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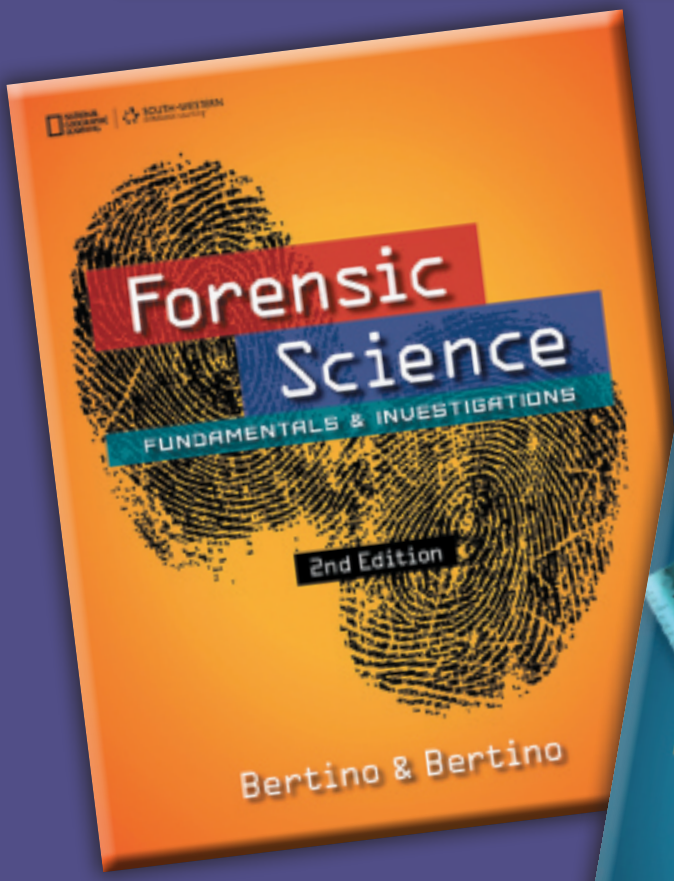
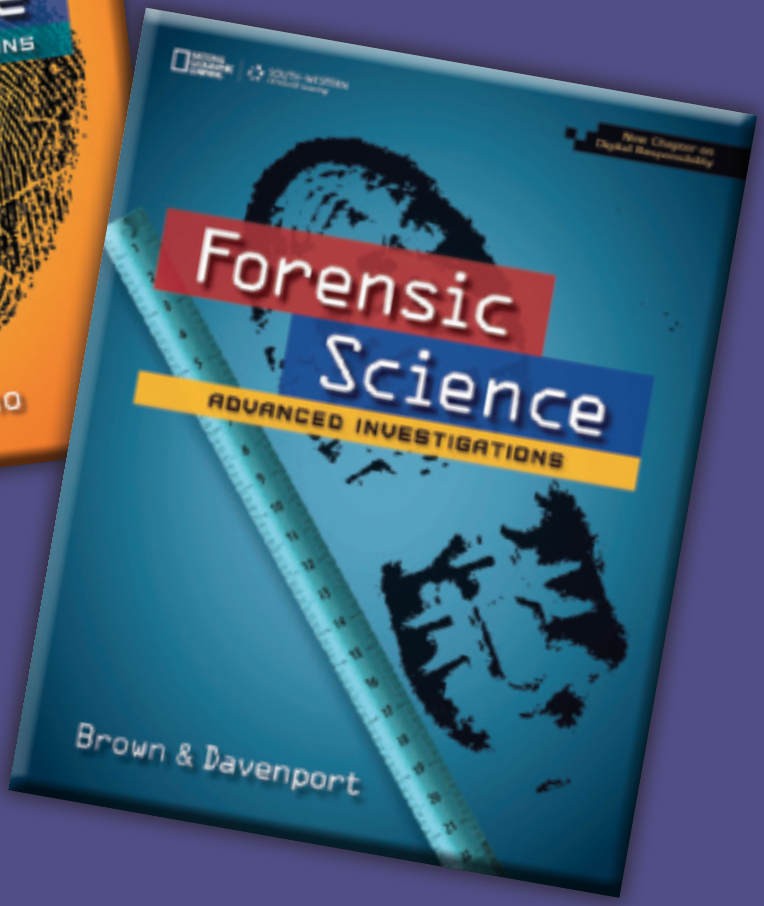
Sampler

Forensic Science

2ND EDITION AND UPDATE



THE STANDARD FOR HIGH SCHOOL FORENSIC SCIENCE HAS BEEN IMPROVED!



Sampler

Forensic Science

FORENSIC SCIENCE: FUNDAMENTALS AND INVESTIGATIONS, 2E
BERTINO & BERTINO

FORENSIC SCIENCE: ADVANCED INVESTIGATIONS, 1E CU
BROWN & DAVENPORT

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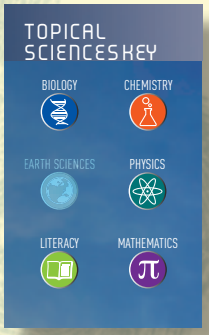
STRAIGHT FROM THE SOURCE, NO ASSUMPTIONS

THE CONTENT YOU REQUESTED HAS BEEN IMPROVED

THE OVERWHELMING SUCCESS OF THE FIRST EDITION BRINGS YOU A NEW EDITION AND UPDATE!

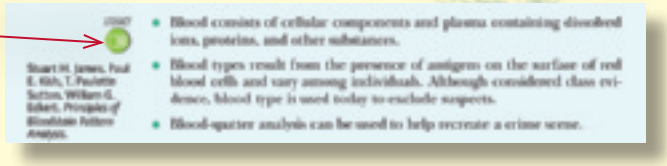
This program's balance of relevant content and hands-on lab activities are a direct result of your input at every stage! No other forensic science program delivers precisely what you need for your students and your course.



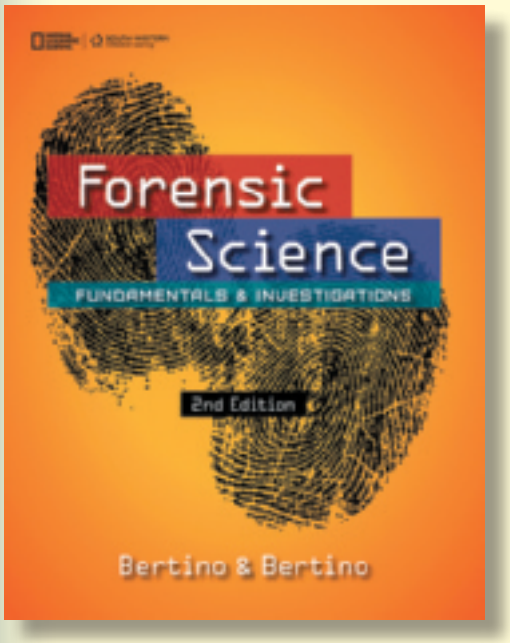
A review board, focus groups, and ongoing educator feedback guided each decision to ensure that the program meets the educational needs of your students.

Student and teacher supplements support the workflow with time-saving tools. Innovative digital resources include the innovative **Forensic Science eCollection database** and the new **MindTap™ with Virtual Labs.**

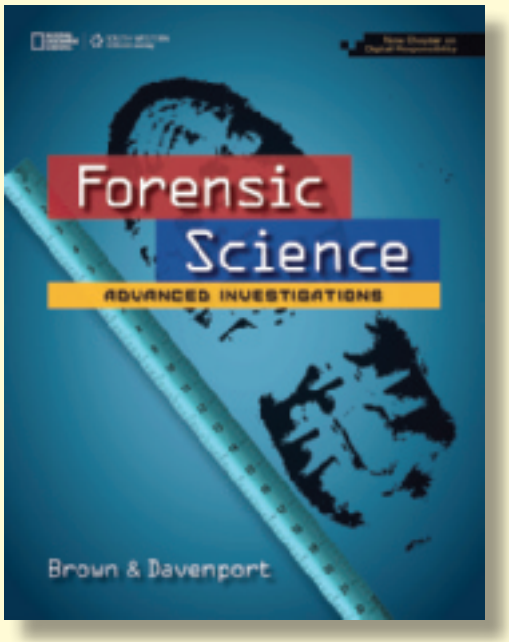
Forensic Science combines topics from math, chemistry, biology, physics, literacy, and Earth science into a single course with all materials clearly aligned with the **National Science Education Standards, NGSS,** and **CCSS**. Distinctive icons identify topics in the chapter opener and throughout the text.



New Second Edition

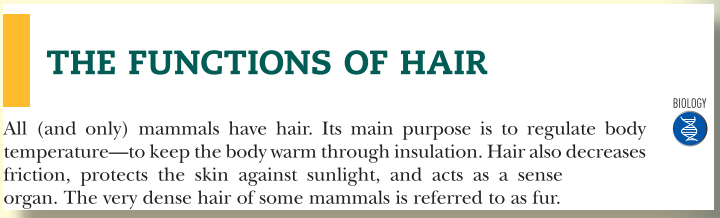


Copyright Update



WHAT'S NEW IN THE NEW EDITION (BERTINO AND BERTINO) AND COPYRIGHT UPDATE (BROWN AND DAVENPORT)

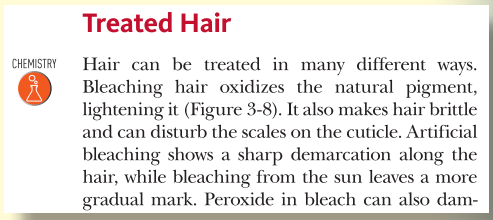
- **What's NEW!—*Forensic Science Fundamentals & Investigations, 2e***, new coverage for various topics such as:
    - A new chapter (11) on entomology
    - Scientific changes in DNA technologies (7)
    - More coverage of autopsy (12)
    - More coverage in crime-scene investigation (2)
    - Pollen chapter is now Forensic Botany (5)
- **What's NEW!—*Forensic Science Advanced Investigations, CU***, new coverage for various topics within such as:
    - A new chapter (15) on Digital Responsibility and Social Networking



THE FUNCTIONS OF HAIR

BIOLOGY

All (and only) mammals have hair. Its main purpose is to regulate body temperature—to keep the body warm through insulation. Hair also decreases friction, protects the skin against sunlight, and acts as a sense organ. The very dense hair of some mammals is referred to as fur.

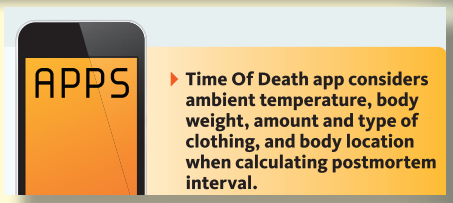


Treated Hair

CHEMISTRY

Hair can be treated in many different ways. Bleaching hair oxidizes the natural pigment, lightening it (Figure 3-8). It also makes hair brittle and can disturb the scales on the cuticle. Artificial bleaching shows a sharp demarcation along the hair, while bleaching from the sun leaves a more gradual mark. Peroxide in bleach can also dam-

- **Aligned to National Standards**—This text combines topics from math, chemistry, biology, physics, literacy, and earth science into a single course with all materials clearly correlated to the National Science Education Standards, NGSS, and CCSS. The topics are identified by distinctive icons in the chapter opener as well as throughout the text.
- **A Wide Variety of High-Interest Lab Activities**—Many updated end-of-chapter lab activities give students the hands-on experience needed to fully understand and truly integrate their knowledge of science and related subjects.
- **Capstone projects** are updated and give students the opportunity to apply key topics learned throughout the year, as well as extend the learning process with the opportunity to synthesize this knowledge and new content.



APPS

Time Of Death app considers ambient temperature, body weight, amount and type of clothing, and body location when calculating postmortem interval.

- **The Gale Forensic Science eCollection™**—This database allows you and your students to investigate the mysteries of forensic science in-depth with online access to hundreds of recent articles—from highly specialized academic journals to general science-focused magazines.
- **NEW—Forensic Science MindTap™ and Virtual Labs**—Give your students real-world lab experience within an online environment with MindTap! **MindTap** is a fully online, highly personalized learning experience that combines readings, multimedia, activities, and assessments into a singular Learning Path. **Virtual Lab** activities include: background information, 3-D crime scenes, clear instructions, Toolkits, post-lab assessments, and critical-thinking and research activities.
- **NEW APPS** feature that discusses Web Apps for related tools and topics. Available with Forensic Science Fundamentals & Investigations.
- **NEW "Further Reading"** for CCSS literacy details additional reading references. Available with Forensic Science Fundamentals & Investigations.

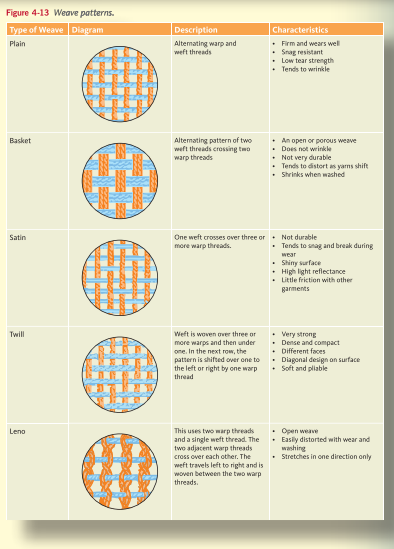


Figure 4-13 *Weave patterns.*

Type of Weave	Diagram	Description	Characteristics
Plain		Alternating warp and weft threads	• Firm and wears well • Snag resistant • Low tear strength • Tends to wrinkle
Basket		Alternating pattern of two weft threads crossing two warp threads	• An open or porous weave • Does not wrinkle • Not very durable • Tends to distort as yarns shift • Shrinks when washed
Satin		One weft crosses over three or more warp threads.	• Not durable • Tends to snag and break during wear • Shiny surface • High light reflectance • Little friction with other garments
Twill		Weft is woven over three or more warps and then under one. In the next row, the pattern is shifted over one to the left or right by one warp thread	• Very strong • Dense and compact • Different faces • Diagonal design on surface • Soft and pliable
Leno		This uses two warp threads and a single weft thread. The two adjacent warp threads cross over each other. The weft travels left to right and is woven between the two warp threads.	• Open weave • Easily distorted with wear and washing • Stretches in one direction only

IT'S ALL IN THE DETAILS

RIVETING DESIGN AND FEATURES OFFER A NEW WAY TO EXPERIENCE SCIENCE

TRACING THE CLUES TO STUDENT SUCCESS

From a dynamic design to captivating images, practical applications, intriguing case studies, and glimpses into actual crime and lab scenes, every part of this text appeals to students; the program presents information the way students learn best.

Chapter-opening scenarios highlight intriguing news shaping forensic science. These exciting stories, taken directly from gripping headlines, draw students into the learning path of the text. Scenarios feature well-known cases, such as Cory Monteith, Michael Jackson, Jodi Arias, and more.

Clear Learning Objectives guide how students study, helping them focus on the key topics. Chapter content and assessment materials, tagged to specific learning objectives, provide a strong framework for mastering key concepts.

Scientific Terms and Vocabulary, highlighted in each chapter, introduce key terms, ensuring students are able to understand their meaning.

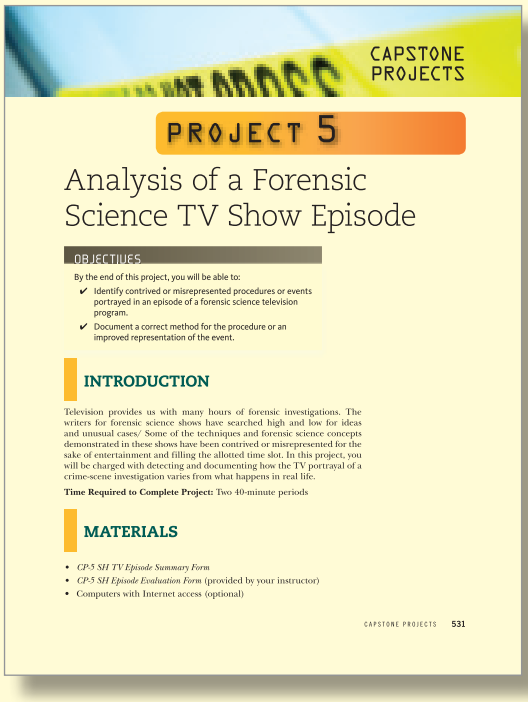
Case Studies bring closure to the chapter concepts using intriguing case facts drawn from actual forensic investigations. Questions prompt discussion and facilitate students' critical-thinking skills.

Careers in Forensic Science sections focus on the hottest careers related to forensic science today, detailing job requirements, necessary preparation, and challenges.

End of Chapter Review Questions, including true-false, multiple choice, and short answer, highlight cross-curricular connections and ensure students thoroughly comprehend principles before moving ahead.

ENGAGE THEM WITH HANDS-ON ACTIVITIES FOR THE REAL WORLD APPLICATION

The variety of high-interest lab activities (3–5 per chapter) saves you time, while giving students the hands-on experience needed to integrate their knowledge of science and related subjects. These activities outline the objectives, time required, materials, safety precautions, scenarios, background information, detailed procedures and data tables, follow-up questions, and research opportunities. Plus the affordable materials allow labs to be completed with minimal investment.


CAPSTONE PROJECTS

PROJECT 5

Analysis of a Forensic Science TV Show Episode

OBJECTIVES

By the end of this project, you will be able to:

- ✔ Identify contrived or misrepresented procedures or events portrayed in an episode of a forensic science television program.
- ✔ Document a correct method for the procedure or an improved representation of the event.

INTRODUCTION

Television provides us with many hours of forensic investigations. The writers for forensic science shows have searched high and low for ideas and unusual cases/ Some of the techniques and forensic science concepts demonstrated in these shows have been contrived or misrepresented for the sake of entertainment and filling the allotted time slot. In this project, you will be charged with detecting and documenting how the TV portrayal of a crime-scene investigation varies from what happens in real life.

Time Required to Complete Project: Two 40-minute periods

MATERIALS

- *CP-5 SH TV Episode Summary Form*
- *CP-5 SH Episode Evaluation Form* (provided by your instructor)
- Computers with Internet access (optional)

CAPSTONE PROJECTS 531


ACTIVITY 6-1

Study Your Fingerprints Obj. 6.2, 6.3

Objectives:

By the end of this activity, you will be able to:

1. Lift your fingerprint using tape and a graphite pencil.
2. Identify the ridge pattern of your finger.
3. Compare and contrast your fingerprints to your classmates' fingerprints.
4. Find two other students with the same basic ridge pattern as your own.
5. Calculate the percentage of students having each of the three different ridge patterns.

Time Required to Complete Activity: 40 minutes

Materials:

Act 6-1 SH
clear, adhesive tape ¾ inch in width or wider (not "transparent" tape)
pencil
two 3" × 5" cards or Act 6-1 SH
magnifying glass

Safety Precautions:

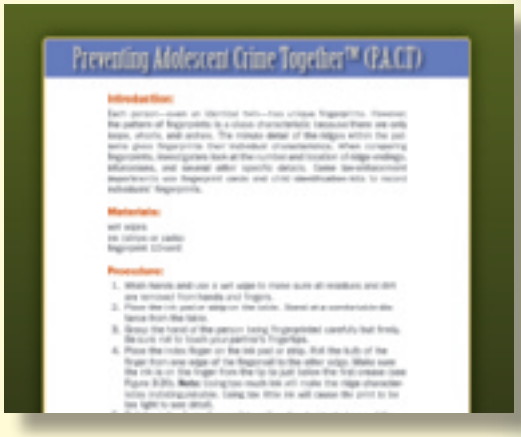
No special precautions

Procedure:

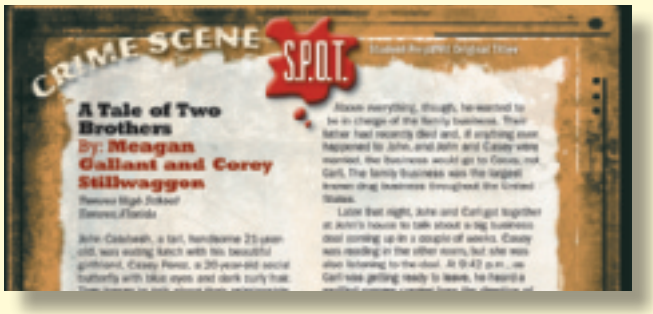
1. On a lined 3" × 5" card, rub the end of a graphite pencil in a back-and-forth motion, creating a dark patch of graphite about 2 by 3 inches.
2. Rub your right index finger across the graphite patch so that the fingertip becomes coated with graphite from the first joint in the finger to the tip, and from fingernail edge to fingernail edge.
3. Tear off a piece of clear adhesive tape about 2 inches long. Carefully press the sticky side of the tape onto your finger pad from the edge of your fingernail across your finger pad to the other side of your fingernail.
4. Gently peel off the tape.
5. Press the tape, sticky side down, on the clean 3" × 5" card.
6. Examine your fingerprint using a magnifying glass.
7. Compare your fingerprint to the pictured samples.
8. Identify whether your fingerprint pattern is a loop, arch, or whorl.
9. Find two other students who have the same ridge pattern as yours.

Fingerprints 175

Capstone Crime Scene projects give students the opportunity to apply key topics throughout the course.


Preventing Adolescent Crime Together™ (P.A.C.T.)

P.A.C.T.™ Activities (Preventing Adolescent Crime Together) provide service learning opportunities through projects addressing issues such as anti-bullying and social responsibility. Available with Forensic Science Advanced Investigations.


CRIME SCENE S.P.O.T.

A Tale of Two Brothers

By: Meagan Gallant and Corey Stillwaggon

Crime Scene S.P.O.T (Student Prepared Original Title) offers short stories written by actual students followed by critical-thinking questions and a writing activity. S.P.O.T. provides interdisciplinary instruction integrating reading and writing throughout the text. Available with Forensic Science Advanced Investigations.

DOWN AND DIRTY

ENABLE STUDENTS TO EXPLORE THE TOOLS OF THE TRADE WITH DYNAMIC ONLINE RESOURCES

The Forensic Science companion websites take learning to a new level with a wealth of learning and teaching resources with access to the eCollection database.

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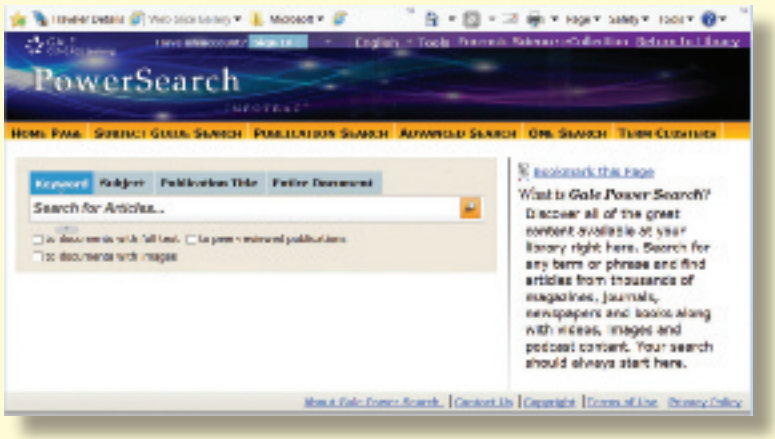
FORENSIC SCIENCE ECOLLECTION™ DATABASE

- Web links to other dynamic science sites
- Interactive flashcards and crossword puzzles to review key terms
- Lab forms to complete in-text lab activities
- Lesson Plans
- PowerPoint® presentation slides

Digging Deeper with Forensic Science eCollection guides students in exploring specific areas of interest related to forensic science for additional reinforcement.

Are fingerprints really unique? How much of the interpretation of fingerprints is subjective on the part of the fingerprint analyst? Search the Gale Forensic Science eCollection for answers at **ngl.cengage.com/forensicscience2e**.

The Gale Forensic Science eCollection™ allows you and your students to systematically investigate the mysteries of forensic science with online access to hundreds of articles via InfoTrac®. From highly specialized academic journals to general science-focused magazines articles, the eCollection allows you and your students to stay current with the latest scientific developments in this growing field. No other publisher offers such a complete, exclusive resource as a free supplement on the textbook companion website.



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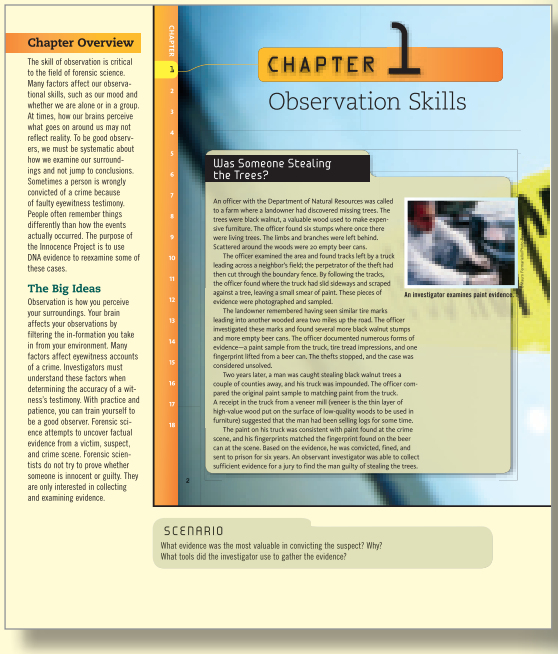
Wraparound Teacher's Edition (WTE) provides reduced student pages with comprehensive related teaching tips and support that expand upon the topics presented on each page. Teaching notes and overviews include:

- The Big Ideas highlight the key science focus of the chapter content
- Teaching Resources
- Tips for Differentiated Learning
- Teaching Tips to engage, teach, explore, evaluate, and close the lesson
- Answers to end of chapter reviews and activities with additional details related to lab materials, safety precautions, procedures, data tables, and further student research
- Expanded cross-curricular information that connects biology, chemistry, Earth science, physics, math, and literacy



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OBSERVE THE EVIDENCE

NEW! FORENSIC SCIENCE FOR MINDTAP™ AND VIRTUAL LABS LEADS STUDENTS TO THE RIGHT CONCLUSION

Forensic Science MindTap™ and Virtual Labs—MindTap is a fully online, highly personalized learning experience that combines readings, multimedia, activities, and assessments into a singular Learning Path. **Virtual Lab** activities include: background information, 3-D crime scenes, clear instructions, Toolkits, post-lab assessments, critical-thinking questions, and research activities.

FORENSIC SCIENCE MINDTAP™

MindTap contains relevant assignments that guide students to analyze, apply, and improve critical-thinking skills; allowing you, as instructor, to measure skills and outcomes with ease. Included with MindTap are:

MindTap Reader is an interactive reading resource that allows learners to make notes, highlight text, and find definitions. In addition, the Learning Path provides instant access to various resources needed to personalize tour course. Included are these additional resources:

- Chapter sections are linked for navigation
- Chapter objectives are linked to activities and key concepts to show correlation
- Terms and definitions linked to the glossary for clarification
- Flashcards, Web links, Merriam-Webster's Dictionary, and ReadSpeaker are other useful tools for research, reinforcement, and enhanced accessibility
- Photos and illustrations are linked to chapter references for navigation

Link to Digging Deeper eCollection provides immediate access for further online research.

Interactivities for quick virtual interactive learning reinforcement.

MindApps are learning Apps with tools to help you succeed.

SET THE SCENE FOR ONLINE LEARNING SUCCESS!

THE VIRTUAL LABS WITHIN MINDTAP

Now you can give your students real-world lab experience within an online environment! Within MindTap, each chapter will include an interactive lab within the Learning Path. Students will use these labs to solidify their understanding of the concepts presented within the chapter.
Also included within Mindtap is a Virtual Lab which can be used as a final assessment for the course. Each lab activity includes:

- Background information
- Clear instructions
- Toolkit
- Lab assessments
- Critical-thinking questions
- Research activities

As students work through the lab, they will record their findings within an auto-graded assignment. After they have completed the lab and recorded the data, there is a post-lab assessment covering the topics and techniques used within the lab.

Fundamentals & Investigations MindTap with Interactive labs and Death of Rose Cedar Virtual Lab
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CHAPTER 6 Fingerprints

Technology Catches Up to Crime: FBI Latent Hit Award 2013

By September 2001, the 1999 San Bernardino, California, murder and robbery of 74-year-old Marshall Adams was a "cold case." All leads had been exhausted. But a new lead had just come to light. The San Bernardino County Sheriff's Department had submitted latent prints from the case to the FBI's *Integrated Automated Fingerprint Identification System* (*IAFIS*), a national fingerprint and criminal history database, and several possible fingerprint matches had been identified. One was about to lead to an arrest and guilty plea.

Ulrich Baumgarten/Getty Images

An FBI technician compares prints on IAFIS with handprints from a crime scene.

The crime In December 1999, a call to San Bernardino's Police Department reported an unresponsive male on the floor of a jewelry store. Detective John Munoz headed the investigation and found the victim, Marshall Adams, brutally beaten and stabbed. His wallet, along with jewelry from the store, had been taken.

Crime-scene evidence Randy Beasley, a fingerprint identification technician from the San Bernardino County Sheriff's Department, collected latent (hidden) fingerprints, palm prints, and blood evidence from a knife, store doors, and a store catalog. A bloody palm print was recovered from the face of the victim.

1999 investigation In 1999, the Sheriff's department searched the latent prints against their local databases without any success. All the evidence from the case was stored in their cold case unit.

2001 evidence and arrest In 2001, IAFIS returned several possible matches to the latent print from the crime scene. James Nursall, a fingerprint examiner with the San Bernardino County Sheriff's Department, concluded that the print belonged to Jad Salem. Through IAFIS, it was discovered that Salem had been arrested and fingerprinted in Texas about two weeks after the 1999 murder. Salem was initially stopped for a traffic violation but was later arrested on a drug charge.

Detective Munoz located Salem in San Bernardino and told him about the fingerprint evidence from the 1999 murder. At first Salem denied being there. Later in the interrogation, Salem admitted being there, but only as a witness. However, after Salem was shown the bloody palm print on the victim's face, along with all the other evidence, he admitted he was the murderer. He was sentenced to 32 years in prison for the murder and robbery.

TOPICAL SCIENCES KEY

OBJECTIVES

By the end of this chapter, you will be able to

- **6.1** Outline the history of fingerprinting.
- **6.2** Describe the characteristics of fingerprints.
- **6.3** Compare and contrast the basic types of fingerprints.
- **6.4** Describe how criminals attempt to alter their fingerprints.
- **6.5** Present and refute arguments that question fingerprint evidence reliability.
- **6.6** Summarize the proper procedures for collecting fingerprint evidence.
- **6.7** Describe the latest identification technologies.
- **6.8** Determine if a fingerprint is consistent with a fingerprint on record.
- **6.9** Lift a latent print.
- **6.10** Prepare a ten card and analyze the ridge patterns of the prints.

VOCABULARY

- **arch** a fingerprint pattern in which the ridge pattern originates from one side of the print and continues to the other side
- **core** a center of a loop
- **delta** a triangular ridge pattern
- **fingerprint** an impression left on any surface that consists of patterns made by the ridges on a finger
- **IAFIS (Integrated Automated Fingerprint Identification System)** FBI-developed national database of more than 76 million criminal fingerprints and criminal histories
- **latent fingerprint** a concealed fingerprint made visible through the use of powders or forensic techniques
- **loop** a fingerprint pattern in which the ridge pattern flows inward and returns in the direction of the origin
- **minutiae** the combination of details in the shapes and positions of ridges in fingerprints that makes each unique; also called *ridge characteristics*
- **patent fingerprint** a visible fingerprint produced when fingers coated with blood, ink, or some other substance touch a surface and transfer their print to that surface
- **plastic fingerprint** a three-dimensional fingerprint made in soft material such as clay, soap, or putty
- **ridge count** the number of ridges between the center of a delta and the core of a loop
- **ridge pattern** the recognizable pattern of the ridges found in the end pads of fingers that form lines on the surfaces of objects in a fingerprint. They fall into three categories: arches, loops, and whorls
- **ten card** a form used to record and preserve a person's fingerprints
- **whorl** a fingerprint pattern that resembles a bull's-eye

INTRODUCTION

Pudd'nhead Wilson is a lawyer created by Mark Twain in the novel of the same name, published in November 1894. In his final address to a jury, Lawyer Wilson exhibits his knowledge of the cutting-edge technology of the day:

> Every human being carries with him from his cradle to his grave, certain physical marks which do not change their character, and by which he can always be identified—and that without shade of doubt or question. These marks are his signature, his physiological autograph, so to speak, and this autograph cannot be counterfeited, nor can he disguise it or hide it away, nor can it become illegible by the wear and mutations of time.

No one is sure how Mark Twain learned that fingerprints made good forensic evidence, but he used them in his book to dramatically solve a case in which identical twins were falsely accused of murder. Using fingerprints as a means to identify individuals was a major breakthrough in forensic science in real life, as well as in novels, and it gave law enforcement around the world a new tool to solve crimes, clear the innocent, and convict the guilty. Fingerprint cards from *Pudd'nhead Wilson* are shown in Figure 6-1.

...orly, ...ctional, ...print cards ...in Twain's Pudd'nhead Wilson.

THUMB PRINTS
From Pudd'nhead Wilson's Collection
"Every human being carries with him from his cradle to his grave certain physical marks which do not change their character."

Twain's Pudd'nhead Wilson

HISTORICAL DEVELOPMENT Obj. 6.1

For thousands of years, humans have been fascinated by the patterns found on the skin of their fingers. But exactly how long ago humans realized that these patterns could identify individuals is not clear. Several ancient cultures used fingerprints as personal markings (Figure 6-2). Archaeologists discovered fingerprints pressed into clay tablet contracts dating back to 1792–1750 B.C. in Babylon. In ancient China, it was common practice to use inked fingerprints on all official documents, such as contracts and loans. The oldest known document showing fingerprints dates from the third century B.C. Chinese historians have found fingerprints and palm prints pressed into clay writing surfaces and surmise that they were used to authenticate official seals and legal documents.

Figure 6-2 *This ancient seal shows the fingerprint of a person who lived hundreds of years ago.*

Photograph by Bruce & Kenneth Zuckerman and Marilyn Lundberg, West Semitic Research. Courtesy of USC Archaeological Research Collection.

In Western culture, the earliest record of the study of the patterns on human hands comes from 1684. Dr. Nehemiah Grew wrote a paper describing the patterns that he saw on human hands under the microscope, including the presence of ridges. Johann Christoph Andreas Mayer (1788) described that "the arrangement of skin ridges is never duplicated in two persons." He was probably the first scientist to

recognize this fact. In 1823, Jan Evangelist Purkyn described nine distinct fingerprint patterns, including loops, spirals, circles, and double whorls. Sir William Herschel began the collecting of fingerprints in 1856. He noted the patterns were unique to each person and were not altered by age.

In 1879, Alphonse Bertillon, an assistant clerk in the records office at the police station in Paris, created a way to identify criminals using a list of physical measurements taken from prisoners. The system, sometimes called Bertillonage, was first used in 1883 to identify repeat offenders. In 1902, he was credited with solving the first murder using fingerprints.

Sir Francis Galton (1822–1911) verified that fingerprints do not change with age. In 1888, Galton, along with Sir E. R. Henry, developed the classification system for fingerprints that is still in use today in the United States and Europe.

Beginning in 1896, Sir Edmund Richard Henry, with the help of two colleagues, created a system that divided fingerprint records into groups based on whether they have an arch, whorl, or loop pattern. Each fingerprint card in the system was imprinted with all 10 fingerprints of a person and marked with individual characteristics. This set of fingerprints has come to be called a **ten card** (Figure 6-3).

Fingerprints are now taken digitally, providing clearer reference prints. By 2012, the FBI-maintained IAFIS system had more than 76 million computerized fingerprints, mug shots, scars, tattoo photos, and other identification records. IAFIS contains information on criminals; known and suspected terrorists; military personnel; and civilians seeking employment, who have had background checks, or who have applied for licenses to purchase firearms. When trying to identify an unknown latent print, crime-scene investigators submit the fingerprint to IAFIS. IAFIS quickly searches its database of fingerprints and selects possible matches. A fingerprint examiner makes the final decision concerning consistency. This system has improved speed and accuracy of identifying matches for both current and cold cases. The IAFIS system will soon be enhanced by Advanced Fingerprint Identification Technology (AFIT).

By 2013, the FBI was integrating the ability to compare crime-scene palm prints with prints collected at the time of arrest. About 20–30 percent of latent prints at a crime scene come from the palm or side of the hand from the little finger to the wrist. These prints may be left on the back of a chair, on a window, or when a suspect pushes off a surface or uses a handle or a doorknob.

Did you know

Alphonse Bertillon was the first person to document incoming prisoners with a photograph, the forerunner of the modern mug shot.

Figure 6-3 *An early example of a ten card.*

ACTIVITY 6-1

Study Your Fingerprints Obj. 6.2, 6.3

Objectives:

By the end of this activity, you will be able to:

1. Lift your fingerprint using tape and a graphite pencil.
2. Identify the ridge pattern of your finger.
3. Compare and contrast your fingerprints to your classmates' fingerprints.
4. Find two other students with the same basic ridge pattern as your own.
5. Calculate the percentage of students having each of the three different ridge patterns.

Time Required to Complete Activity: 40 minutes

Materials:

Act 6-1 SH
clear, adhesive tape ¾ inch in width or wider (not "transparent" tape)
pencil
two 3" × 5" cards or Act 6-1 SH
magnifying glass

Safety Precautions:

No special precautions

Procedure:

1. On a lined 3" × 5" card, rub the end of a graphite pencil in a back-and-forth motion, creating a dark patch of graphite about 2 by 3 inches.
2. Rub your right index finger across the graphite patch so that the fingertip becomes coated with graphite from the first joint in the finger to the tip, and from fingernail edge to fingernail edge.
3. Tear off a piece of clear adhesive tape about 2 inches long. Carefully press the sticky side of the tape onto your finger pad from the edge of your fingernail across your finger pad to the other side of your fingernail.
4. Gently peel off the tape.
5. Press the tape, sticky side down, on the clean 3" × 5" card.
6. Examine your fingerprint using a magnifying glass.
7. Compare your fingerprint to the pictured samples.
8. Identify whether your fingerprint pattern is a loop, arch, or whorl.
9. Find two other students who have the same ridge pattern as yours.

10. Find two other students who have the other two types of ridge pattern
11. Calculate the percentage of loops, whorls, and arches found in your class.

Arches 5%

Whorls 30%

Loops 65%

Data Collection From Class:

Record the number of students showing each of the three types of fingerprint patterns and place those numbers in the data table. Complete the rest of the data table.

Data Table

	Loop	Whorl	Arch
Number of students showing trait			
Total students in class (This will be the same total for each column.)			
Percentage of class showing the trait (Divide the number of students with the trait by the total number in the class, and then multiply by 100.)			
National averages	65%	30%	5%

Questions:

1. Did the class percentage agree with the national averages? Support your claim using data from the data table.
2. Describe how to improve this data-collecting activity so that your results might be more reliable.

Going Further:

Research chi-squared statistical analyses. Then run chi-squared statistical analyses to determine if the differences between your data and the national averages were significant.

ACTIVITY 6-2

Giant Balloon Fingerprint Obj. 6.3

Objectives:

By the end of this activity, you will be able to:

1. Create a giant balloon fingerprint for use in studying various ridge patterns.
2. Identify the three basic ridge patterns among your classmates' fingerprints.

Introduction:

Ridge patterns on fingerprints are unique and identifiable. In this activity, you will be comparing and contrasting your own thumbprint and those of your classmates to identify these patterns.

Time Required to Complete Activity: 20 minutes

Materials:

1 large white balloon
fingerprinting inkpad
hand soap or moist wipes
paper towels
Act 6-2 SH
ballpoint pen

What you will need to do this experiment: a white balloon and an inkpad.

Safety Precautions:

Before doing this activity, if you are allergic to latex, ask your teacher for a nitrile glove instead of a balloon.

Procedures:

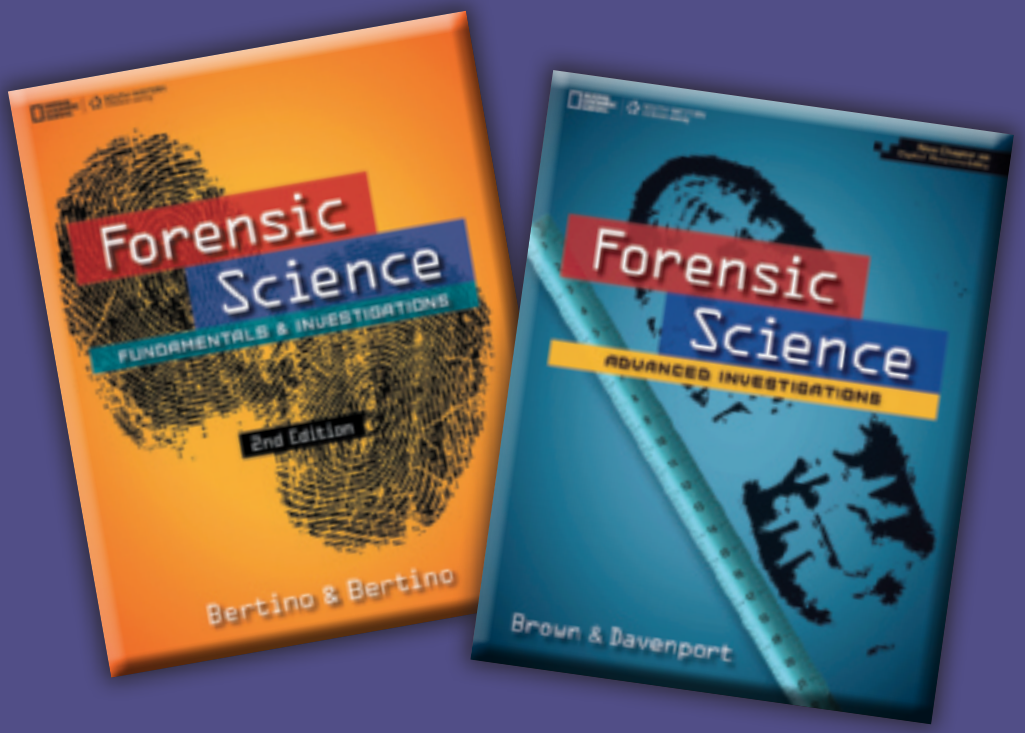
1. Slightly inflate a large balloon.
2. Ink your thumb from thumbnail to thumbnail and past the first joint.
3. Position your thumb so that your print will be about a quarter of the way from the top of the balloon and two thirds of the way from the bottom. Gently press your thumb into the semi-inflated balloon. Do not roll your thumb. Pull your thumb from the balloon.
4. Fully inflate the balloon and examine your thumbprint.
5. Identify your thumb pattern as a loop, whorl, or arch.
6. Examine the balloons of your classmates and identify the ridge types.
7. Deflate your balloon and save it, unless you plan to do the Going Further activity below.

Going Further:

Refer to Figure 6-9, which describes minutiae patterns. Use a ballpoint pen to identify and circle the minutiae patterns on the balloon. Then deflate your balloon and save it.

Sampler

FURTHER ENHANCE YOUR STUDENTS' FORENSIC SCIENCE SKILLS!



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