Dedicated to all my children and grandchildren.
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OBJECTIVES

In this chapter you should gain an understanding of:

- The characteristics that permit fingerprints to be used for personal identification
- Methods used to develop latent fingerprints
- Methods used to visualize fingerprints
- The classification of fingerprints
- The use of fingerprints for biometric identification
YOU ARE THE FORENSIC SCIENTIST

Yes, the police officer would be able to search the backpack under the emergency exceptions, plain view doctrine, Section 215 of the USA Patriot Act allows the FBI to order any person or entity to turn over “any tangible things," around it.

Categories: Choking agents, blister agents, blood

Chapter Spotlight

Evidence must be confirmed by the testimony of witnesses.

It is important that investigators consider the possibility of secondary transfer whenever they examine trace evidence. It could spy on her because she wrote a letter to the editor that criticized government policy. It also is possible that two or more intermediate objects may be involved in secondary transfer. Occasions, trace evidence is transferred from one object to another by way of an intermediate object, in a process known as secondary transfer. The chair has fibers on it that match fibers from the jacket and the sweater. The jacket has been altered. Looking at questioned documents under a microscope reveals that the white area has been covered by paint.

YOU ARE THE FORENSIC SCIENTIST SUMMARY

Chapter 7

Back at the Crime Lab: Summary of scientific principles and procedures.

Key Terms

Incorporating agent: A chemical that doubles but does not last.

Half-life: The time required for half of the atoms in a radioactive sample to decay.

Back at the Crime Lab

Summary

Chapter 7: Detecting Mass Destruction

Appendix A

Appendix B

Back at the Crime Lab

Appendix C

Appendix D

Appendix E

Appendix F

Appendix G

Appendix H

Appendix I

Appendix J

Appendix K

Appendix L

Appendix M

Appendix N

Appendix O

Appendix P

Appendix Q

Appendix R

Appendix S

Appendix T

Appendix U

Appendix V

Appendix W

Appendix X

Appendix Y

Appendix Z

Appendix AA

Appendix BB

Appendix CC

Appendix DD

Appendix EE

Appendix FF

Appendix GG

Appendix HH

Appendix II

Appendix JJ

Appendix KK

Appendix LL

Appendix MM

Appendix NN

Appendix OO

Appendix PP

Appendix QQ

Appendix RR

Appendix SS

Appendix TT

Appendix UU

Appendix VV

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Appendix ZZ

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Appendix BBB

Appendix CCC

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Appendix FFF

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Appendix HHH

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Appendix KKK

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Appendix KKKKK

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Appendix XXXXX

Appendix YYYYY

Appendix ZZZZZ

Appendix AAAAAA

Appendix BBBBBB

Appendix CCCCCC

Appendix DDDDDD

Appendix EEEEEE

Appendix FFFFFF

Appendix GGGGGG

Appendix HHHHHH

Appendix IIIIII

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Appendix KKKKKK

Appendix LLLLLL

Appendix MMMMMM

Appendix NNNNNN

Appendix OOOOOO

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Appendix SSSSSS

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Appendix AAAAAA

Appendix BBBBBBB

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Appendix AAAAAMMM

Appendix BBBBMMMMM

Appendix CCCCCCCCCM

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Appendix GGGGGGMMM

Appendix HHHHHHHMM

Appendix IIIIIIIIMM

Appendix JJJJJJJJMM

Appendix KKKKKKKKKK

Appendix LLLLLLLLLL

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Appendix QQQQQQQQQQ

Appendix RRRRRRRRRR

Appendix SSSSSSSSSS
Preface

The criminal justice system has learned to rely heavily on the analysis of physical evidence as scientific procedures and methods have become increasingly more reliable and telling than eyewitness testimony. The influence of television programs showing the use of highly sophisticated analytical equipment to solve crimes has caused juries to come to expect scientific evidence to be presented in all criminal cases. Greater stress is now placed on investigators to handle physical evidence in an appropriate scientific manner for later presentation in court. The introduction of DNA typing and database matching have revolutionized how physical evidence from the crime scene is processed. Forensic investigators must process both a sound understanding of the scientific principles that underlie the measurements they make and a keen knowledge of how to locate physical evidence without disrupting any trace elements at the scene.

In many ways, the attacks of September 11, 2001, expanded the role of criminalistics from traditional examination of crime scenes and physical evidence to assisting the Department of Homeland Security in deterring terrorism. Threats of terrorism from both within and outside of United States borders widen the scope of those working in the criminal justice system. I have included sections of this book that speak directly to these issues because of the changed nature and role of criminalistics.

New laws passed since 9/11 have placed a precarious balance between the rights and freedoms of individuals and the protection of society as a whole. This tension is evident when we are asked by politicians how much personal freedom we are willing to sacrifice in the name of national security. We now stand in long lines to pass through extensive security monitoring to board airplanes. We are limited in what we can carry with us on these flights. We face the potential of having our telephone conversations recorded. We can even be questioned about the material we check out of public and academic libraries. While these issues are of great importance to the individual, they are of even greater importance to understand for those working in the criminal justice field.

There are no easy answers to these issues, but it is the goal of this textbook to present information to students to help them understand how forensic measurements are made and to find a balance that protects the individual and benefits society as a whole.

Organization

The organization and approach of this text differ in several ways from other criminalistics books intended solely for criminal justice students. It places
forensic science with the framework of the basic principles of chemistry, biology, and physics and assumes the reader has little or no scientific background.

The first two chapters introduce the student to the crime scene and physical evidence. In Chapter 1, we learn to secure and document the crime scene. Next, to collect, preserve, package, inventory, and then submit evidence to the crime lab. In Chapter 2, common types of physical evidence are described, and basic scientific principles familiarize students with crime scene reconstruction. This early description of the many types of physical evidence found at crime scenes not only establishes the importance of a careful methodical approach to the crime scene but also gives students a firm foundation for how this evidence will be used to reconstruct the events that transpired during the commission of the crime.

Chapters 3, 4, and 5 offer a solid introduction to the core physical properties that are normally used to examine trace evidence. Chapter 3 shows how the physical properties can be used to characterize evidence. Chapter 4 describes the many types of microscopes used to examine fiber, hair, and paint evidence. The addition of paint evidence is new to the second edition and a response to requests from users of the first edition. Chapter 5 describes optical physical properties, such as color and refractive index, and how they can be used to characterize glass evidence. Wherever possible in these chapters, physical properties are discussed in the context of characterizing physical evidence, building a bridge to understanding how patterns and chemical and biological properties will be used to characterize evidence in the chapters that follow.

Next, students are introduced to pattern evidence. Chapters 6 covers fingerprints—their classification and the methods used to visualize latent fingerprints. A new box in Chapter 6 describes the new hand-held fingerprint scanners that search fingerprint databases while wirelessly connected to the Internet. The focus of Chapter 7 turns to questioned documents, with discussion of handwriting, typed and word processed documents, ink, indented writing, and security printing. Chapter 8 is devoted to firearms and describes handguns, rifles, shotguns, and submachine guns. Techniques used to compare fired bullets and shell casings are described, as well as the methods used to restore obliterated serial numbers.

We then focus on chemical evidence. Chapter 9, which introduces readers to the periodic table and inorganic chemistry, provides a useful introduction to the examination of bullets and gunshot residue. In addition, it provides a foundation for more advanced chemical principles that will be presented in later chapters. Chapter 10 describes the chemistry of fire and introduces the student to organic chemistry through a discussion of hydrocarbon accelerants that are used by arsonists. In Chapter 11, drugs of abuse are arranged by category and the techniques used to detect them in bulk or in person samples are described.

Chapters 12, 13, and 14 deal with biological evidence. Chapter 12 describes how toxicological measurements are made. Even if the measurements are made after a person has died, they can often be used to reconstruct events that transpired days before. Biological fluids, such as blood, semen, and saliva are the focus of Chapter 13. Techniques used to locate and characterize biological evidence are presented, along with an introduction to DNA. Chapter 14 presents the separation and characterization of short tandem repeats (STRs) by capillary electrophoresis and how this information is used to establishaternity and match offender profiles.

The final section of the text focuses on terrorism. Chapter 15, a new chapter added for the second edition, describes computer forensics, cybercrime, and cyberterrorism. Chapter 16 describes the construction of explosive devices such as improvised explosive devices and the methods used to test for explosive residue. Chapter 17 presents the three major types of weapons of mass destruction—chemical, nuclear, and biological—and the techniques being developed to detect these threats, both point and standoff detectors.
semesters course. The text is arranged in a traditional format, beginning with the crime scene and physical evidence, followed by sections on trace evidence, pattern evidence, and terrorism. Those who have been teaching a one-semester criminalistics course with a different text can use the first 12 chapters of this text in sequence. Other options for a one-semester course are to use the first five chapters, followed by choices for the remaining chapter depending on the teacher's preferences. Those instructors who stress chemical and biological evidence may choose to skip Chapters 6, 7, and 8. Those wanting to stress terrorism may choose to skip the first three chapters.
Acknowledgments

In preparing the second edition of this book I have added topics that weren’t covered in the first edition. A section on the composition and analysis of paint has been added to Chapter 4. Most importantly, a whole new chapter (15) on computer forensics and cybercrime has been added as a response to instructor requests. Since the publication of the first edition in 2007, there have been many advances in the field of forensic science, and the book has been updated throughout to incorporate these changes.

I would like to express my gratitude and appreciation to everyone who contributed to this book. I extend special gratitude to Erik Garcia, who worked with me for over four years to create the wonderful graphic drawings in this text; Jonathan Edwardsen, who analyzed samples and produced the chromatograms and spectra contained in the book; Seth Reuter, who worked with me to develop the computer forensics chapter; Connie Diamant, my wife, who crafted the case studies and put up with me during this project.

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