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2nd Edition

Forensics

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- Evaluate crime scene evidence
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D.P. Lyle, MD

Award-winning author, lecturer, and story consultant

Forensics

2nd Edition

by D. P. Lyle, MD

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Forensics For Dummies®, 2nd Edition

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Contents at a Glance

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Introduction

You probably purchased *Forensics For Dummies,* 2nd Edition, because you're fascinated by the marriage of criminal justice and science. I wrote this book because I have a similar fascination. And you and I are not alone. Shows such as *CSI: Crime Scene Investigation*, *CSI: Miami*, and *NCIS* have dominated network television ratings for many years, attesting to the fact that millions of people agree that forensics is an interesting subject. Every criminal investigation you see on the news or read about in the newspaper, it seems, hinges on some bit of forensic evidence.

This book is designed to give you an understanding of the techniques and procedures used by forensic scientists. The next time you read or view a mystery story or hear a news report about a crime, you can turn to this book for the science underlying the story.

About This Book

Forensics For Dummies, 2nd Edition, is an introduction to the field of forensic science, covering a broad range of forensic topics in a clear and concise fashion. I explain these often complex principles in plain English so that readers at all levels can gain a better understanding of forensic science. The book includes many examples of how these techniques are applied in real-life situations. In addition, I include case studies throughout the book to illustrate how forensic science has been used to solve famous cases.

If you know absolutely nothing about forensics, this book is an excellent starting point. If you're familiar with many forensic topics, this book serves to refresh and expand your knowledge.

Note: The conventional language used by scientists is foreign to most people, so I hold scientific jargon to a minimum in this book. Still, as with other areas of science, the study of forensics can be dry and boring at times. To avoid painting such an arid landscape, I added practical examples of how each technique works, and I included many famous cases that relied on forensic science for their solutions. I also threw in a little humor to liven things up a bit. If my humor falls flat, remember, I'm a physician, not a stand-up comedian.

Foolish Assumptions

As I wrote this book, I made some assumptions about you and what your needs may be, including that

- You have an interest in forensic science.
- You're a fan of the many forensic science shows that are aired on both network and cable television.
- You avidly follow criminal cases reported on TV and in newspapers.
- You're considering a career in forensic science.
- You love reading mysteries and want to better understand the science behind the stories.
- You're simply curious by nature.

Icons Used in This Book

Like other *For Dummies* books, this one has icons in the margins to guide you through the information and help you zero in on what you want to know. The following paragraphs describe the icons and what they mean.


A CLOSER LOOK

This icon indicates that I'm giving you a look behind the scenes of a forensic practice or area of investigation. I use it to point out in-depth discussions of these concepts.


CASE STUDY

I use many real-life stories to illustrate the points in this book. This icon sets off these tales of crimes past.


TIP

Sometimes, to give you a clearer picture of how a forensic practice came about, I provide the historical background or a note about a related instance from long ago.


REMEMBER

I flag certain pieces of information with this icon to let you know something is particularly worth keeping in mind.

STRANGE BUT TRUE

Forensics deals with plenty of mind-blowing information about such things as the human body, evidence, and crime itself. For those of you who want just the juicy facts, look for this icon.

TECHNICAL STUFF

This icon signals that I'm going to delve a little deeper than usual into a scientific or medical explanation. I don't mean to suggest the information is too difficult to understand — just a little more detailed.

Beyond the Book

This book is bursting with content, but you can go online and find even more. Check out the book's Cheat Sheet at `www.dummies.com/cheatsheet/forensics` for tips on what to do if you witness a crime, tools of the trade in crime scene investigation, and more. And you can find some handy bonus articles related to forensics at `www.dummies.com/extras/forensics`.

Where to Go from Here

Forensics is a broad and diverse field that involves many areas of science and criminal investigation. In this book, you can find out about many but not all of its concerns. You may use this book as a reference and as a springboard for further investigation. The next time you see a news report, read a mystery novel, or watch a movie involving a crime, you can turn to this book to obtain a better understanding of the science behind the story.

1 Cracking Open the Case

IN THIS PART . . .

Discover how forensic science works.

Find out who makes up the forensics team and what they do.

Figure out how to properly collect and protect evidence at a crime scene.

Understand the inner workings of a criminal mind.

IN THIS CHAPTER

- Defining forensic science and checking out its origins
- Understanding why the principle of evidence exchange is important
- Unveiling how forensic science is organized
- Revealing what services a crime lab offers

Chapter 1

Understanding the World of Forensic Science

Turn on the TV any night of the week, and you'll find crime scene investigators, or *criminalists,* tracking down criminals, crime lab technicians evaluating evidence, and even forensic pathologists conducting autopsies on shows detailing cases real or imagined. I don't think this newfound interest in all things forensic stems from some macabre fascination with death or a guilty enchantment with the criminal world. If you ask me, people simply are curious by nature and have a strong appetite for scientific knowledge. Remember everyone's fascination with the space program not too many years ago? The cool tools and magical feats of forensic science, such as making fingerprints appear from nowhere, identifying suspects by their shoeprints, sniffing out a forger by the unique signature of a laser printer, and finding even the most obscure poisons, are proving equally fascinating.

In this chapter, you get your feet wet with the basic definitions and organizational elements of the field of forensic science. Most of the topics that I touch on here are explored further in the chapters that follow.

Defining Forensics: The Science of Catching Criminals

If you lived in ancient Rome, you'd head to the forum when you wanted to discuss the news of the day. The town *forum* was a community meeting place for merchants, politicians, scholars, and citizens that doubled as a center for public justice. Steal your neighbor's toga, and the case would be tried at the forum.

REMEMBER

The term *forensic* stems from the Latin word *forum* and applies to anything that relates to law. *Forensic science,* or criminalistics, is the application of scientific disciplines to the law.

The same tools and principles that drive scientific research in universities and identify cures in hospitals are used by forensic scientists to reveal how a victim died and, ideally, who was responsible. In the same way modern hospital laboratories employ professionals to deal with pathology (the study of diseases of the human body), toxicology (the study of drugs and poisons), and serology (the study of blood), modern forensic laboratories employ experts in forensic pathology, forensic toxicology, and forensic serology, all of whom use the principles and testing procedures of their medical specialties to help resolve legal issues and answer questions like

- When and how did the victim die?
- Does the suspect's blood match the blood found at the crime scene?
- Was a suspect's unusual behavior caused by drug use?

Integrating science into the practice of law

Not long ago identifying, capturing, and convicting criminals depended primarily upon eyewitnesses and confessions. The world was smaller, communities more closely knit, and the extent of travel basically only as far as you could walk. Whenever anyone witnessed a crime, he likely knew the perpetrator. Case closed.

Trains, planes, and automobiles changed all that. Criminals can now rapidly travel far and wide, and with this newfound mobility they are less and less likely to be recognized by an eyewitness. Besides, eyewitness evidence these days frequently is proven to be unreliable (see Chapter 3).

For law enforcement to keep pace with these changes, other techniques for identifying criminals had to be developed. Science came to the rescue with methods that depend less on eyewitnesses to identify perpetrators or at least link them to

their victims or crime scenes. Fingerprinting (Chapter 5), firearms identification and gunshot residue analysis (Chapter 18), hair and fiber studies (Chapter 17), blood typing (Chapter 14), DNA analysis (Chapter 15), and many other scientific techniques now help solve crimes that would've remained unsolved in the past.

The marriage of science and law hasn't been without its setbacks. Many scientific breakthroughs are viewed with suspicion, if not downright hostility, until they become widely accepted. And before a science can ever enter the courtroom, it must be widely accepted. It should come as no surprise that before forensic science could develop, science in general had to reach a certain level of maturity.

Drawing from other sciences


A CLOSER LOOK

The development of modern forensic science parallels general advancements in science, particularly the physical and biological sciences. Take a look at how a few milestones in science pushed forensic science several steps forward:

- The invention of the microscope enabled criminalists to analyze even the smallest bits of evidence and to see details in evidence that never before were imagined.
- The development of photography gave criminalists a crystal-clear representation of the crime scene without relying on memory or the slow process (and far less detailed results) of making drawings.
- The understanding of the physics of ballistic trajectories gave criminalists a much clearer idea of where a bullet may have come from, which, in turn, made crime-scene reconstruction more accurate.
- The discovery of blood typing and DNA analysis made matching suspect to crime scene far more exact.
- The expansion of our knowledge in basic chemistry allowed scientists to identify chemicals and poisons, particularly arsenic, and led to the development of forensic toxicology.

Getting the Big Picture: Forensic Science in Action

You witness a burglar sneaking away from a store late at night. You call the police, and when they arrive, you identify the thief as someone you know. That person is arrested. However, fingerprints from the store's broken window, cracked safe,

and tools used to open the safe don't match those of the person you've identified. Instead, they match the fingerprints of a known safecracker. What do you think police, prosecutors, and more importantly, the jury are going to believe? After all, it was dark and raining, you were 100 feet away, you caught only a glimpse of the thief, and you'd just left a bar where you'd had a couple of drinks with friends. The fingerprints, on the other hand, match those of a known thief in each and every detail, meaning they came from him and only him. Which bit of evidence, the fingerprints or your eyewitness account, is more reliable?

This scenario represents what forensic science does, or at least attempts to do. Each and every forensic technique that you discover in this book is designed to either identify perpetrators or connect them to the crime.

Starting out small: Basic forensic services

Properly identifying, collecting, documenting, and storing evidence are at the heart of the forensic services offered by virtually all law enforcement agencies, from village cops to major metropolitan police departments. They need the basic services in the list that follows to be able to investigate and solve crimes and to convict the criminals who commit them:

- **Evidence collection unit:** This *crime-scene investigation unit* collects and preserves evidence from the crime scene and transports it to the lab. Regardless of whether they're individual police officers or highly trained professionals, members of this unit expose and lift latent fingerprints (Chapter 5), collect hair and fibers (Chapter 3), and gather any other articles of evidence at the scene.
- **Photography unit:** The *photography unit* takes pictures of the crime scene, all evidence, and the body (whenever one is present). These photos are crucial, serving as blueprints for crime-scene reconstruction and an excellent format for presenting evidence in the courtroom. Turn to Chapter 3 to find out more about photographing a crime scene.
- **Evidence storage:** A secure place for storing and preserving the evidence is essential. Evidence usually is stored in a locked room with restricted access that is housed at your local police station or sheriff's department. Evidentiary materials are kept in storage for years or even decades, and the chain of custody (see Chapter 3) must remain unbroken throughout that time, or the evidence can be compromised, losing its value.

Looking at physical forensic science

Tracking down trace evidence, checking the characteristics of bullets fired from a gun, examining the penmanship of a signature on an important document, and evaluating the swirling ridges of fingerprints under a microscope all are part of the physical side of forensic science.

- **Trace evidence:** Any small item of evidence, such as hair, fiber, paint, glass, or soil, for example, that places the suspect at the scene of the crime or in direct contact with the victim is considered *trace evidence.* Matching glass fragments found on the victim of a hit-and-run motor-vehicle accident to glass from the broken headlamp of the suspect's car is a prime example. Find out more in Chapter 17.
- **Firearms examination:** *Firearms examination* deals with the identification of weapons and the projectiles they fire, including ammunition, fired bullets, shell casings, and shotgun shells. Firearms experts use a microscope and various types of chemical analysis to identify the type of weapon used to commit a crime and match any bullets fired from that weapon or shell casings to a suspect weapon. I cover firearms examination in Chapter 18.
- **Document examination:** Whenever an important written document's age or authenticity is in doubt, a *document examiner* uses handwriting analysis to match handwriting samples to questioned documents or signatures. Document examination also may include analyzing the physical and chemical properties of papers and inks or exposing *indented writing* (the impressions made on the page beneath one that was written on). Typewritten or photocopied documents that may have been altered also fall under the document examiner's area of expertise. Check out Chapter 19 for the details.
- **Fingerprint examination:** *Fingerprint examiners* match prints to the fingers, palms, or soles of the people who left them at the crime scene. A print found at a crime scene can be compared with another taken from a database or from a suspect, victim, or bystander. Chapter 5 tells you all about fingerprint examination.

Delving into biological forensic science

Forensic science deals not only with physical evidence but also with biological evidence, which may take the form of a corpse, skeletal remains, drugs and poisons, teeth, bite marks, insects, and plant materials, to name a few. It also includes analysis of the criminal mind. Biological evidence is often what makes or breaks a case.

For example, an *autopsy* (postmortem examination of the body, which is discussed in Chapter 9) may reveal the nature and cause of any injuries, the presence of any poisons, and ultimately why and how the victim died. These findings alone may lead to the perpetrator. Blood and DNA analysis can positively identify suspects and link them to crimes. DNA and dental pattern records can be used to identify an unidentified corpse, and plant and insect evidence can reveal the time of death and link a suspect to the crime scene. Find out more about these sciences and the people who specialize in them in Chapter 2.

Investigating the Crime Lab

Although they use much of the same equipment and follow similar research procedures, forensics (crime) labs are quite different from medical (clinical) labs. The latter deal with the living by carrying out testing aimed at diagnosing and treating the sick. On the other hand, forensics labs are geared toward testing evidence with the hope of establishing links between a suspect and a crime.

Creating the first crime lab


TIP

The United States's first forensic laboratory was established in 1923 by August Volmer in the Los Angeles Police Department. Shortly thereafter, the first private forensic lab was created in Chicago in 1929 as a result of the investigation of Chicago's infamous St. Valentine's Day Massacre (see the nearby sidebar). This case involved the expertise of Calvin Goddard, then America's leading firearms identification expert, who was able to link the killings to Al "Scarface" Capone. Two businessmen who served on the coroner's inquest jury were so impressed with Goddard and his scientific use of firearms identification that they funded the development of a crime lab at Northwestern University. The lab brought together the disciplines of firearms examination, blood analysis, fingerprinting, and trace evidence analysis and served as a prototype for other labs.

In 1932, Goddard helped the Federal Bureau of Investigation (FBI) establish a national forensics laboratory that offered virtually every forensic service known to law enforcement across the United States. It, too, served as a model for future state and local labs. Now many states have networks of regional and local labs that support law enforcement at all levels.

CASE STUDY

THE ST. VALENTINE'S DAY MASSACRE

During the height of Prohibition, gang warfare raged over control of the illegal alcohol trade that sprang up in many U.S. cities. None was bloodier than the war between Chicago rivals Al "Scarface" Capone and George "Bugs" Moran.

On the night of February 14, 1929, seven of Moran's men were waiting for a shipment of hijacked liquor in a warehouse on Chicago's Clark Street. Unbeknownst to them, the shipment was a setup orchestrated by Capone in an attempt to kill his chief rival, Bugs Moran. Moran was supposed to be at the warehouse, but he arrived late. When he got there, he saw a police car pull up and five officers enter the warehouse. Moran retreated and heard machine gun fire, then saw the five cops come out and drive away.

The real police arrived and found that each of the seven men had been shot numerous times. They recovered 70 shell casings. Bullets later were recovered from the victims. Cardiologist Dr. Calvin Goddard, who became famous during the Sacco and Vanzetti case (see Chapter 20), was called in because of his expertise in firearms identification. He determined that the shell casings were from Thompson submachine guns. Using the newly developed comparison microscope, he tested casings from Thompsons belonging to police and determined that none of them were the murder weapons. Goddard's findings meant that the killers had impersonated police officers. Suspicion fell on Capone. Police raided the home of one of Capone's hit men, finding two Thompsons that later were identified as two of the murder weapons.

Identifying common procedures

Scientific services offered by modern crime labs and medical examiners' offices are varied and complex. The number of services supplied by a particular laboratory depends on its size and budget. State and regional labs may provide a wide array of services, whereas local labs may provide only basic testing. These smaller labs typically outsource more sophisticated testing to larger regional labs. In addition, the FBI's National Crime Lab offers services to law enforcement throughout the country. Not only does the FBI lab perform virtually every type of test, it also possesses or has access to databases on everything from fingerprints and tire-track impressions to postage stamps.

Larger labs often feature separate departments for each discipline, while smaller labs tend to combine services, perhaps even relying on a single technician to do all the work. Obviously, in this circumstance, a great deal of the work must be sent to larger regional labs.

Common procedures conducted in a crime lab include

- Fingerprint analysis (Chapter 5)
- Tool-mark and impression analysis (Chapter 7)
- Blood analysis (Chapter 14)
- DNA analysis (Chapter 15)
- Toxicological testing (Chapter 16)
- Trace evidence evaluation (Chapter 17)
- Firearms examination (Chapter 18)


TIP

FROM FICTION TO FACT: FORENSIC SCIENTISTS THROUGH THE YEARS

The first forensic scientist came not from the world of science but from the world of fiction. Sir Arthur Conan Doyle's character Sherlock Holmes frequently used the sciences of fingerprinting, document examination, and blood analysis to solve the crimes he investigated. In fact, in the first Sherlock Holmes' novel, *A Study in Scarlet,* Holmes developed a chemical that determined whether a stain was blood.

Similarly, Mark Twain employed fingerprint evaluation in two of his works *(Life on the Mississippi* and *Pudd'nhead Wilson)* nearly a decade before they became recognized investigational tools.

The first real-life forensic scientist was Hans Gross. In 1893, he published the first treatise on the use of scientific knowledge and procedures in criminal investigations. Others soon followed.

In 1901, Karl Landsteiner discovered that human blood could be grouped and devised the ABO blood groups that still are in use today. In 1915, Leone Lattes developed a simple method for determining the ABO group of a dried bloodstain and immediately began using it in criminal investigations. Today, ABO typing, though not able to absolutely identify a particular person, is used to exonerate some suspects, to refute paternity, and to reconstruct crime scenes.

Early in the 20th century, Calvin Goddard perfected a system for comparing bullets under a comparison microscope to determine whether they came from the same weapon. And, Albert Osborn laid down the principles of document examination in his book, *Questioned Documents,* which still is used today.

Peeking Inside the Criminalist's Toolbox

Crime-scene investigators are charged with finding, collecting, protecting, and transporting all types of evidence to the crime lab. Although each person or team may have different ways of doing things, typical equipment and supplies they take to the scene include the following:

- Crime-scene tape to demarcate and secure the scene
- Camera and/or video recorder to document the scene and the evidence
- Sketchpad and pens for scene sketches
- Disposable protective clothing, masks, and gloves
- Flashlight-alternative light sources such as laser, ultraviolet, and infrared lighting for exposing certain types of evidence
- Magnifying glass, tweezers, and cotton swabs for collecting hair, fiber, and fluid evidence
- Paper and plastic evidence bags and glass tubes to collect and transport evidence
- Fingerprint supplies, which include ink, print cards, lifting tape, and various dusting powders and exposing reagents such as luminol
- Casting kit for making casts of tires, footwear, and tool-mark impressions
- Serology kit for collecting blood and other bodily fluids
- Entomology kit for collecting and preserving insect evidence
- Hazmat kit for handling hazardous materials

The Cornerstone of Forensic Science: Locard's Exchange Principle

REMEMBER

Every contact you make with another person, place, or object results in an exchange of physical materials. If you own a pet, this material exchange is well known to you. Look at your clothes and you're likely to see cat or dog hair clinging to the fabric — a pain in the behind if you want to keep your clothes looking sharp, but an incredible boon for forensic science. You may also find that you transfer these hairs to your car, your office, and any other place you frequent.

Known as the *Locard Exchange Principle*, after Dr. Edmond Locard, the French police officer who first noticed it, the exchange of materials is the basis of modern forensic investigation. Using this principle, forensic scientists can determine where a suspect has been by analyzing *trace evidence* (any small piece of evidence), such as fibers on clothing, hair in a car, or gunk on the soles of shoes.

Looking at Locard's principle in action

As an example, say that you have two children and a cat. You run out to take care of some errands that include stopping at a furniture store, the laundry, and the house of a friend who has one child and a dog. From a forensic science standpoint, this sequence of events can provide a gold mine of information.

You leave behind a little bit of yourself at each stop, including

- Hair from yourself, your children, and your cat
- Fibers from your clothing and the carpets and furniture in your home and car
- Fingerprints and shoeprints
- Dirt and plant matter from your shoes
- Biological materials, if you accidentally cut yourself and leave a drop of blood on the floor or sneeze into a tissue and then drop it in a trash can

But that's not all. You also pick up similar materials everywhere you go:

- Fibers from each sofa or chair you sat on at the furniture store ride away on your clothes, as do hair and fibers left behind by customers who sat there before you.
- Fibers of all types flow through the air and ventilation system and settle on each customer at the laundry.
- Hair from your friend, her child, and her dog latch on to you as do fibers from your friend's carpet and furniture.
- Fibers, hairs, dirt, dust, plant material, and gravel are collected by your shoes and pants everywhere you set foot.

In short, by merely running errands, you become a walking trace evidence factory.

Reading the trace evidence

An examination of your clothes and shoes after the preceding expedition essentially provides a travelogue of your errands. If someone robbed your friend's house that evening while your friend was away, criminalists would find your fingerprints, your hair (as well as that of your children and your cat), and fibers from the carpets in your house and car. They could place you at the scene of the crime.

Of course, you'd have an alibi (I hope) and a legitimate reason why your trace evidence was found at the scene. The thief would not be able to offer a legitimate reason for his trace evidence being at the scene, which means the presence of his prints, hair, and carpet fibers would need an explanation.

Determining who did what where


REMEMBER

Placing a suspect at the scene of a crime is one of the basic functions of forensic science. The analysis of fingerprints, blood, DNA, fibers, dirt, plant materials, paint, glass, shoe and tire impressions, and indeed every test done by the crime lab, is performed to create an association between the perpetrator and the crime.

In many cases, the mere fact that a suspect can be placed at the scene is an indication of guilt. A fingerprint on the faceplate of a cracked bank vault, semen obtained from a rape victim, or paint from the fender of a car involved in a hit-and-run accident connects suspects to crime scenes where they have no innocent reason for being.

IN THIS CHAPTER

- Checking out the duties of criminalists
- Looking at forensic science specialties
- Understanding the medical examiner's duties
- Getting to know the forensic investigator
- Offering expert testimony in court

Chapter 2
Getting to Know the Forensics Team

TV forensics teams have it good: There's a specialist for every possible field of study and a fancy piece of equipment for analyzing whatever evidence comes in. Unfortunately, that's not the case even in larger, more sophisticated jurisdictions, much less in smaller ones where law enforcement officers or a single or very small number of criminalists perform all the required duties.

More often than not, this is due to funding shortfalls. The truth is that most crime labs are severely underfunded. This fact led author Jan Burke to create the Crime Lab Project (`https://crimelabproject.wordpress.com`), a site that helps raise public awareness of this national problem.

Police typically are the first officials to arrive at any crime scene. After they determine the nature and exact location of the criminal act and secure the scene, they call in various forensic specialists to document and gather evidence, and then transport it to the crime lab for further testing. Who shows up to handle these duties depends upon the resources and structure of the jurisdiction.


REMEMBER

Larger crime labs may have a special crime-scene investigation unit (CSIU) that consists of individuals trained in evidence recognition, collection, and preservation. They are also skilled in performing many of the field tests and screening tests that must be done at a crime scene. Although their exact titles and duties vary from jurisdiction to jurisdiction, these specialists can be divided into two groups. I use the terms *criminalists* or *forensic investigators* for those who deal with the physical evidence and *coroner's technicians* to refer to those who deal with the body in cases of death.

Gathering the Evidence: The Criminalist at Work

Criminalist is a relatively new term and one that's not easy to define. It covers a wide range of abilities, responsibilities, and training. Some, such as serologists and chemists, are scientists, while others, such as fingerprint and firearms examiners, are likely to be ex-police officers who have no true scientific training. Still others are technicians with on-the-job training.

No matter what their specialty or education, the bottom line is that criminalists work with evidence. That can mean a lot of things, from looking for poisons in blood samples to authenticating written documents, but all of it falls under the banner of criminalist.


REMEMBER

In spite of what you see on TV and in the movies, criminalists aren't cops (although, in some cases, they are *former* police officers). They don't carry guns, interrogate suspects or witnesses, or make arrests. They don't treat the injured or deal with a dead body. They collect and analyze evidence. That's it.

Common job titles for criminalists include the following:

- **Crime-scene investigator:** These are the CSI guys and gals who visit the crime scene to locate, collect, protect, and transport any and all evidence to the crime lab. They document the scene by sketching and photographing it, unless there is a sketch artist or photographer on the scene to take over this duty at their direction.
- **Latent print examiner:** These specialists examine fingerprints as well as palm and footprints and compare them with prints obtained from suspects, other crime scenes, or print databases. Chapter 5 gives you the skinny on fingerprints.

- **Firearms examiner:** The duties of this individual include examining and identifying firearms, comparing bullets and shell casings, and searching for and identifying gunshot residue. Chapter 18 gives you the details.
- **Tool-mark examiner:** Like fingers, tools leave behind distinct markings that may connect them to a crime scene. Tool-mark examiners compare these marks to suspect tools. I cover this practice in Chapter 7.

LOOKING INTO THE CSI EFFECT

I'm sure you're familiar with the TV series *CSI: Crime Scene Investigation* and its many spin-off shows. How could you not be? Though they more often than not get the science right, they create an unrealistic picture of what a crime lab looks like, how well equipped it is, and what CSI and lab techs actually do. But, like other more scientifically based shows like *Forensic Files,* for example, these shows have raised public awareness of forensic science and introduced viewers to the world of forensic investigation.

One unintended consequence of these shows and the raised public awareness of forensic science procedures is the *CSI Effect.* Though controversial as to whether it actually exists, many experts believe it does, while others feel it doesn't. Regardless, it makes sense that saturating the public with all this forensic science would naturally change its view on criminal investigation and prosecution. Those who support the existence of this effect point to three major areas: the public, and thus jurors; judges, prosecutors, and defense attorneys; and criminals.

Whenever a high-profile case pops up on the news, the public seems to immediately jump to whether there is DNA evidence or not. If there is, the suspect must be guilty, and if not, he must be innocent. The facts are that DNA analysis is only relevant in a very small percentage of cases, perhaps as low as 5 percent. Most crimes are solved by good police work, not the crime lab. This attitude naturally enters the courtroom where jurors are asking the same question: Why is there no DNA? Did the police do something wrong by not collecting it? Is there no DNA because the defendant is innocent? You can see how this complicates the job of prosecutors and defense attorneys. If jurors expect forensic evidence to be presented to support their cases, these attorneys need to explain any absence of such evidence.

And what about criminals? They watch these shows. They learn what law enforcement and crime labs can do. They wear gloves when breaking into a home to avoid leaving fingerprints, they wear condoms in rapes to avoid leaving behind DNA evidence, and they take other steps to avoid detection. Fortunately, a little knowledge is a dangerous thing, and as you see in the remainder of this book, criminals may avoid leaving behind one type of evidence while ignoring other, equally damning, evidence. And that's a good thing.

- **Document examiner:** These experts examine various documents to determine their authenticity and authorship and to look for any alterations in a document's original content. They may also be asked to identify whether a particular typewriter or copier produced a certain document. Check out Chapter 19 for more.
- **Trace evidence examiner:** These specialists analyze and compare hair, fibers, glass, soils, and paints to determine their type and origin. Chapter 17 tells you more about analyzing trace evidence.

From Analyzing Blood to Identifying Bugs: Forensic Science Specialists

If you need to find out how a victim died or identify a piece of a plant found at a crime scene, you call on a forensic scientist trained in pathology or botany, respectively. Professionals who work in the various forensic biological sciences are among the most highly trained and skilled members of the forensics team. They include the following:

- **Pathologist:** A *forensic pathologist* is a licensed physician with specialty training in *pathology,* which deals with the nature of disease and the structural and functional changes it causes in the human body. In addition, the forensic pathologist takes subspecialty training in forensic pathology, the application of pathological science to the law.

  The forensic pathologist is in charge of the body and all the evidence that is gleaned from its examination. He uses the autopsy, police report, medical records if indicated, suspect and witness interviews, the results of crime lab evidence evaluations, and much more in the pursuit of answers. The forensic pathologist also examines living victims to determine the causes and ages of injuries, particularly in cases of assault, rape, or abuse. Part III of this book focuses on forensic pathology.
- **Anthropologist:** The *forensic anthropologist* studies human skeletal remains to determine the age, sex, and race of the deceased, identify any illnesses or injuries that the victim may have suffered, and to estimate the time of death. The forensic anthropologist examines not only the recovered bones, but also the location and circumstances in which they were found. Toxicological, chemical, and DNA analyses also are used by the forensic anthropologist. Other responsibilities may include identifying victims of mass disasters and those interred in mass graves. You can find out more about forensic anthropology in Chapter 10.

- **Odontologist:** A *forensic odontologist* (or forensic dentist) helps identify unknown corpses by matching dental patterns with previous X-rays, dental casts, or photographs. Because dental enamel is the hardest substance in the human body, forensic dental services can help with identifying homicide victims, victims of mass disasters, and skeletal remains. Forensic odontologists are called upon to match a suspect's teeth with bite marks on the victim or on food products such as cheese or apples. Chapter 10 tells you more about forensic odontology.
- **Entomologist:** *Entomology* is the study of insects. The *forensic entomologist* uses knowledge of the life cycles of flies and various other insects that feed on corpses to determine the approximate time of death. Likewise, the forensic entomologist uses knowledge of insect habitats to determine whether a body has been moved from one location to another. Find out more in Chapter 11.
- **Psychiatrist:** The *forensic psychiatrist* may be asked to address someone's sanity or competence to stand trial, sign documents, or give informed medical consent. In suicide cases, forensic psychiatrists may be asked to conduct psychological autopsies to determine possible motivations of the deceased. A forensic psychiatrist may also be asked to provide a psychological profile of an unknown perpetrator. Check out Chapter 4 for the lowdown on forensic psychiatry.
- **Serologist:** The *serology* lab deals with blood and other bodily fluids such as saliva and semen, identifying the presence or absence of antigens and antibodies in those fluids. Blood typing, paternity testing, and in some labs even DNA profiling are conducted by the *serologist.* Turn to Chapter 14 for more.
- **Toxicologist:** *Toxicology* is the study of drugs and poisons. The *forensic toxicologist* determines whether drugs or poisons are present in the living and the deceased, often to assess how those substances contributed to aberrant behavior or death. The forensic toxicologist also determines whether drivers were intoxicated or workers violated company drug-use policies. Check out Chapter 16 for the full scoop on toxicology.
- **Botanist:** Examining plant residues, one of the tasks performed by a *forensic botanist,* is sometimes crucial to solving a crime. Plant fragments, seeds, pollen, and soil may be used to place a suspect at the crime scene. For example, pollen found on the clothing of a suspect can be matched to that of a rural crime scene, thus suggesting that the suspect was in the same area. Plant and pollen evidence also can reveal that a corpse has been moved. Find out more about forensic botany in Chapter 17.

Forensic Investigation's Head Honcho: The Medical Examiner

Coroners and medical examiners are charged with determining the cause and manner of death, overseeing the analysis of evidence, and presenting their findings in court. They often work with the police to help guide ongoing investigations by supplying them with the results of any forensic tests that have been performed. The responsibilities of these two offices cover every aspect of investigating a death.


REMEMBER

The terms coroner and medical examiner (ME) are often used interchangeably, but they are, at least theoretically, quite different (see the following section for details). Regardless of which system is employed, in death investigations many of the duties of the coroner or the ME are similar. I use the term ME throughout the remainder of this book, even though some jurisdictions employ coroners for handling the legalities of death.

Looking at two forensic systems

In the United States, two types of forensic investigative systems exist: the coroner system and the medical examiner system. Fortunately, the trend is toward the latter system, though it is far from perfect.

The coroner is an appointed or elected position that, unfortunately, requires no special medical or forensic skills. The sole criterion seems to be the ability of the person seeking the office to be elected or appointed. The coroner could be the sheriff, a newspaper publisher, a neighborhood café owner, or the local funeral director. They too often possess little or no medical training or experience.

During the past several decades, the politics of the office have evolved so that today many jurisdictions require the coroner to be a licensed physician. He may be an internist, an obstetrician, or a dermatologist but doesn't necessarily have to be a pathologist and certainly not a forensic pathologist. Thus, the coroner may not actually be qualified to perform many of the duties of the office. This deficiency led to the creation of the medical examiner system.


REMEMBER

In theory, a *medical examiner (ME)* is a physician licensed to practice medicine, and many are trained in pathology and forensic pathology, meaning that ideally they are medical doctors with special training in pathology and experience and training in forensic pathology. A *forensic pathologist* is a clinical pathologist who has taken extra forensic training. He usually heads up the crime lab and oversees all aspects