Identify each fingerprint pattern.

A

Left Hand

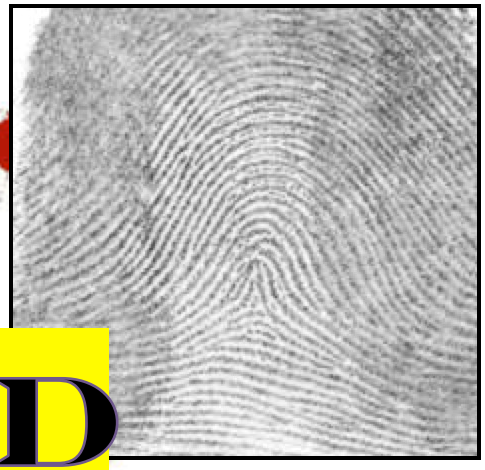
?

B

Right Hand

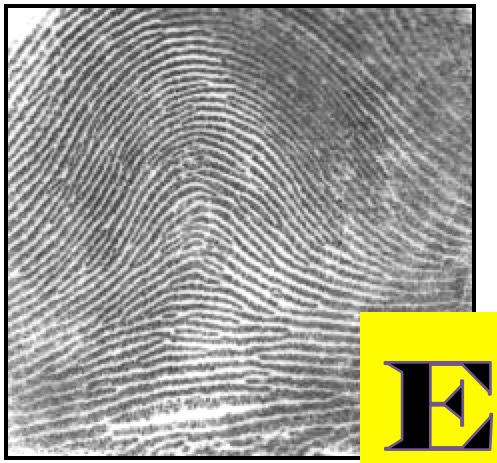
C

Right Hand



D

Right Hand



E

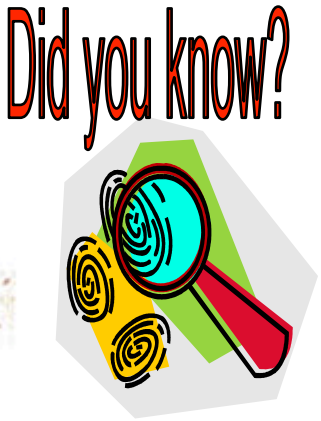
Left Hand

CHARACTERISTICS OF FINGERPRINTS

- Basic patterns can be further divided:
  - Arch patterns can be plain (4%) or tented (1%).
  - Whorl patterns can be central pocket (2%), double loop (4%), or accidental (0.01%).
- Even twins have unique fingerprints due to small differences (called *minutiae*) in the ridge patterns.

RIDEGEOLOGY

Ridgeology: The study of the uniqueness of friction **ridge** structures and their use for personal **identification**.



The koala is one of the few mammals (other than primates) that has fingerprints. In fact, koala fingerprints are remarkably similar to human fingerprints; even with an electron microscope, it can be quite difficult to distinguish between the two.

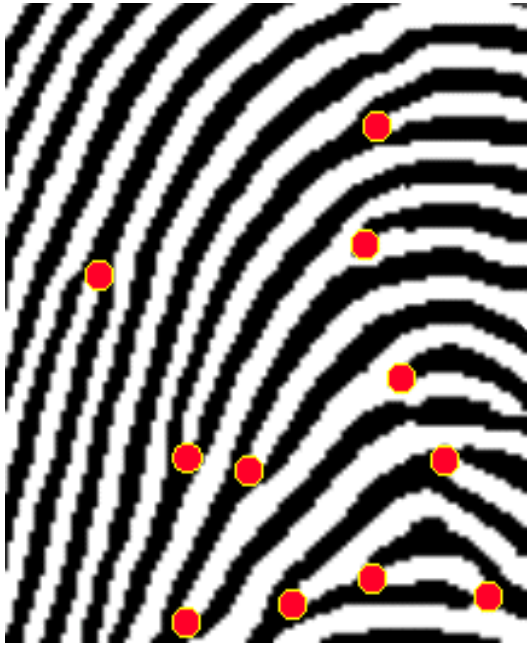
RIDGE CHARACTERISTICS

Minutiae:

- Points where print ridges come together or end
  - Minutiae points considered to be the “uniqueness” of an individual
  - FBI have found that no two individuals have more than 8 common “Points”

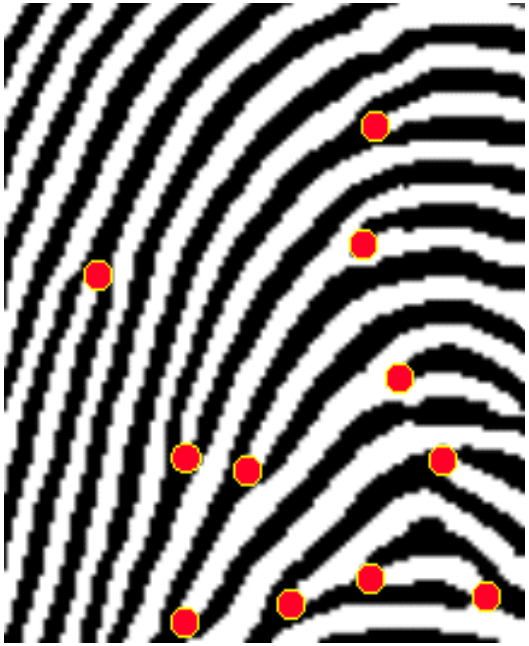
RIDEGEOLOGY

- As we have learned in our first lesson, a fingerprint is made of a series of **ridges** and **valleys** on the surface of the finger.
- The uniqueness of a fingerprint can be determined by the **pattern** of ridges and valleys as well as the **minutiae** points, ***which are points where the ridge structure changes***.

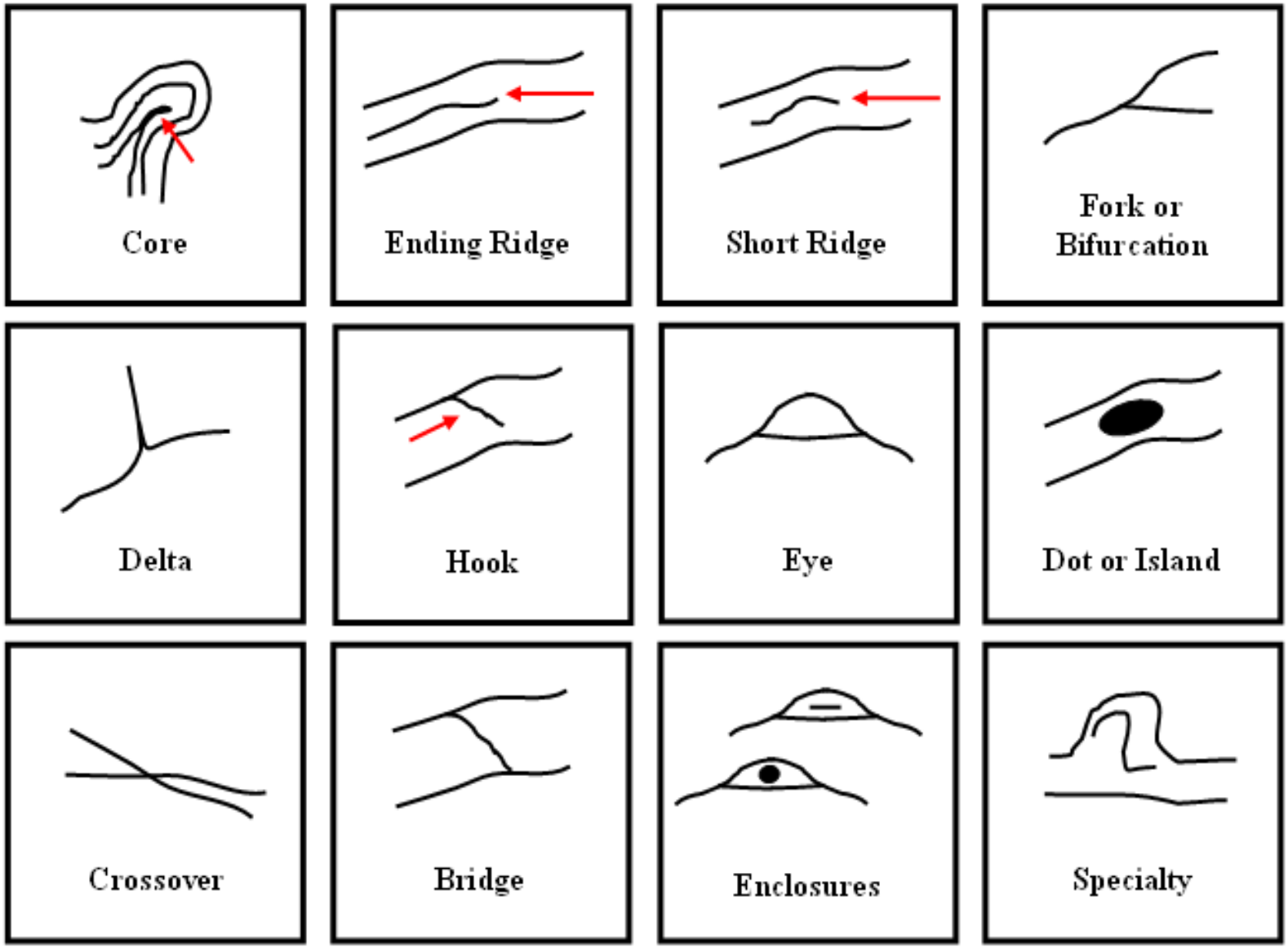


RIDEGEOLOGY

- When minutiae on two different prints match, these are called points of **similarity** or points of **identification**.
- At this point there is **no** international standard for the number of points of identification required for a match between two fingerprints.
- However, the United Kingdom requires a minimum **sixteen** points while Australia requires **twelve**.

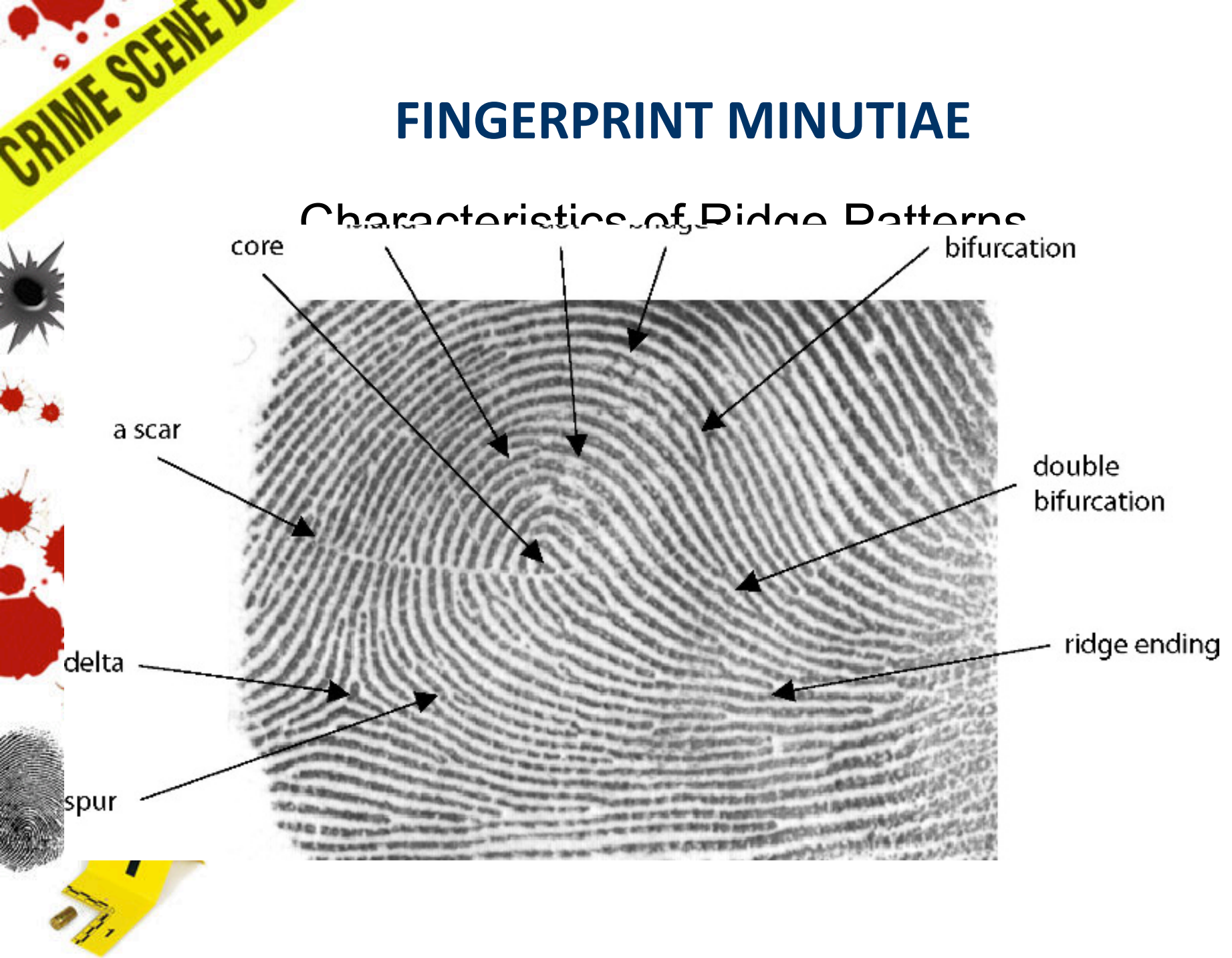


Ridge Characteristics

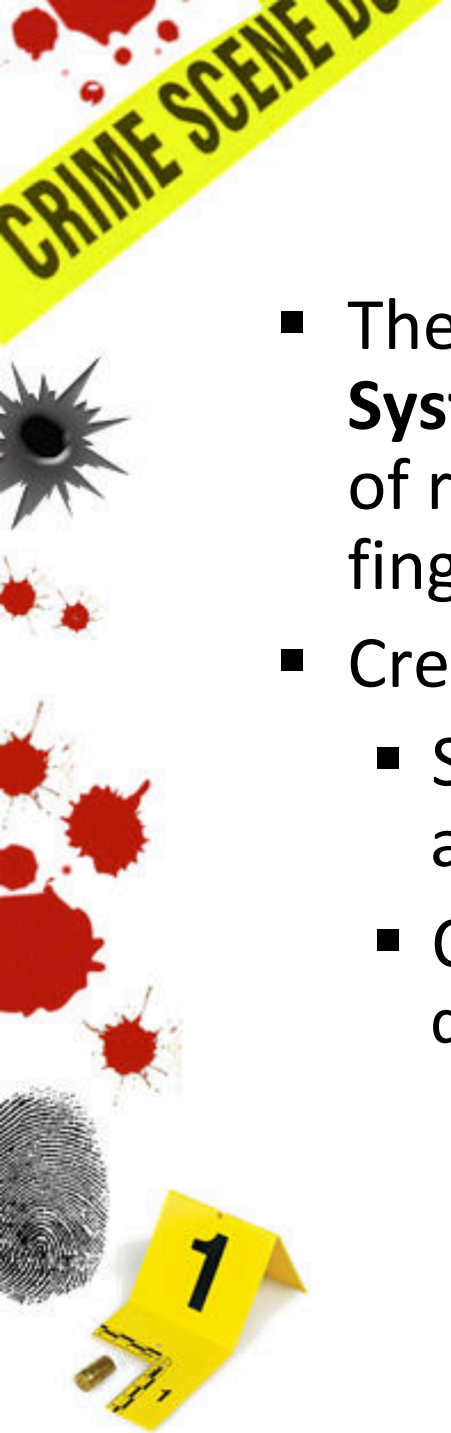


Use these characteristics as points of identification when comparing fingerprint samples. The more points you can find in common, the better the match!

FINGERPRINT MINUTIAE



RIDGE CHARACTERISTICS



AFIS

- The **Automated Fingerprint Identification System** (AFIS) is a computerized system capable of reading, classifying, matching, and storing fingerprints for criminal justice agencies.
- Created in the early 1970's to:
  - Search large files for a set of prints taken from an individual
  - Compare a single print, usually a latent print developed from a crime scene

AFIS

- Quality latent fingerprints are entered into the AFIS for a search for possible matches against the state maintained databases for fingerprint records to help establish the identity of unknown deceased persons or suspects in a criminal case.

AFIS

- The computer searches AFIS system and produces a list of fingerprints that match closest with the original print
- A fingerprint expert then examines the prints and makes a final verification on the print's identify

AFIS

- By the 1990's most large jurisdictions had their own system in place.
  - However, there was a problem: A person's fingerprints may be in one AFIS but not in others
- The solution was to create **IAFIS**
  - IAFIS is the FBI's Integrated Automated Fingerprint Identification System which is a ***national*** database of all fingerprint cards from all over the country

TYPES OF FINGERPRINTS

There are 3 types of prints that investigators look for at crime scenes:

1. **Patent fingerprints** are *visible* prints transferred onto smooth surfaces by blood or other liquids.

2. **Plastic fingerprints** are *indentations* left in soft materials such as clay or wax.

3. **Latent fingerprints** are *not visible* but made so by dusting with powders or the use of chemicals.

LATENT FINGERPRINTS

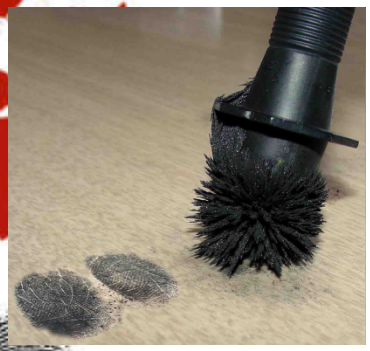
Latent prints are impressions left by friction ridge skin on a surface, such as a tool handle, glass, door, etc.

Prints may be collected by revealing them with a dusting of **black powder** and then lifted with a piece of **clear tape**.

Did you know? Camel hair is the most common animal hair used to make fingerprint brushes. Now many brushes (like the one above) are made out of fiberglass.

LATENT FINGERPRINTS

Some investigators use **fluorescent** powder and UV lights to help them find latent prints on multi-colored or dark surfaces.



Magnetic powder can also be used to reveal latent prints. This type of powder works better on **shiny** surfaces or **plastic** baggies or containers.

LATENT FINGERPRINTS

The **cyanoacrylate** fuming method *(often called the super glue method)* is a procedure that is used to develop latent fingerprints on a variety of objects.

Ninhydrin is a chemical that bonds with the amino acids in fingerprints and will produce a blue or purple color. It is used to lift prints from surfaces such as paper and cardboard.

Click the icon to view the Crime 360 Super Glue Video

LATENT FINGERPRINTS

- Latent fingerprints are those that are *not visible* to the naked eye.
- These prints consist of the natural secretions (oil, sweat, etc.) of human skin and require development for them to become visible.

DEVELOPING LATENT FINGERPRINTS

- Developing a print requires substances that interact with secretions that cause the print to stand out against its background.
- It may be necessary to attempt more than one technique, done in a particular order so as not to destroy the print.

  - **Powders**—adhere to both water and fatty deposits. Choose a color to contrast the background.
  - **Iodine**—fumes react with oils and fats to produce a temporary yellow brown reaction.

DEVELOPING LATENT FINGERPRINTS

- **Ninhydrin**—reacts with amino acids to produce a purple color.
- **Silver nitrate**—reacts with chloride to form silver chloride, a material which turns gray when exposed to light.
- **Cyanoacrylate**—"super glue" fumes react with water and other fingerprint constituents to form a hard, whitish deposit.

IODINE FINGERPRINTS

NINHYDRIN FINGERPRINTS

CYANOACRYLATE FINGERPRINTS

FINGERPRINT FAQ

- ***Can fingerprints be erased?***

  No. If, for example, they are removed with acids or chemicals, they will grow back. Scars on fingers make prints even more unique

- ***Is fingerprint identification reliable?***

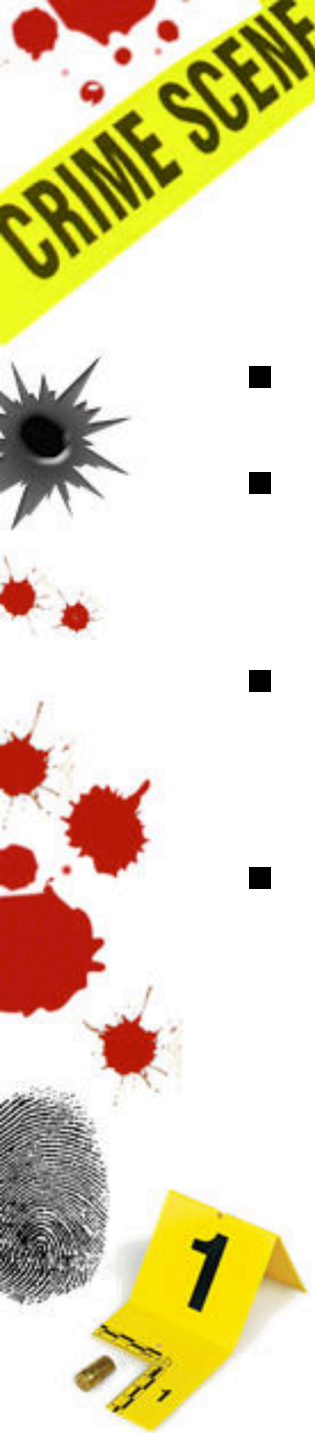
  Yes, but analysts can make mistakes.

- ***Is fingerprint matching carried out by computers in a matter of seconds?***

  No, but the FBI's Integrated Automated Fingerprint Identification System (IAFIS or AFIS) can provide a match in 2 hours for the prints in its Master File.

OTHER TYPES OF PRINTS

- **Ears**—shape, length and width
- **Voice**—electronic pulses measured on a spectrograph
- **Foot**—size of foot and toes; friction ridges on the foot
- **Shoes**—can be compared and identified by type of shoe, brand, size, year of purchase, and wear pattern.



OTHER TYPES OF PRINTS

Palm—friction ridges can be identified and may be used against suspects.

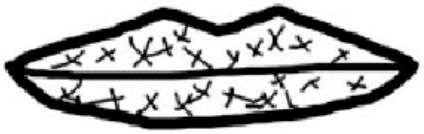
OTHER TYPES OF PRINTS

Footprints are take
birth as a means o
identification of
infants.

OTHER TYPES OF PRINTS

Lips—display several common patterns

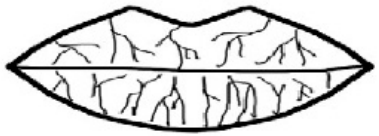
short vertical lines



crosshatching

- Short vertical lines
- Short horizontal lines
- Crosshatching
- Branching grooves

short horizontal lines



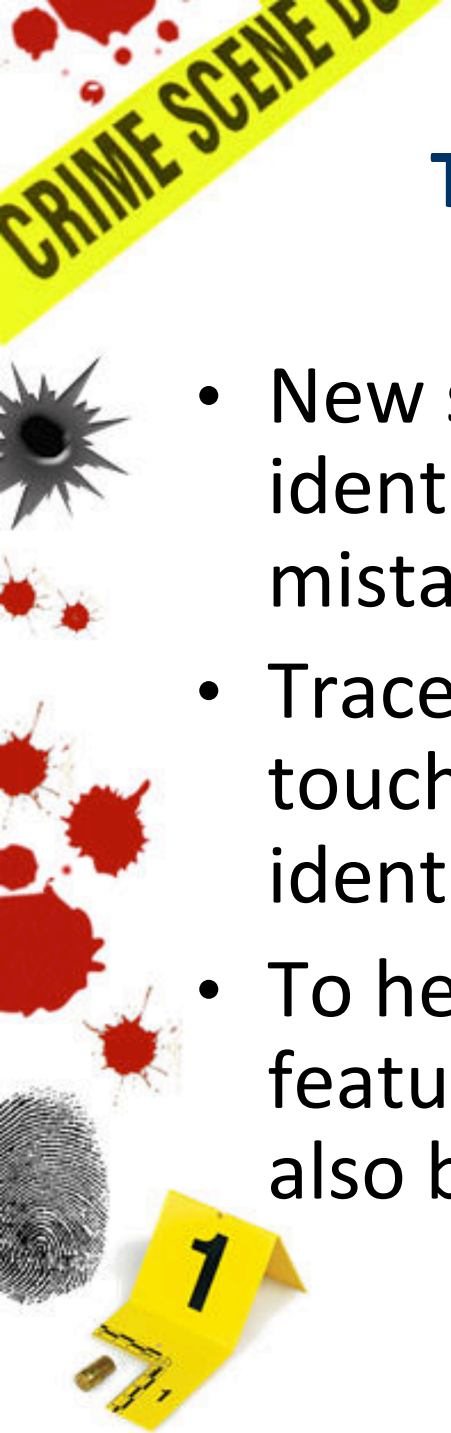
branching grooves

OTHER TYPES OF PRINTS

Teeth—bite marks are unique and can be used to identify suspects. These imprints were placed in gum and could be matched to crime scene evidence.

OTHER TYPES OF PRINTS

- The blood vessel patterns in the eye may be unique to individuals.
- They are used today for various security purposes.



THE FUTURE OF FINGERPRINTING

- New scanning technologies and digitally identifying patterns may eliminate analytical mistakes.
- Trace elements of objects that have been touched are being studied to help with the identification of individuals.
- To help with identification, other physical features such as eyes and facial patterns are also being studied.

SUMMARY

- Fingerprints have long been used for identification, and in the mid-1800s were recognized as unique to each person.
- Three main groups include arches, whorls, and loops.
- Basic analysis includes looking for cores, deltas, and making a ridge count.

SUMMARY

- Investigators search for patent, plastic, and latent prints.
- Dusting with powders or using special chemicals can make latent fingerprints visible.
- New developments may eliminate errors by analysts.

FINGERPRINT LAB

- Please follow all directions exactly!
- Be conservative of all supplies. Do not waste any of the powder!
- WARNING: Immature behavior in a lab setting will earn you a line in your agenda.

It's time to make some prints!

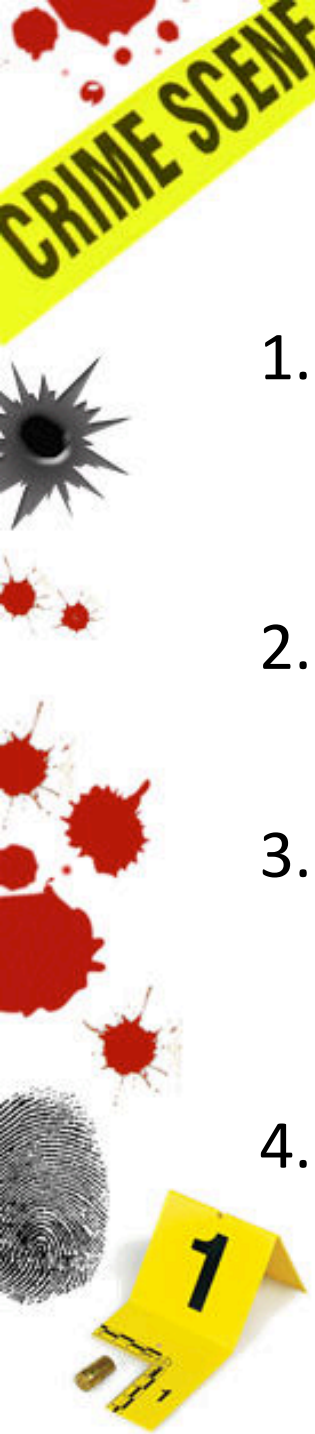
Avoid Partial Prints

GOOD PRINT

Get as much of the top part of your finger as possible!

DIRECTIONS

1. Roll the “pad” portion of your thumb over the ink pad from the left side of your thumb to the right. You do NOT have to push down really hard!
2. Roll the “pad” portion of your thumb from the left side of your thumb to the right in the correct box on your paper to make a thumbprint.
3. Continue this process to make a fingerprint of all ten fingers on the “My Prints” worksheet.
4. Use your notes and a magnifying lens to help you figure out what type of pattern is found in each of your fingerprints. Label each one with the pattern’s name.



DEVELOPING A LATENT PRINT

1. Cover your table with white butcher paper or newspaper. *Everything you dust MUST be placed on the paper!*
2. Get a lifting kit from your teacher that contains black powder, brushes, and clear tape.
3. Press the pad of your right thumb on a glass slide to make a print. Place the slide on the paper covering your table.
4. Dip a brush lightly into the container of black powder and then tap off the extra on the lid. You ONLY need a very small amount of powder to dust the print.

DEVELOPING A LATENT PRINT

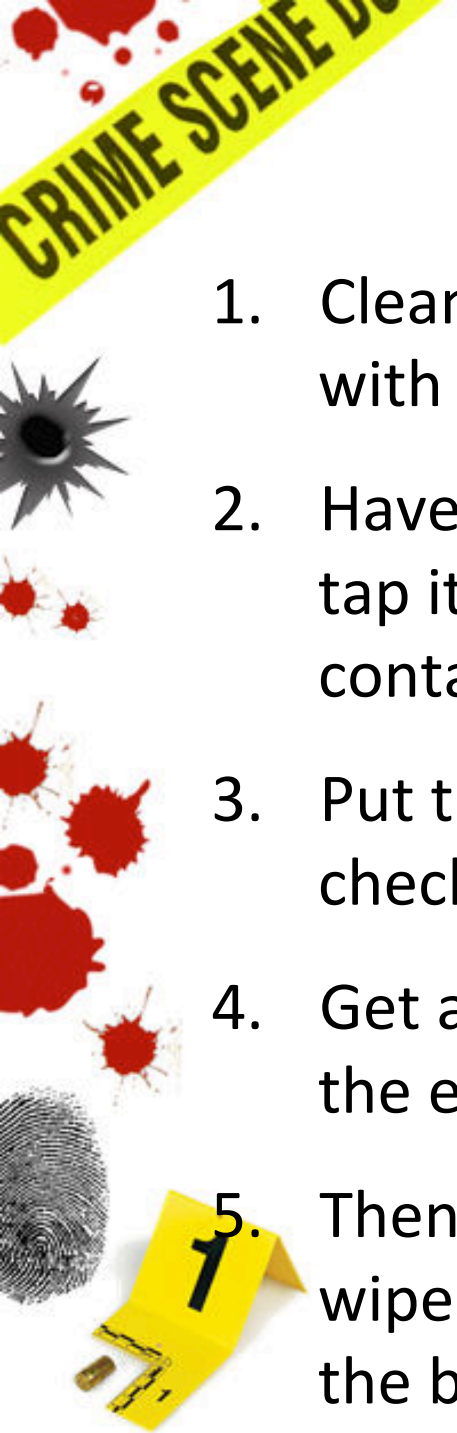
5. Using the fingerprint brush and black powder, GENTLY dust the fingerprint (use a circular motion). If you brush too hard, you will destroy the fingerprint.

6. Using a piece of clear tape, press and lift the print off of the surface.

7. Tape your latent print into your lab notebook.

8. Identify your print pattern as either a loop, arch or whorl.

CAUTION: The black powder will be messy and isn't easy to clean up. Don't dust anything without permission!



CLEAN UP YOUR AREA

1. Clean off the glass slides and put them back in the kit with the brushes and tape.
2. Have someone help you fold the paper in half and tap it to return the extra black powder to the container.
3. Put the black powder in the container and have it checked in by your teacher.
4. Get a DRY towel and wipe down the table, especially the edges that weren't covered with paper.
5. Then get a WET towel to wash off the table and then wipe it with some dry towels. Keep cleaning until all the black powder is off the table!