quite high or unknown. While the field of forensic science is rapidly tightening it reliance upon rigorous scientific standards, there remain instances of “less-than-ideal” practices and interpretation of scientific evidence in the courts. There are also times that scientific evidence just can’t be found or there is too little to complete the analysis.

But the proper inclusion of science in the courtroom has also led to another problem that the legal system is dealing with, a problem largely brought about by the popular depictions of forensics. Too frequently juries find cases are somehow lacking unless all possible types of scientific data are presented. For example, juries feel that even a truly strong case is somehow weak unless DNA evidence is provided – even when there is no question of identity or that a suspect was at the crime scene (often by admission of the defendant). Juries may not have a clue about what the actual forensic evidence can tell them but feel that every possible piece of scientific evidence must be provided. This sometimes leads to silly and expensive uses of forensic testing – such as DNA evidence for shoplifting cases. And sometimes, partial or incomplete knowledge can be a dangerous thing – such as when jury members feel that they have acquired a
deep level of understanding of some aspect of forensic science simply by watching television programs that often depict conveniently inaccurate or incorrect science.

Given all this, however, there are truly remarkable advances in forensic science that have resulted from discoveries in the laboratory and allied sciences. Science in the courtroom now reaches the highest standards ever seen in history and each discipline is continually working very hard to tighten up their standards and practices. It stands as a truly respectable applied science, joining the ranks as a full member with the other applied sciences of medicine and engineering. Organizations and agencies, such as the American Academy of Forensic Science (AAFS), the American Society of Crime Lab Directors (ASCLD), the Department of Justice, and the United Nations (UN), are all working to ensure the highest levels of scientific standard are employed in all forensic disciplines. Through these efforts, scientists can often provide information that investigators could only dream about just a few years ago and the courts are now provided with new ways to fairly and justly decide upon what and who were involved in criminal acts. A strong system of justice requires an equally strong partner in forensic science. It can now be said that the best in criminal justice comes through the best in forensic science.

In order to make sense of where the field of forensic science finds itself today, we must briefly start near the beginning of its development.