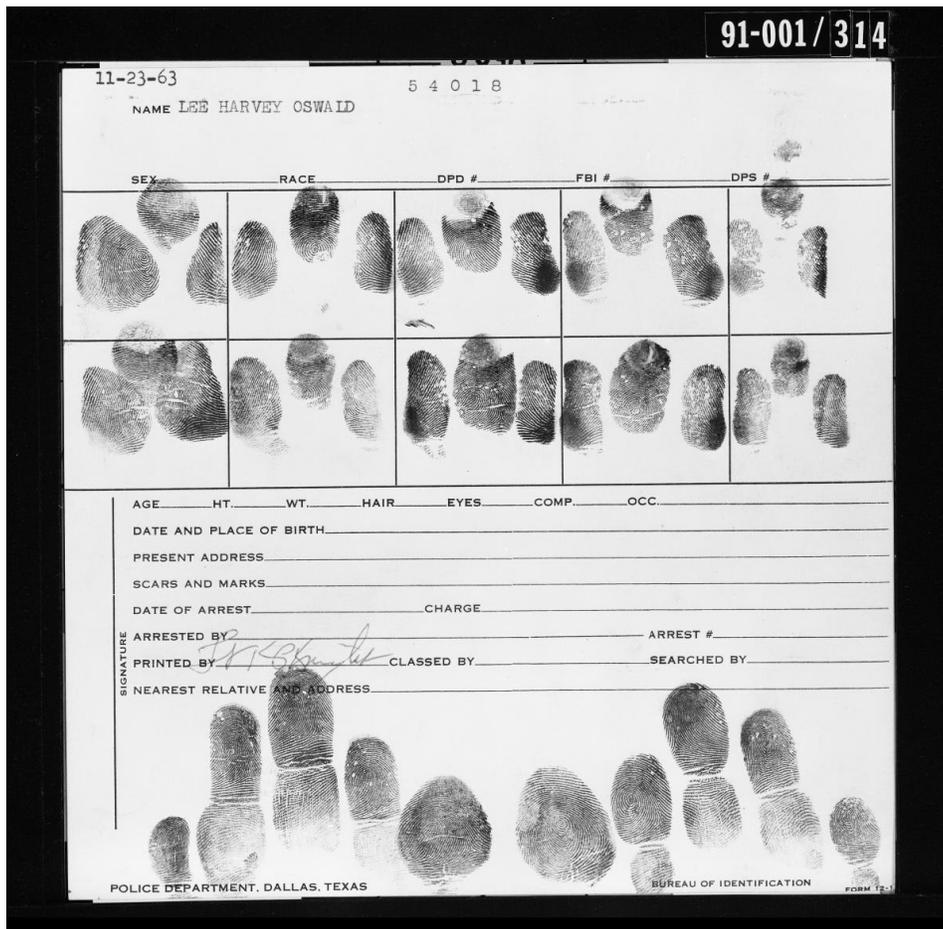


SIXTIES SCIENCE

FORENSICS: FINGERPRINTS AND DNA

Forensic science is the use of science and the scientific method to investigate crimes and evidence. Forensic investigations cover several topics including fingerprinting and DNA which are used to identify people using characteristics that are unique to each person. This *Sixties Science* lesson will show you how to collect and study fingerprints and extract DNA.



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NAME LEE HARVEY OSWALD

SEX _____ RACE _____ DPD # _____ FBI # _____ DPS # _____

AGE _____ HT. _____ WT. _____ HAIR _____ EYES _____ COMP. _____ OCC. _____

DATE AND PLACE OF BIRTH _____

PRESENT ADDRESS _____

SCARS AND MARKS _____

DATE OF ARREST _____ CHARGE _____

ARRESTED BY _____ ARREST # _____

PRINTED BY *J. H. [Signature]* CLASSIFIED BY _____ SEARCHED BY _____

SIGNATURE _____

NEAREST RELATIVE AND ADDRESS _____

POLICE DEPARTMENT, DALLAS, TEXAS BUREAU OF IDENTIFICATION FORM 12-1

Dallas (Tex.). Police Department. Fingerprint Card: Lee Harvey Oswald, photograph, 1963

Fingerprinting

In the 1870s Dr. Henry Faulds was working as a missionary in Japan sifting through pottery. During his work, he discovered that he could still see fingerprints from the people who created the pottery. When he returned to the hospital where he worked, Faulds asked his colleagues to provide their fingerprints for his research. He discovered that each of the fingerprints were unique. During his research he used fingerprinting to solve a small crime by using fingerprints left on a beaker to determine who was stealing alcohol from the hospital and drinking it. A few years later, Azizul Haque from Bengal, India, created a system for matching fingerprints using categories that helped identify unique markings for each fingerprint.

The use of fingerprint identification in court cases grew over the decades with police and investigators praising the new technique. In 1910 Thomas Jennings became the first defendant in a murder trial to be convicted using fingerprint evidence. Over the decades, fingerprinting has become less reliable as evidence in criminal investigations because there are no consistent standards across the country for determining a valid fingerprint. When a fingerprint is reviewed, results can vary from analyst to analyst. As a result, new forms of forensic identification have developed.

DNA Identification

Investigators began collecting and analyzing DNA samples from crime scenes in the mid-1980s. Alec Jeffreys, a genetics professor at the University of Leicester, used his research into patterns in someone's DNA to investigate the 1986 murder of a 15 year old girl. Police collected blood and saliva from more than 4,000 to be analyzed and compared with DNA collected at the crime scene. In 1987, Colin Pitchfork was arrested, convicted and sentenced based on the DNA evidence.

DNA identification is used in investigations today although it has its own issues. Slow processing times have been a problem that has improved over time as technology has improved. Successful identification of different people in a mixed DNA sample has also improved since it was first used. However, DNA identification cannot be used alone to prove or disprove a case. It has been used many times in recent years to help set people free who were wrongly convicted.

Forensics and the Assassination of President Kennedy

After the assassination of President Kennedy, Dallas Police Lt. Carl Day, head of the Dallas Police Crime Scene Search Unit, conducted an examination of the rifle and fingerprint evidence at the Texas School Book Depository. As part of his investigation, he was responsible for looking for fingerprints on a rifle discovered at the Texas School Book Depository building on November 22, 1963. In 2006 he donated his original crime lab supplies and equipment to the Museum. He is pictured here in front of the Texas School Book Depository building with the rifle discovered on the sixth floor on November 22, 1963.



Dallas Times Herald Collection / The Sixth Floor Museum at Dealey Plaza

Experiments

Lifting Fingerprints Experiment

Materials:

Glass cup
Glue stick
Cocoa Powder or Flour
Small soft bristled brush such as a paint brush or a makeup brush
Sheet of blank paper
Clear tape

Instructions:

1. Coat index fingertip on one hand with glue stick.
2. Place the side of your fingertip on the glass and roll the fingertip from one side to the other leaving a fingerprint on the glass.
3. Pour a small amount of cocoa powder or flour on top of the fingerprint, covering the entire print.
4. Using your soft-bristled brush, gently clear away the powder until all you have left is the coated fingerprint. Be careful not to scrape the fingerprint with the bristles of the brush.
5. Place a piece of clear tape on top of the coated fingerprint and gently press down on the fingerprint area to make the powder stick.
6. Remove the tape from the glass and attach it to the blank piece of paper.
7. Examine the fingerprint. Can you see the ridges?

Extension: Try using other materials to see if you can get a better fingerprint. Can you lift a fingerprint from fabric or metal? Is your fingerprint more visible if you use lotion or honey instead of glue stick?



Reading Fingerprints Experiment

Materials:

Washable ink pad or washable marker

Soap

Water

Towel

Personal Identification Form (Download at: bit.ly/TSFMFingerprint)

Instructions:

1. Complete the information at the top of the Personal Identification Form
2. Coat the tip of your right thumb with ink from the ink pad or marker.
3. Place the left side of your thumb on the left side of the box labeled 1. R. Thumb. Roll your thumb across the box to leave a print. Make sure you don't let your finger slip!
4. Repeat this with process making a fingerprint in each box.
5. After getting a print of each finger, wash your hands to remove all the ink.
6. Use the second page of the Personal Identification Form to see if your fingerprint is a loop, whorl, or arch pattern.

Extension 1: Have members of your family and friends create fingerprints and compare them to your own. How are they the same? How are they different?

Extension 2: Collect two sets of fingerprints from 3-4 people. Label each print on the back. Mix the prints and see if you can match each set without looking at the back.

DNA Experiment

How it works:

Using an extraction liquid of water, salt, and dishwashing liquid, you will release DNA from strawberries. The dishwashing liquid breaks open the strawberry cells to release the DNA and the salt helps the DNA to gather in clumps, making it visible. The cold rubbing alcohol pulled the DNA from the liquid, creating

Materials:

½ teaspoon salt
1 tablespoon dishwashing liquid
1/3 cup water
3 strawberries, stems removed
Sealable plastic bag (sandwich or gallon size)
½ cup Rubbing alcohol (chilled in freezer)
3 drinking cups – at least one must be glass
1 small strainer

Instructions:

1. Place rubbing alcohol in the freezer.
2. Mix water, dishwashing liquid and salt together in a drinking cup until salt is completely dissolved. This will be your extraction liquid.
3. Place strawberries into the large plastic bag. Remove excess air and seal. Smash the strawberries for two minutes until all large pieces are broken down.
4. Open the bag and add the extraction liquid. Remove all excess air and reseal. Mix the strawberries and extraction liquid inside the bag for one minute.
5. Place the strainer on top of an empty drinking cup and pour the strawberry liquid into the strainer. Using the back of a spoon, smash the strawberries in the strainer until the liquid is in the glass. Do not let the solid pieces of strawberry get into the liquid.
6. Pour the strained strawberry liquid from the drinking cup into the glass drinking cup.
7. Tilt the drinking cup with the strawberry liquid and gently pour the rubbing alcohol into the side of the glass. Slowly pour all the rubbing alcohol into the glass making sure it does not mix with the strawberry mixture.
8. Set the glass on a flat surface and observe the liquid. You will see white strands forming in the clear rubbing alcohol on top of the strawberry mixture. This is the strawberries' DNA. Using tweezers or the end of a spoon, you can gently remove the DNA strands for closer observation.

Extension: Try this experiment using other foods such as kiwi, banana, red onion, or oatmeal.

Learn More:

American Academy of Forensic Sciences

aafs.org

Crime Museum

Crime Library – Forensic Investigation

crimemuseum.org/crime-library/forensic-investigation

Information on Forensic Science and different disciplines, evidence, and famous investigators.

CSI: The Experience – Web Adventures

forensics.rice.edu/en/For-Educators/Cool-Links.html

Information on several types of forensic analysis and careers in forensics.