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- The SPO Virtual Classrooms offer many educational resources. These can include: lecture PowerPoints, practice test questions, review questions, video tutorials, sample assignments and course syllabi.
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- Several helpful links to fun and interactive learning tools are included on the Smart Links slide, near the end of the PowerPoint
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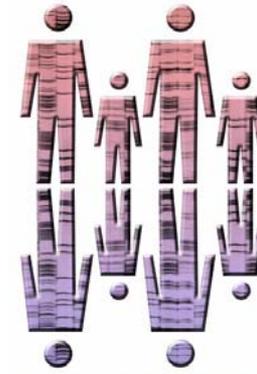
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Introduction to Anatomy and Physiology Lecture Series



Dizygotic (Fraternal) Twins. [Wikioedia.](#)



Monozygotic (Identical) Twins. [Wellcome Library.](#)

Why don't identical
twins have identical
fingerprints?

Fingerprint Anatomy and Physiology

Why don't identical twins have identical fingerprints?



Monozygotic twins. [Wikipedia](#).

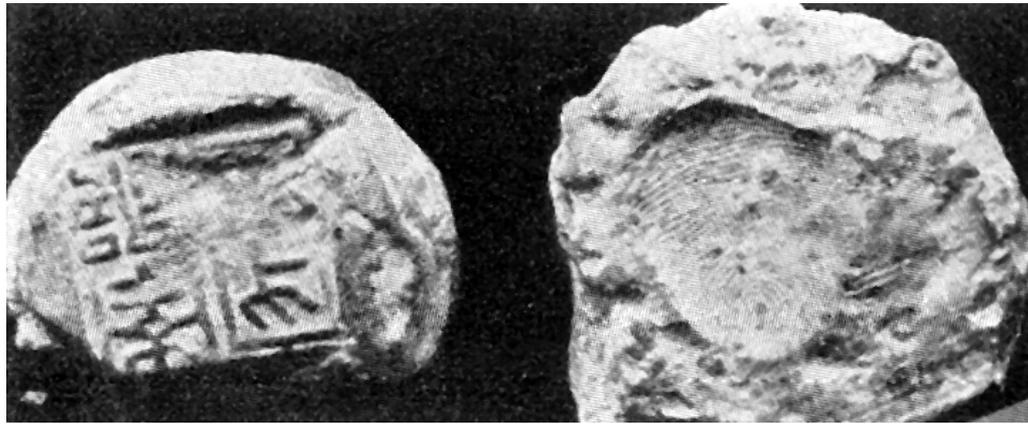
Even though monozygotic twins have the same **Genetic code** they do not have the same **ridge patterns** on their fingertips.



You can't tell identical twins apart with DNA fingerprinting but with old fashioned ink fingerprints you can. Why?



Fingerprint Anatomy and Physiology



13th Century BC Chinese fingerprint in clay tablets. Public Domain

- Ancient civilizations in China, Egypt and the Roman Empire used fingerprint identification for commerce.
- Alphonse Bertillion, a French police officer in the late 1800s collected many different measurements of the human body to see which could be used to identify individuals (Bertillion system)



Alphonse Bertillion (right). Public Domain



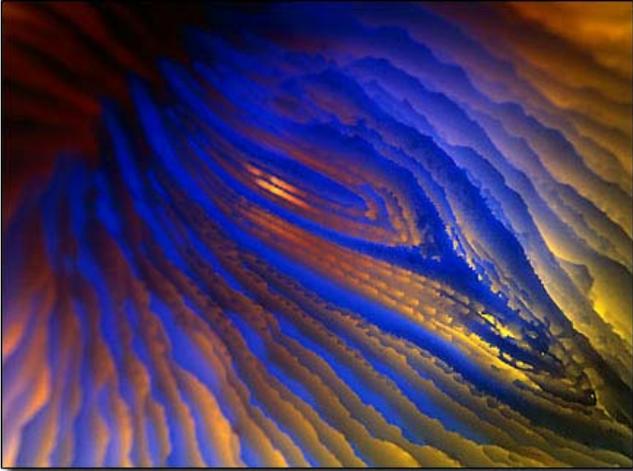
Sir Francis Galton (right). Public Domain

- Sir Francis Galton was the first Western scientist to publish a fingerprint analysis text in 1888.
- In 1897, Scotland Yard refined and adopted Galton's method of fingerprint analysis for solving crimes
- In the United States today, AFIS computer system (automated fingerprint analysis system) and technicians match fingerprints to a national database



AFIS system in use. US [FBI](https://www.fbi.gov/).

What are fingerprints?



Fingerprints can be **visible** or **latent**.

They are formed when secretions from *eccrine* glands in the skin are left behind by the **friction ridges** on the digits, palms or soles of feet.

Friction ridges are the raised portion of the **epidermis** on the *palmar* side of the hand.

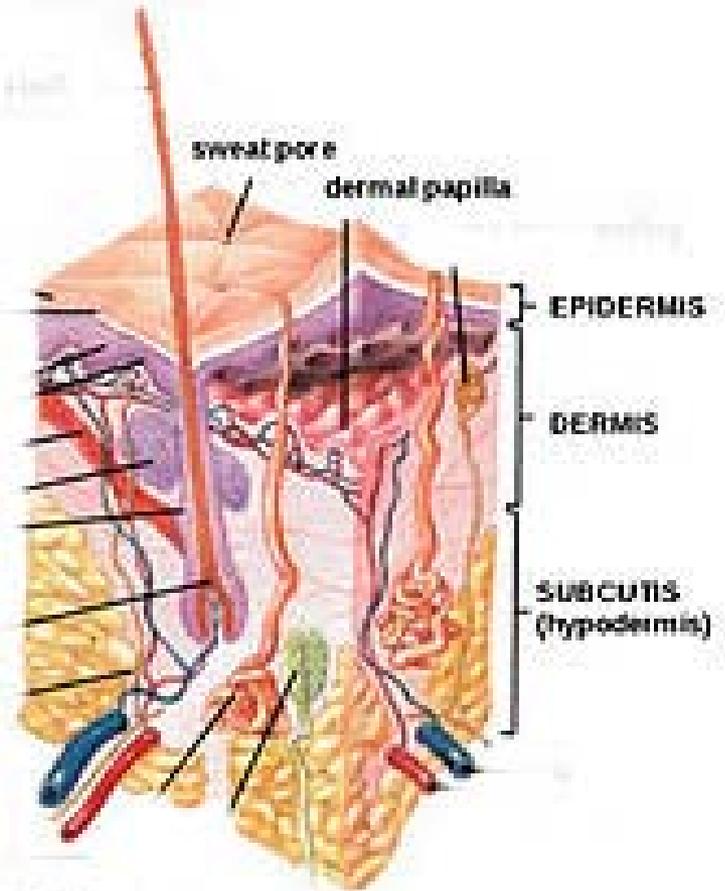
These friction ridges are formed by the **dermal papillae**.

Skin Structure and Fingerprints



The friction ridges are found on the surface of the **epidermis**.

The pattern of the **dermal papilla** forms the pattern of the **friction ridges**.



Fingerprint Anatomy and Physiology

How do fingerprints form?

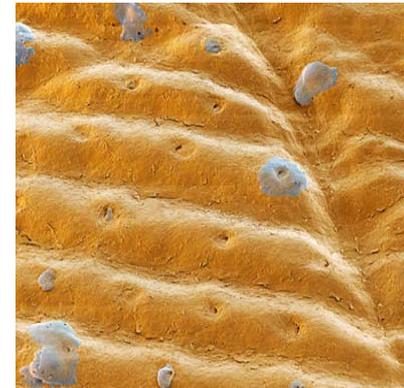


Volar pads begin forming during weeks **6-7** of *gestation*

Fetal volar pads. [Hand Research](#)



Friction ridges begin forming in random patterns during weeks **10-11** of *gestation*



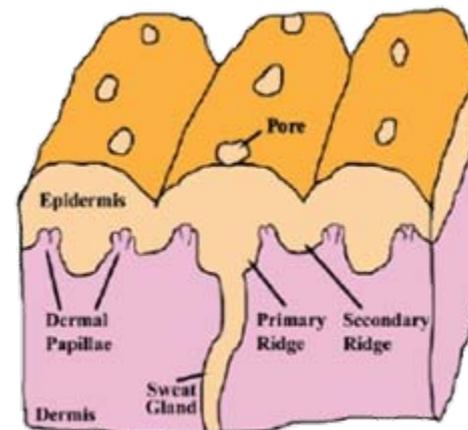
Sweat glands and pores begin forming during week **14-15** of *gestation*

Pores of Sweat glands. [Hand Facts.](#)



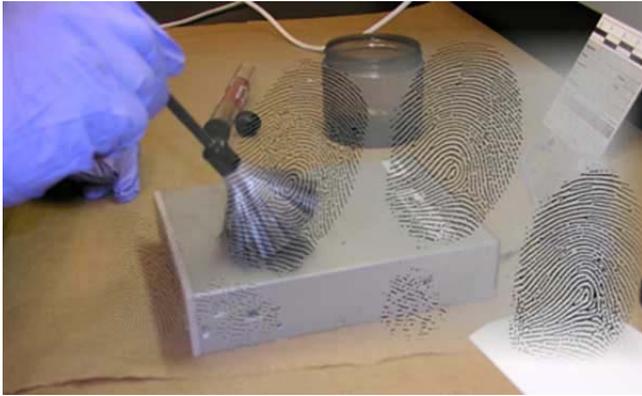
Friction ridge patterns do not change throughout a person's life.

From the Virtual Anatomy and Physiology classroom on [ScienceProfOnline.com](#)



Secondary friction ridges begin forming during weeks **17-24** of *gestation*

Collection of fingerprints from Crime Scenes



Latent print. [Douglas County Sheriif,CO](#)

These are found at the crime scene by **coating smooth surfaces** with select powders, **chemical development**, or **cyanocrilate fuming**.

These are **found at the scene** then collected and stored if possible.

Visible
Latent
Molded



Molded print. [USNPS](#).

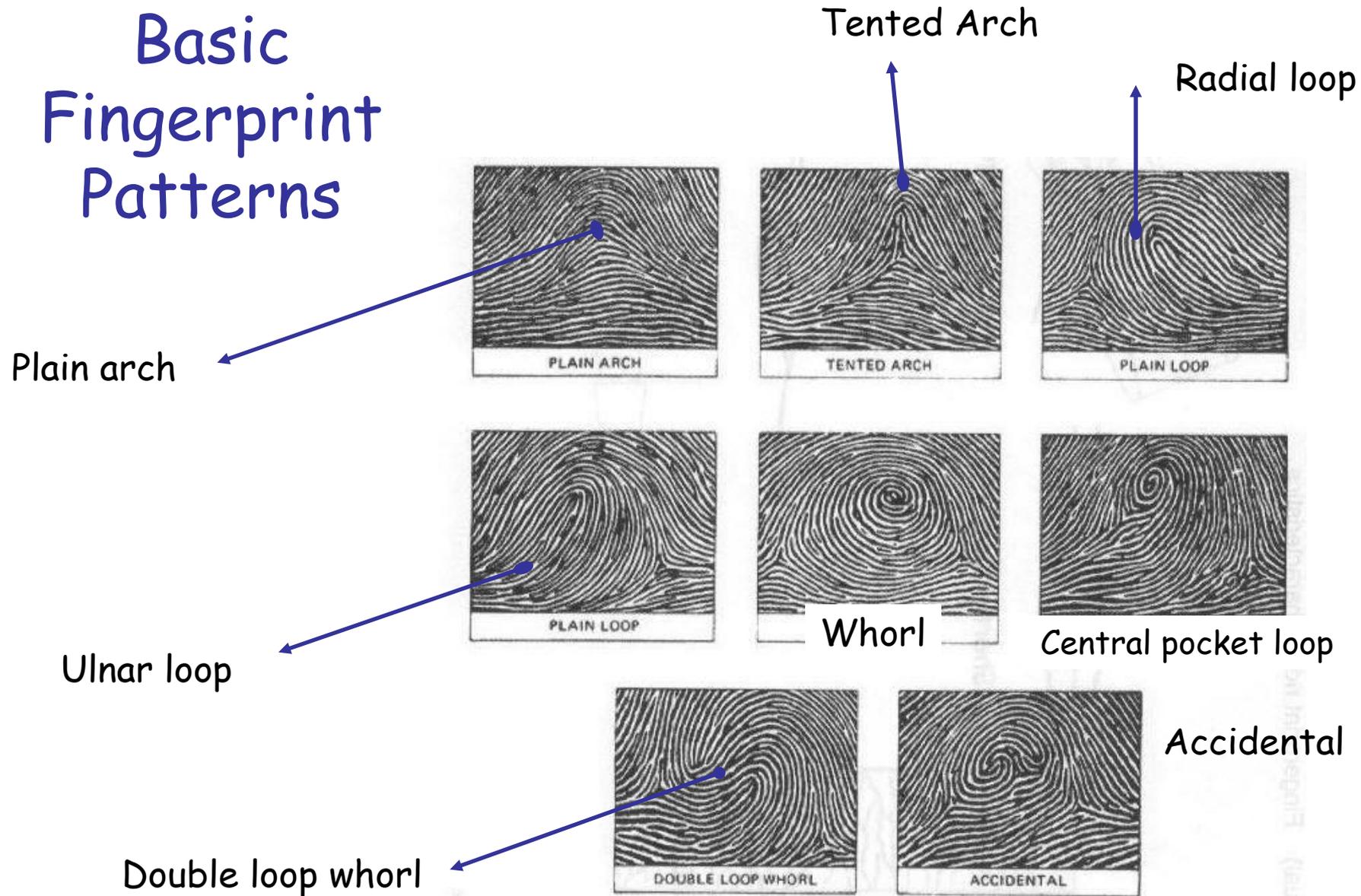


Visible print. [Wikicommons](#).

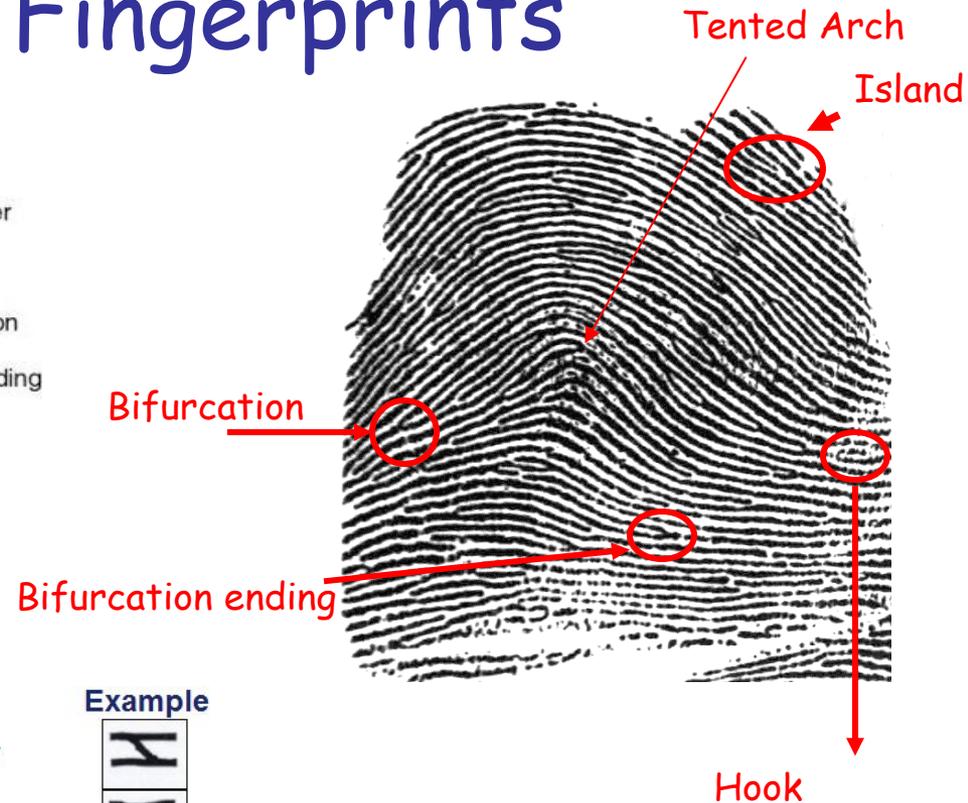
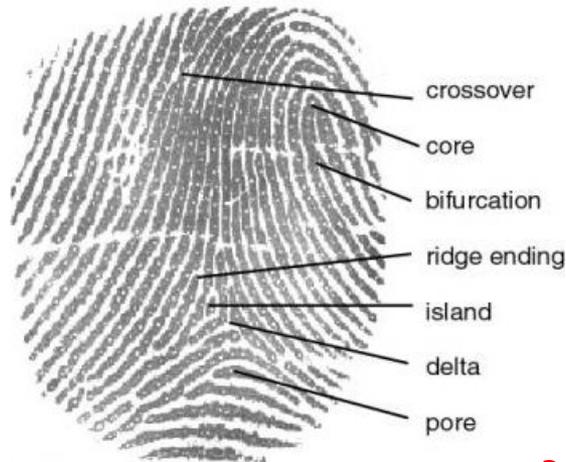
Casts of these are made at the crime scene and analyzed in the lab.

Fingerprint Anatomy and Physiology

Basic Fingerprint Patterns



Analysis of Fingerprints



| Minutiae | Example | Minutiae | Example |
|----------------------|---|----------------------------------|--|
| ridge ending | 1  | bridge | 7  |
| bifurcation | 2  | double bifurcation | 8  |
| dot | 3  | trifurcation | 9  |
| island (short ridge) | 4  | opposed bifurcations | 10  |
| lake (enclosure) | 5  | ridge crossing | 11  |
| hook (spur) | 6  | opposed bifurcation/ridge ending | 12  |

Can you analyze this print using the information to the right?

So, why don't identical twins have identical fingerprints?

Friction ridges form in random patterns during fetal development. The general pattern may be alike but no two people share the exact same fingerprint patterns. The **pattern is not inherited** so identical twins, who share the same DNA, will not have the same fingerprint pattern.





Smart Links

These links can help you review or learn more about this topic

- AFIS fingerprint system

<http://www.youtube.com/watch?v=ZKi1CKTRCQM>

- Friction Skin Growth

http://ridgesandfurrows.homestead.com/friction_skin.html

- Use of fingerprints in court

<http://forensiclaw.uslegal.com/evidentiary-value-of-fingerprint-analysis/>

(You must be in PPT slideshow view to click on links.)