

Identifying Firearms

Reading Preview

Key Concepts

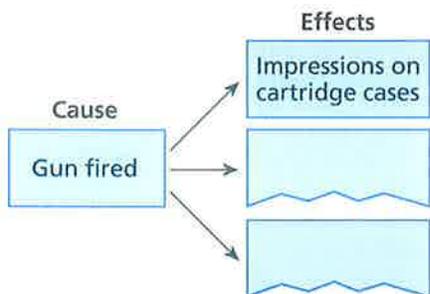
- What kinds of evidence can investigators collect when a weapon is fired?
- How is the evidence from firearms analyzed?

Key Terms

- cartridge
- rifling
- gunshot residue

Target Reading Skill

Relating Cause and Effect As you read, identify three effects of firing a gun. Choose effects that can be used as evidence. Write the information in a graphic organizer like the one below.



Russian Olga Zajceva takes aim during a biathlon 7.5 km sprint competition.

Discover Activity

Where Does the Powder Go?



Your teacher will ask for volunteers to do this demonstration. Record your observations in your notebook.

1. Use a plastic spoon and a funnel to transfer a spoonful of cornstarch into a small balloon. Have your partner hold the neck of the balloon open.
2. Blow up the balloon and tie off the end.
3. Hold the balloon at arm's length while your partner uses a pin to burst the balloon. Observe what happens to the powder. CAUTION: Take care not to slip on the cornstarch.

Think It Over

Making Models Make a drawing in your notebook showing the location of the balloon, the path of the powder, and where the powder ended up. Refer to this drawing when you read about trace evidence from firearms.

If you watch the winter Olympics, you may see athletes on skis carrying a rifle. The athletes are taking part in an event called a biathlon (by ATH lahn). As the athletes race cross country on skis, they must stop at times to shoot at targets. To win the race, an athlete must ski fast and be accurate with a rifle.

The sport started in Northern Europe. In countries such as Norway, people used skis when they hunted for food. Soldiers also skied with weapons to protect their country's borders.

Not every use of a rifle is as innocent as in a biathlon. Many crimes in the United States involve the use of rifles and handguns. Forensic scientists have the task of identifying the firearms used in those crimes.



Evidence From Firearms

Crime scene investigators may find a gun or a person with a gun at the scene of a shooting. But this doesn't happen in most cases. So what else can investigators do? **Investigators look for the evidence that is left behind when a weapon is fired.**

How Firearms Work Firearms are designed to shoot an object at high speed toward a target. In a pistol like the one in Figure 16, the object is a bullet. A bullet is shaped like a cylinder with a pointed tip. Bullets are typically made from lead. Each bullet is packed in a metal case, or **cartridge**. The cartridge also contains gunpowder and a primer.

Pulling a trigger makes the firing pin strike the cartridge. This pressure causes the primer to ignite, which in turn ignites the gunpowder. The hot gases produced by the reaction push the bullet through the barrel of the gun at high speed.

Evidence From Cartridge Cases A CSI can learn many things by just observing empty cartridge cases. The size of the cases can help narrow down the list of possible firearms. When cases are found, they are typically near the spot where a weapon was fired. From the number of cases, the CSI can infer how many bullets were fired.

Firing a gun leaves impressions on a cartridge case. The firing pin leaves a small, distinctive dent. Marks are also stamped on the case when it is pressed against the inside of the firing chamber and when it is ejected from the gun.

FIGURE 16

Inside a Handgun

Firing a gun leaves impressions on bullets and cartridge cases.

Interpreting Diagrams What happens to the empty cartridge case after the gunpowder ignites?



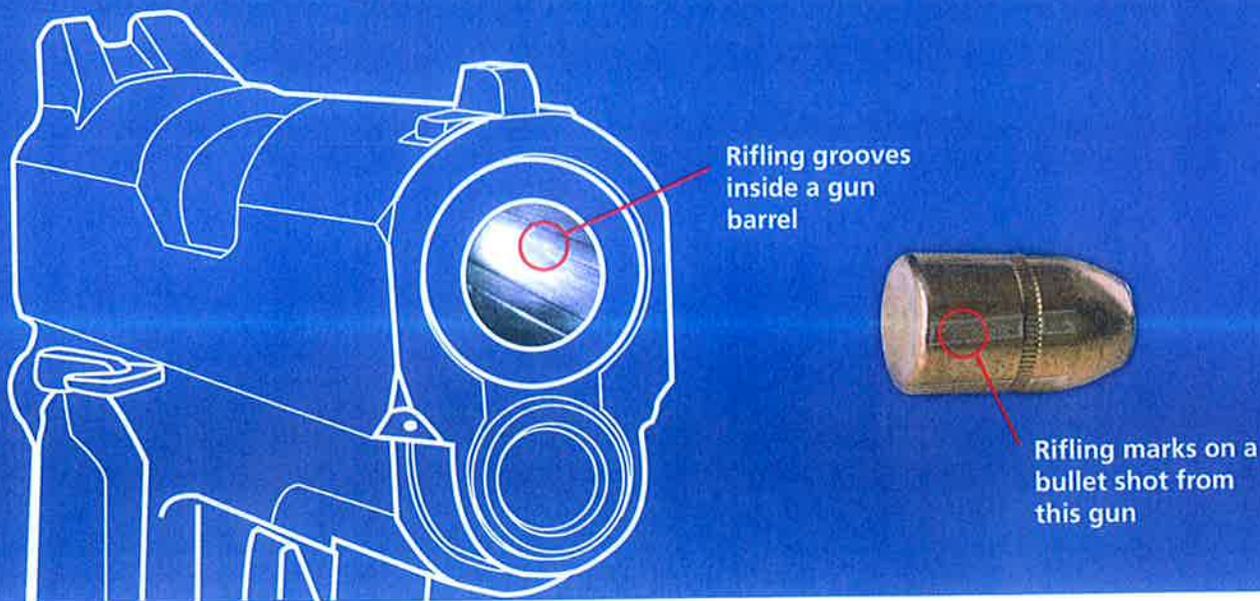


FIGURE 17 Rifling

The grooves inside a gun barrel make marks on a bullet as it passes through the barrel.

Skills Activity

Making Models



1. Cut a 5-cm piece from a plastic straw. Use a push pin to make four holes in the straw.
2. Roll a grape-size piece of clay into a tube that is narrow enough to fit in the straw, but wide enough to fill the straw.
3. Insert the clay into the straw. Use a cotton swab to gently force the clay through the straw.
4. Look for marks on the surface of the clay. Where do you think these marks came from?
5. Explain how this activity models what happens to a bullet when a gun is fired.

Evidence From Bullets First investigators must find the bullets. X-rays are used to locate bullets in shooting victims. If the victim is alive, the bullets may be removed during an operation. If the victim is dead, the medical examiner will retrieve the bullets during an autopsy.

A bullet may miss the victim. A CSI can search for that bullet at the crime scene and use its location to trace a path back to the spot where the gun was fired.

A CSI can also use marks on a bullet as evidence. **Firing a gun leaves impressions on a bullet.** Inside a gun barrel, there are spiral grooves called **rifling**. The grooves cause a bullet to spin as it passes through the barrel. Rifling leaves marks on a bullet that match the size, spacing, and angle of the grooves, as shown in Figure 17. The marks help narrow down the list of possible weapons. A gun barrel also has tiny nicks and bumps. These flaws leave a unique pattern of scratches on the bullet.

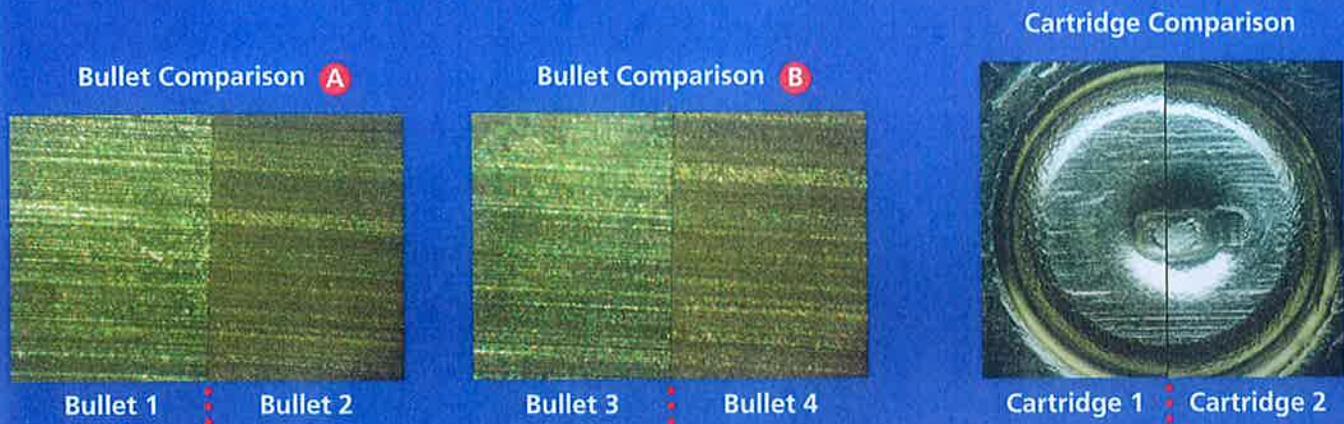
Evidence From Gunpowder Impressions are not the only physical evidence produced when a gun is fired. **Firing a gun leaves trace evidence on the person who fires the gun.** Often, some of the gunpowder and primer in a cartridge does not burn. This material is called **gunshot residue**. As the residue sprays out of the barrel and trigger hole, some lands on the hands, face, and clothes of the person who fires the gun. If the gun is close to the victim, some residue lands on the victim.

A CSI can use a swab or tape to collect gunshot residue from a person's hands. The residue is fairly easy to wash or wipe off. So a CSI will also look for traces on a suspect's clothes.



Reading Checkpoint

What causes a bullet to spin inside a gun barrel?



Analyzing Firearms Evidence

A firearms analyst wants to identify the weapon used in a crime and the person who used the weapon. **Microscopes and chemical tests are used to check for gunshot residue. Microscopes and databases are used to compare impressions from firearms.**

Testing for Gunshot Residue Some particles in gunshot residue have a distinctive shape. When the particles are magnified with a scanning electron microscope, the shape is easy to see. A CSI uses tape to collect residue that will be magnified.

Gunshot residue contains traces of the chemical elements lead, barium, and antimony. There are chemical tests that can identify these elements. A CSI uses swabs to collect residue that will be tested chemically.

Testing a Firearm To figure out if a gun was used in a crime, an analyst needs a bullet to compare with one from the crime scene. So she uses the gun to fire a bullet. The bullet is fired into water or a gel so it is not damaged.

The analyst compares the rifling on the test bullet with a bullet from the crime scene. If the rifling matches, she has the right type of gun. But does she have the actual gun that was used? To find out, she must take a closer look at the bullets.

Using a comparison microscope, an analyst can see if two bullets have the same pattern of scratches. If they do, the analyst has proof that a bullet from the crime scene was fired from the gun being tested. The microscope is also used to compare marks on cartridge cases, as shown in Figure 18. Those marks can also help to match a specific gun to a crime.

FIGURE 18

Comparing Impressions

When the images of two bullets or cartridge cases are lined up, an analyst can compare the marks made by a barrel or firing pin.

Drawing Conclusions Which pair of bullets was fired from the same gun? Explain your answer.



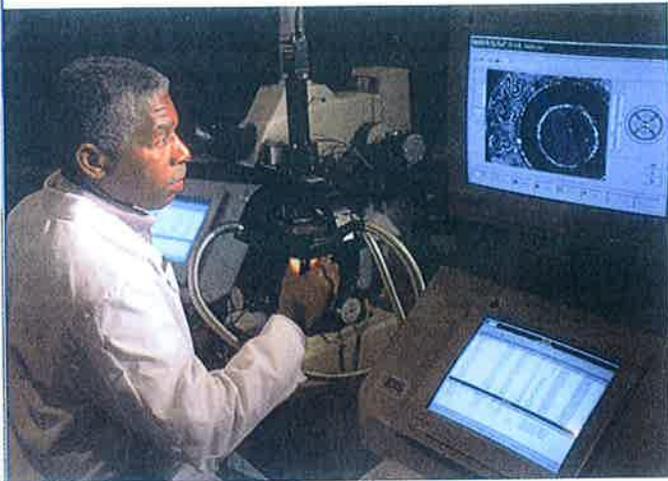


FIGURE 19
Using a Firearms Database
 This analyst is checking an image of a cartridge case that was found during a computer search.

Using Computer Databases What happens if the analyst doesn't have a gun to test? There is another way to use the evidence from the crime scene. A criminal may have used the gun before. If so, images of evidence from the previous crime may be stored in an online database. A technician can search the database to match firearms evidence from one crime to evidence from other crimes.

The FBI keeps a national database of firearms evidence. It has more than 900,000 images from crime scenes and test firings. A technician starts a search by scanning an image of a bullet or cartridge case. Then the software searches for a match. If a likely match is found, he uses a microscope to check the match. If he accepts the match, the system has a "hit." A hit is a link between two unrelated crimes.

Using a database saves time. A computer can do a search in minutes that might take an analyst months. When crime labs in different states use the same database, each lab has more data to compare with its data. So it is less likely that a criminal can avoid capture by simply moving from one place to another.



Reading Checkpoint

What kinds of images are stored in a firearms database?

Lesson 3 Assessment

Target Reading Skill Relating Cause and Effect Use the information in your graphic organizer about the effects of firing a gun to help you answer Question 1.

Reviewing Key Concepts

1. a. **Describing** How does trace evidence end up on the person who fires a gun?
 - b. **Comparing and Contrasting** Firing a gun leaves two types of marks on a bullet. How are these marks similar? How are they different?
 - c. **Making Generalizations** Why does a CSI record the location of bullets and cartridge cases at a crime scene?
2. a. **Describing** What are two tests that can be done to check for the presence of gunshot residue?

- b. **Sequencing** What steps does a firearms analyst use to figure out if a firearm was used in a crime?
- c. **Making Generalizations** What are two advantages of using a firearms database to match firearms evidence?

In the Community

Reducing Crime Some communities use "gun buy-back" programs to reduce crime. Interview a police officer to find out if your police department has such a program. If not, ask the officer to describe programs the police do use to reduce crime. Write a paragraph summarizing your research.