Preface

Public Fascination with Forensic Science

Many readers of this book have been drawn to the subject of forensic science by the assortment of television shows about scientific crime investigation. Story lines depicting the crime-solving abilities of forensic scientists have greatly excited the imagination of the general public. Furthermore, a constant of forensic science is how frequently its applications become front-page news. Whether the story is the sudden death of pop music superstar Michael Jackson, sniper shootings, or the tragic consequences of the terrorist attacks of 9/11, forensic science is at the forefront of the public response.

During the highly publicized O. J. Simpson criminal and civil trials, forensic scientists systematically placed Simpson at the crime scene through DNA analyses, hair and fiber comparisons, and footwear impressions. As millions of Americans watched the case unfold, they, in a sense, became students of forensic science. Intense media coverage of the crime-scene search and investigation, as well as the ramifications of findings of physical evidence at the crime scene, became the subject of study, commentary, and conjecture.

For instructors who have taught forensic science in the classroom, it comes as no surprise that forensic science can grab and hold the attention of those who otherwise would have no interest in any area of science. The O. J. Simpson case, for example, amply demonstrates the extent to which forensic science has intertwined with criminal investigation.

Perhaps we can attribute our obsession with forensic science to the yearnings of a society bent on apprehending criminals but desirous of a system of justice that ensures the correctness of its verdicts. The level of sophistication that forensic science has brought to criminal investigations is formidable. But once one puts aside all the drama of a forensic science case, what remains is an academic subject emphasizing logic and technology.

Purpose of This Book

It is to this end—revealing that essence of forensic science—that the thirteenth edition of Criminalistics is dedicated. The basic aim of the book is still to make the subject of forensic science clear and comprehensible to a wide variety of readers who are or plan to be aligned with the forensic science profession, as well as to those who have a curiosity about the subject’s underpinnings.

DNA profiling has altered the complexion of criminal investigation. DNA collected from saliva on a cup or from dandruff or sweat on a hat exemplifies the emergence of nontraditional forms of evidence collection at crime scenes. Currently, the criminal justice system is creating vast DNA data banks designed to snare criminals who are unaware of the consequences of leaving the minutest quantity of biological material behind at a crime scene.

New to This Edition

- Numerous case files have been added to select chapters to illustrate how forensic technology has been applied to solving crimes of notoriety.
- Chapter 4 “Crime scene Reconstruction: Bloodstain Pattern Analysis” has been updated to reflect changes in terminology and interpretation of blood stain pattern evidence.
- Chapter 16, “DNA: The Indispensable Forensic Science Tool,” has been updated to including information on the use of Rapid DNA systems, Probabilistic Genotyping and Forensic Genetic Genealogy.
- Chapter 1, “Introduction,” has been expanded to cover the discussion of the reliability and controversy surrounding forensic bite mark comparison.
• Chapter 20, “Mobile Device Forensics,” has been updated to discuss the impact of Carpenter v. United States and an overview of the use of a StingRay device.
• Information throughout the text has been updated and many new figures have been added to illustrate concepts discussed in the chapters.

Focus on Cutting-Edge Tools and Techniques

Through thirteen editions, Criminalistics has strived to depict the role of the forensic scientist in the criminal justice system. The current edition builds on the content of its predecessors and updates the reader on the latest technologies available to crime laboratory personnel. A new chapter has been added to this edition dealing with the subject of forensic biometrics. The reader is introduced to the FBI’s recently implemented Next Generation Identification System which houses its fingerprint and facial recognition databases.

The computer, the Internet, and mobile electronic devices have influenced all aspects of modern life, and forensic science is no exception. Chapter 19, “Computer Forensics,” and Chapter 20, “Mobile Devices Forensics,” explore the retrieval of computerized information thought to be lost or erased during the course of a criminal investigation and delve into the investigation of hacking incidents.

A major portion of the text centers on discussions of the common items of physical evidence encountered at crime scenes. Various chapters include descriptions of forensic analysis, as well as updated techniques for the proper collection and preservation of evidence at crime scenes. The reader is offered the option of delving into the more difficult technical aspects of the subject by reading the “Inside the Science” features. This option can be bypassed without detracting from a basic comprehension of the subject of forensic science.

The implications of DNA profiling are important enough to warrant their inclusion in a separate chapter in Criminalistics. Chapter 16 describes the topic of DNA in a manner that is comprehensible and relevant to readers who lack a scientific background. The discussion defines DNA and explains its central role in controlling the body’s chemistry. Finally, Chapter 16 explains the process of DNA typing and illustrates its application to criminal investigations through the presentation of actual case histories.

A Grounded Approach

The content of Criminalistics reflects the author’s experience as both an active forensic scientist and an instructor of forensic science at the college level. The author assumes that readers have no prior knowledge of scientific principles or techniques. The areas of chemistry and biology relating to the analysis of physical evidence are presented with a minimum of scientific terminology and equations. The discussion involving chemistry and biology is limited to a minimum core of facts and principles that make the subject matter understandable and meaningful to the nonscientist. Although it is not the intent of this book to turn readers into scientists or forensic experts, the author would certainly be gratified if the book motivates some students to seek further scientific knowledge and perhaps direct their education toward careers in forensic science.

Although Criminalistics is an outgrowth of a one-semester course offered as part of a criminal justice program at many New Jersey colleges, the value of the book is not limited to college students. Optimum utilization of crime laboratory services requires that criminal investigators have knowledge of the techniques and capabilities of the laboratory. That awareness extends beyond any summary that may be gleaned from departmental brochures dealing with the collection and packaging of physical evidence. Investigators must mesh knowledge of the principles and techniques of forensic science with logic and common sense to gain comprehensive insight into the meaning and significance of physical evidence and its role in.
criminal investigations. Forensic science begins at the crime scene. If the investigator cannot recognize, collect, and package evidence properly, no amount of equipment or expertise will salvage the situation.

Likewise, there is a dire need to bridge the “communication gap” that currently exists among lawyers, judges, and forensic scientists. An intelligent evaluation of the scientist’s data and any subsequent testimony will again depend on familiarity with the underlying principles of forensic science. Too many practitioners of the law profess ignorance of the subject or attempt to gain a superficial understanding of its meaning and significance only minutes before meeting the expert witness. It is hoped that the book will provide a painless route to comprehending the nature of the science.

In order to merge theory with practice, actual forensic case histories are included in the text. The intent is for these illustrations to move forensic science from the domain of the abstract into the real world of criminal investigation.

Key Features of the Thirteenth Edition

The Thirteenth edition, which is now available in a variety of print and electronic formats, presents modern forensic science approaches and techniques with the aid of real-life examples, up-to-date information, and interactive media. Key features include the following:

Headline News stories at the beginning of each chapter introduce readers to the chapter topics by describing high-profile crimes and the related forensic science techniques used in the investigations.

Steven Avery: Making a Murderer

The case of Steven Avery captured America’s attention when it was featured in the Netflix documentary Making a Murderer. The documentary detailed the case of Avery, who was wrongfully convicted in 1985 of sexual assault and attempted murder. After serving 18 years of a 20-year sentence, he was exonerated by DNA testing and released.

In 2003, Avery filed a $36 million lawsuit against Manitowoc County, its former sheriff, and its former district attorney for wrongful conviction and imprisonment. In November 2005, with his civil suit still pending, he was arrested for the murder of Wisconsin photographer Teresa Halbach. Teresa Halbach was last seen on October 31, 2005. Her last known appointment was a meeting with Avery, at his home on the grounds of Avery’s Auto Salvage, to photograph his sister’s minivan that he was offering for sale on Autotrader.com. During the investigation into her disappearance, Halbach’s vehicle was found partially concealed in the salvage yard, and bloodstains recovered from its interior matched Avery’s DNA. Investigators later matched bone fragments found in a burn pit near Avery’s home as Halbach’s. Manitowoc deputy found the key to Halbach’s vehicle in Avery’s bedroom. Avery’s attorneys said there was a conflict of interest in their participation and suggested evidence tampering.

Avery was arrested and charged with Halbach’s murder, kidnapping, sexual assault, and mutilation of a corpse on November 11, 2005. Although Manitowoc County ceded control of the murder investigation to the neighboring Calumet County Sheriff’s Department because of Avery’s suit against Manitowoc County, Manitowoc sheriff’s deputies participated in repeated searches of Avery’s trailer, garage, and property, supervised by Calumet County officers. The case serves as a prime example of the kinds of legal questions that can be raised if proper consideration isn’t given to crime scene search and recovery procedures.

Inside the Science boxes throughout the text explore scientific phenomena and technology in relation to select chapter topics, and are accompanied by Review Questions for Inside the Science at the end of the chapter.
Richard Ramirez committed his first murder in June 1984. His victim was a 79-year-old woman who was stabbed repeatedly and sexually assaulted and then had her throat slashed. It would be eight months before Ramirez murdered again. In the spring, Ramirez began a murderous rampage that resulted in 13 additional killings and 5 rapes.

His modus operandi was to enter a home through an open window, shoot the male residents, and savagely rape his female victims. He scribed a pentagram on the wall of one of his victims and the words *Jack the Knife*, and was reported by another to force her to “swear to Satan” during the assault. His identity still unknown, the news media dubbed him the “Night Stalker.”

As the body count continued to rise, public hysteria and a media frenzy prevailed. The break in the case came when the license plate of what seemed to be a suspicious car related to a sighting of the Night Stalker was reported to the police. The police determined that the car had been stolen and eventually located it, abandoned in a parking lot. After processing the car for prints, police found one usable partial fingerprint. This fingerprint was entered into the Los Angeles Police Department’s brand-new AFIS computerized fingerprint system.

The Night Stalker was identified as Richard Ramirez, who had been fingerprinted following a traffic violation some years before. Police searched the home of one of his friends and found the gun used to commit the murders, and jewelry belonging to his victims was found in the possession of Ramirez’s sister. Ramirez was convicted of murder and sentenced to death in 1989, where he died from natural causes in 2013.

**Case File** boxes throughout the text present brief, real-life case examples that are illustrative of the forensic science topics and techniques described in the chapters.

**Application and Critical Thinking** questions at the end of each chapter challenge students to demonstrate their understanding of the material through a variety of question types, including hypothetical scenarios and sets of images for visual identification and analysis. Answers to these questions are provided in the Instructor’s Manual.

**Webextras** serve to expand the coverage of the book through video presentations, Internet-related information, animations, and graphic displays keyed to enhancing reader’s understanding of the subject’s more difficult concepts. Webextras are accessible on the book website at www.pearsonhighered.com/careersresources.

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**Fluorescence**

The first hint of things to come was the discovery that latent fingerprints could be visualized by exposure to laser light. This laser method took advantage of the fact that perspiration contains a variety of components that fluoresce when illuminated by laser light. Fluorescence occurs when a substance absorbs light and emits light at a longer wavelength than the illuminating source. Important components that emit light or fluorescence are more readily seen with either the naked eye or through photography than are non-light-emitting materials. The high sensitivity of fluorescence serves as the underlying principle of many of the new chemical techniques used to visualize latent fingerprints.

One versatile use of fluorescence to visualize fingerprints came with the direct illumination of a fingerprint with argon–ion lasers. This laser type was chosen because its blue-green light output induced some of the perspiration components of a fingerprint to fluoresce (see figure). The major drawback of this approach is that the perspiration components of a fingerprint are often present in quantities too minute to observe even with the aid of fluorescence. The fingerprint examiner, wearing safety goggles containing optical filters, visually examines the specimen being exposed to the laser light. The filters absorb the laser light and permit the wavelengths at which latent-print residues fluoresce to pass through to the eyes of the wearer. The filter also protects the operator against eye damage from scattered or reflected laser light. Likewise, latent-print residue producing sufficient fluorescence can be photographed by placing this same filter across the lens of the camera. Examination of specimens and photography of the fluorescing latent prints are carried out in a darkened room.
application and critical thinking

1. Indicate the phase of growth of each of the following hairs:
   a. The root is club-shaped
   b. The hair has a follicular tag
   c. The root bulb is flame-shaped
   d. The root is elongated

2. A criminalist studying a dyed sample hair notices that the dyed color ends about 1.5 centimeters from the tip of the hair. Approximately how many weeks before the examination was the hair dyed? Explain your answer.

3. Following are descriptions of several hairs; based on these descriptions, indicate the likely race of the person from whom the hair originated:
   a. Evenly distributed, fine pigmentation
   b. Continuous medullation
   c. Dense, uneven pigmentation
   d. Wavy with a round cross-section

4. Criminalist Pete Evett is collecting fiber evidence from a murder scene. He notices fibers on the victim’s shirt and trousers, so he places both of these items of clothing in a plastic bag. He also sees fibers on a sheet near the victim, so he balls up the sheet and places it in a separate plastic bag. Noticing fibers adhering to the windowsill from which the attacker gained entrance, Pete carefully removes them with his fingers and places them in a regular envelope. What mistakes, if any, did Pete make while collecting this evidence?

5. For each of the following human hair samples, indicate the medulla pattern present.

   ![Hair samples](image)

Richard Saferstein, Ph.D.

Instructor Supplements

Instructor’s Manual with Test Bank. Includes content outlines for classroom discussion, teaching suggestions, and answers to selected end-of-chapter questions from the text. This also contains a Word document version of the test bank.

TestGen. This computerized test generation system gives you maximum flexibility in creating and administering tests on paper, electronically, or online. It provides state-of-the-art features for viewing and editing test bank questions, dragging a selected question into a test you are creating, and printing sleek, formatted tests in a variety of layouts. Select test items from test banks included with TestGen for quick test creation, or write your own questions from scratch. TestGen’s random generator provides the option to display different text or calculated number values each time questions are used.

PowerPoint Presentations. Our presentations are clear and straightforward. Photos, illustrations, charts, and tables from the book are included in the presentations when applicable.

To access supplementary materials online, instructors need to request an instructor access code. Go to www.pearsonhighered.com/irc, where you can register for an instructor access code. Within 48 hours after registering, you will receive a confirming email, including an instructor access code. Once you have received your code, go to the site and log on for full instructions on downloading the materials you wish to use.

Alternate Versions

eBooks. This text is also available in multiple eBook formats. These are an exciting new choice for students looking to save money. As an alternative to purchasing the printed textbook, students can purchase an electronic version of the same content. With an eTextbook, students can search the text, make notes online, print out reading assignments that incorporate lecture notes, and bookmark important passages for later review. For more information, visit your favorite online eBook reseller or visit www.mypearsonstore.com.
Revel Criminalistics, Thirteenth Edition by Richard Saferstein and Tiffany Roy

Designed for how you want to teach – and how your students want to learn

Revel is an interactive learning environment that engages students and helps them prepare for your class. Reimagining their content, our authors integrate media and assessment throughout the narrative so students can read, explore, and practice, all at the same time. Thanks to this dynamic reading experience, students come to class prepared to discuss, apply, and learn about criminal justice — from you and from each other.

Revel seamlessly combines the full content of Pearson’s bestselling criminal justice titles with multimedia learning tools. You assign the topics your students cover. Author Explanatory Videos, application exercises, survey questions, and short quizzes engage students and enhance their understanding of core topics as they progress through the content. Through its engaging learning experience, Revel helps students better understand course material while preparing them to meaningfully participate in class.

Author Explanatory Videos

Short 2-3 minute Author Explanatory Videos, embedded in the narrative, provide students with a verbal explanation of an important topic or concept and illuminating the concept with additional examples.

Criminalistics Virtual Laboratory Exercises

The Criminalistics virtual laboratory exercises are intended to give the student a first-hand look at the types of tests and examinations performed in the crime lab. Using 360-degree photography, microscope imagery and explanatory videos, these laboratory exercises will bring the content to life and give students an opportunity to experience a day in the life of a forensic scientist.

Point/CounterPoint Videos

Instead of simply reading about criminal justice, students are empowered to think critically about key topics through Point/Counterpoint videos that explore different views on controversial issues such as the effectiveness of the fourth amendment, privacy, search and seizure, Miranda, prisoner rights, death penalty and many other topics.

Student Survey Questions

Student Survey Questions appear within the narrative asking students to respond to questions about controversial topics and important concepts. Students then see their response versus the responses of all other students who have answered the question in the form of a bar chart.

Track time-on-task throughout the course

The Performance Dashboard allows you to see how much time the class or individual students have spent reading a section or doing an assignment, as well as points earned per assignment. This data helps correlate study time with performance and provides a window into where students may be having difficulty with the material.

Learning Management System Integration

Pearson provides Blackboard Learn™, Canvas™, Brightspace by D2L, and Moodle integration, giving institutions, instructors, and students easy access to Revel. Our Revel integration delivers streamlined access to everything your students need for the course in these learning management system (LMS) environments.
The Revel App

The Revel mobile app lets students read, practice, and study—anywhere, anytime, on any device. Content is available both online and offline, and the app syncs work across all registered devices automatically, giving students great flexibility to toggle between phone, tablet, and laptop as they move through their day. The app also lets students set assignment notifications to stay on top of all due dates. Available for download from the App Store or Google Play. Visit www.pearson-highered.com/revel/ to learn more.

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Tiffany Roy, JD, MSFS
Richard Saferstein, Ph.D., retired after serving 21 years as the chief forensic scientist of the New Jersey State Police Laboratory, one of the largest crime laboratories in the United States. He currently acts as a consultant for attorneys and the media in the area of forensic science. During the O. J. Simpson criminal trial, Dr. Saferstein provided extensive commentary on forensic aspects of the case for the Rivera Live show, the E! television network, ABC radio, and various radio talk shows. Dr. Saferstein holds degrees from the City College of New York and earned his doctorate degree in chemistry in 1970 from the City University of New York. From 1972 to 1991, he taught an introductory forensic science course in the criminal justice programs at the College of New Jersey and Ocean County College. These teaching experiences played an influential role in Dr. Saferstein’s authorship in 1977 of the widely used introductory textbook Criminalistics: An Introduction to Forensic Science, currently in this thirteenth edition. Saferstein’s basic philosophy in writing Criminalistics is to make forensic science understandable and meaningful to the nonscience reader, while giving the reader an appreciation for the scientific principles that underlie the subject.

Dr. Saferstein has authored or co-authored more than 45 technical papers and chapters covering a variety of forensic topics. Dr. Saferstein has co-authored Lab Manual for Criminalistics (Pearson, 2015) to be used in conjunction with this text. He is also the author of Forensic Science: An Introduction (Pearson, 2008 and 2011) and Forensic Science: From the Crime Scene to the Crime Lab (2009 and 2015). He has also edited the widely used professional reference books Forensic Science Handbook, Volumes I, II, and III, 2nd edition (published in 2002, 2005, and 2010, respectively, by Pearson).

Dr. Saferstein is a member of the American Chemical Society, the American Academy of Forensic Sciences, the Canadian Society of Forensic Scientists, the International Association for Identification, the Northeastern Association of Forensic Scientists, and the Society of Forensic Toxicologists. He is the recipient of the American Academy of Forensic Sciences 2006 Paul L. Kirk Award for distinguished service and contributions to the field of criminalistics.

Tiffany Roy, MSFS, JD is a Forensic DNA expert with over thirteen years of forensic biology experience in both public and private laboratories in the United States. She has processed thousands of DNA samples and thousands of cases over the course of her career. She has provided expert witness testimony in more than one hundred cases in state, federal and international courts. She instructs undergraduates at Palm Beach Atlantic University, University of Maryland Global Campus; and Southern New Hampshire University. She currently acts as a consultant for attorneys and the media in the area of forensic biology through her firm, ForensicAid, LLC.

Roy holds degrees from Syracuse University, Massachusetts School of Law and University of Florida in the areas of Biology, Law and Forensic Science. Her teaching, legal writing and testimonial experience help her to take complex scientific concepts and make them easily understandable for the nonscientist. Roy assisted Dr. Saferstein in completing Forensic Science: From the Crime Scene to the Crime Lab 4e (Pearson 2019) and has authored the text The Complete Guide to the American Board of Criminalistics Molecular Biology Examination (CRC Press 2020) to assist working forensic scientists achieve the goal of certification.

Roy is a member of the American Academy of Forensic Sciences, the Northeastern Association of Forensic Scientists and the Massachusetts Board of Bar Examiners. She is a certified Diplomate in the area of Forensic Biology by the American Board of Criminalistics. Aside from her teaching, writing and consulting, Roy also assists with international capacity building initiatives, providing subject matter expertise for trainings for criminal justice stakeholders in the Middle East and Africa.