

# The World of Fingerprints and Skin

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# Fingerprints

## 101

- One of the oldest and most used types of forensic evidence.
- Evidence of our presence that we leave on objects within our environment.
- Some of those fingerprints are nearly immediately erased or smeared over by the next person that encounters the same object, but other prints might linger indefinitely.
- Even though it has been around for a long time, fingerprint science still holds new.

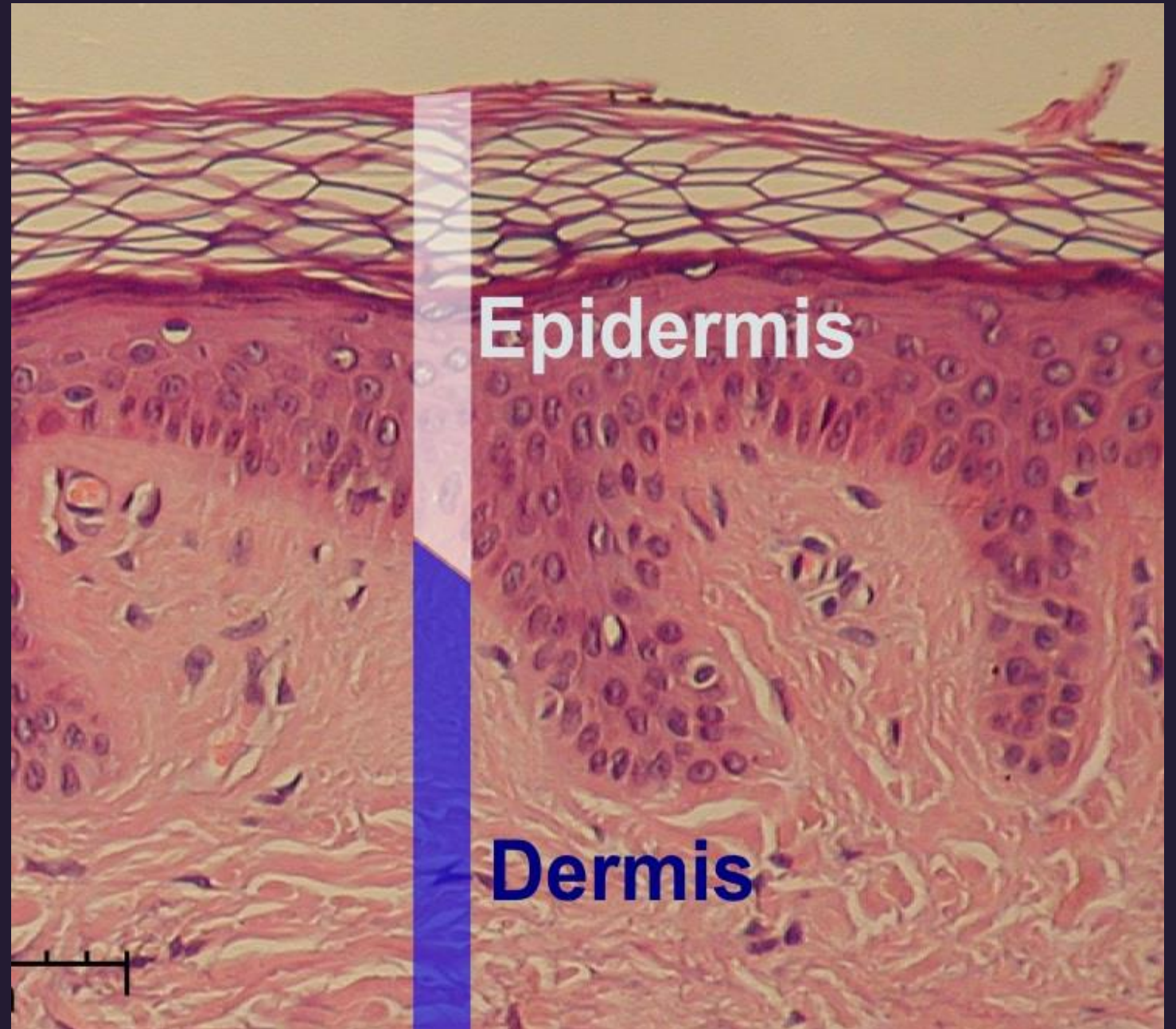
# FINGERPRINTS





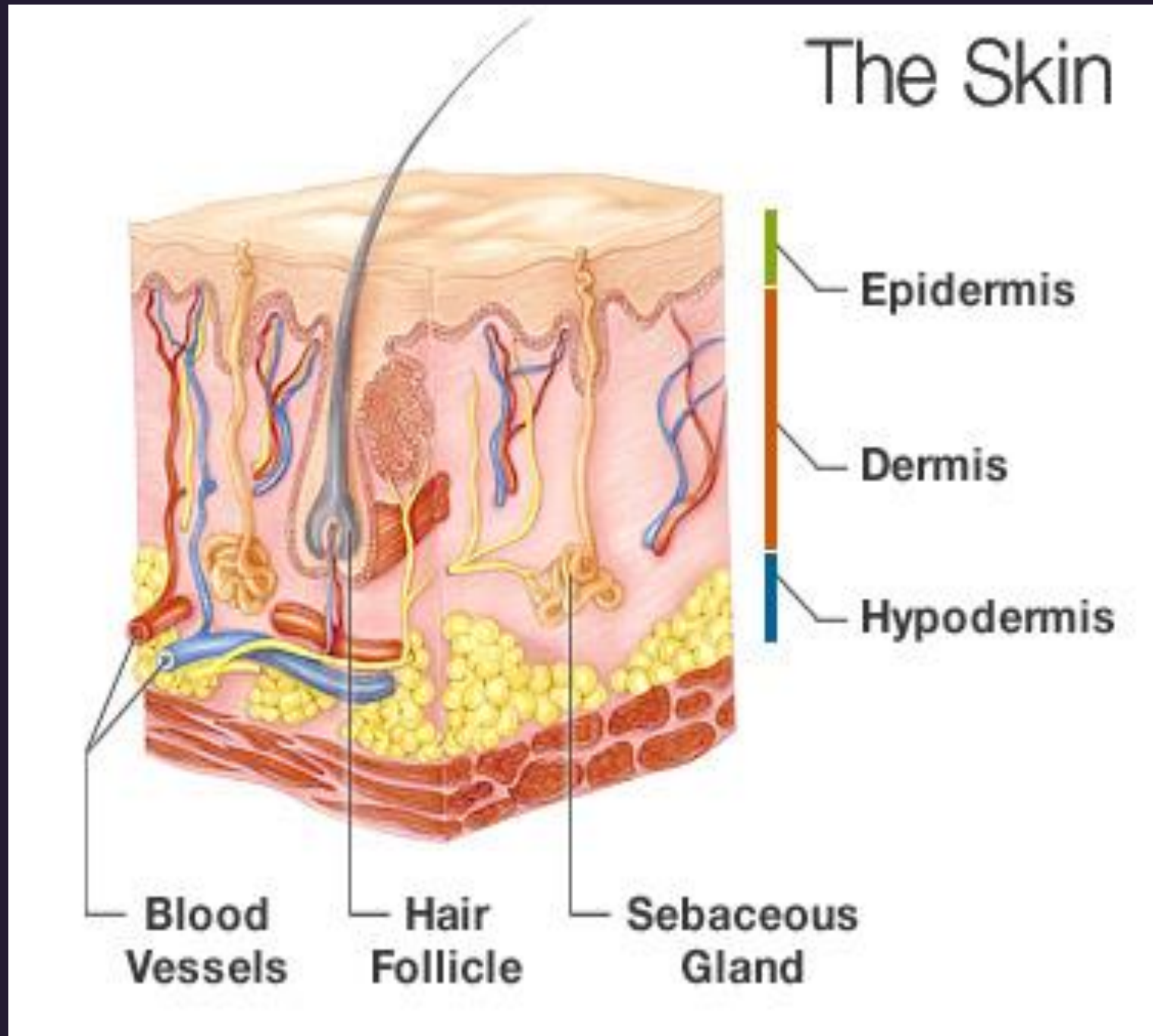
# The Epidermis & The Dermis

- The skin on vertebrate animals include fish, amphibians, reptiles, birds, and mammals—has 2 main layers: an outer layer called the epidermis and a deeper layer known as the dermis.
- The epidermis is made of tightly packed cells that form a barrier to the outside world,
- The dermis underneath has blood vessels, different kinds of glands, and other structures—such as scales, feathers, hairs, or nails—anchored in it.



# Thin Skin VS. Thick Skin

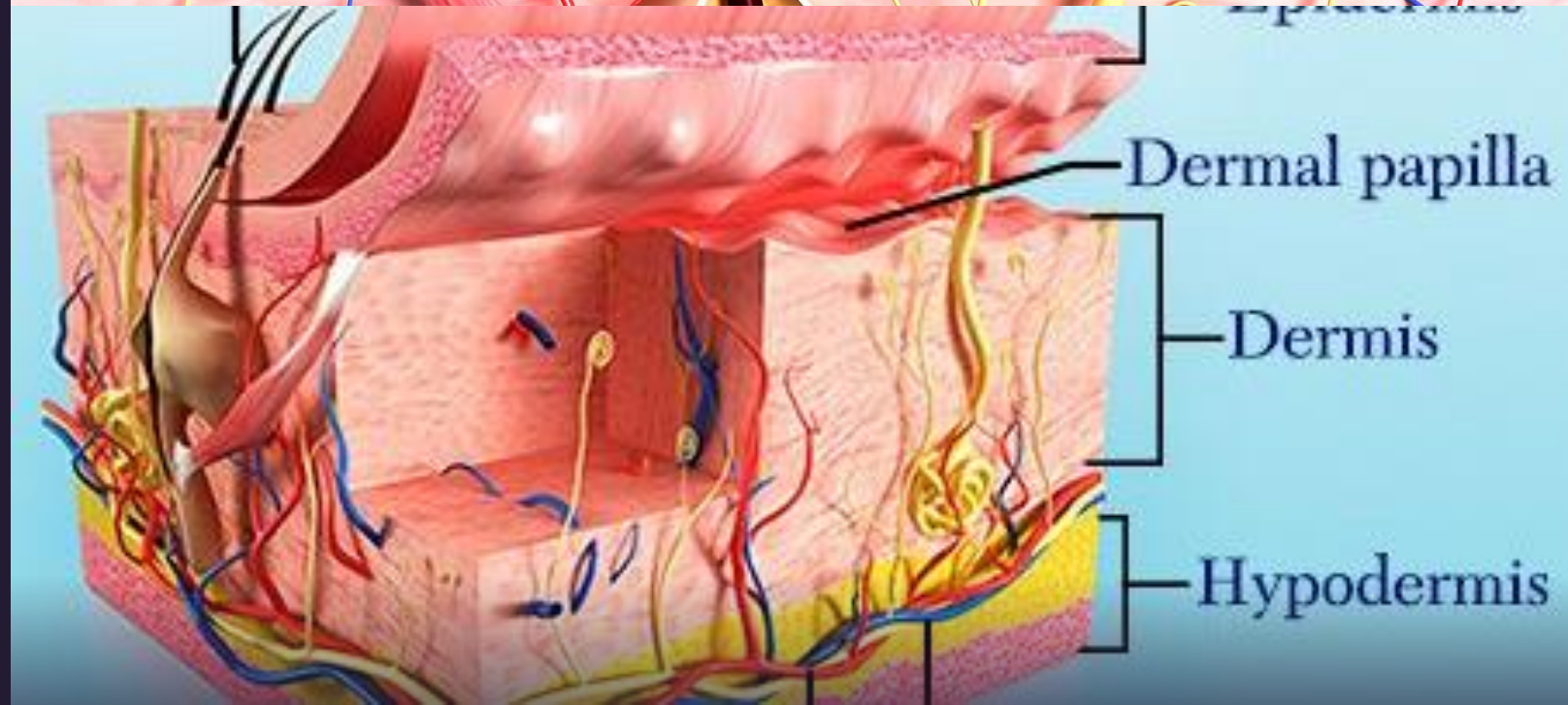
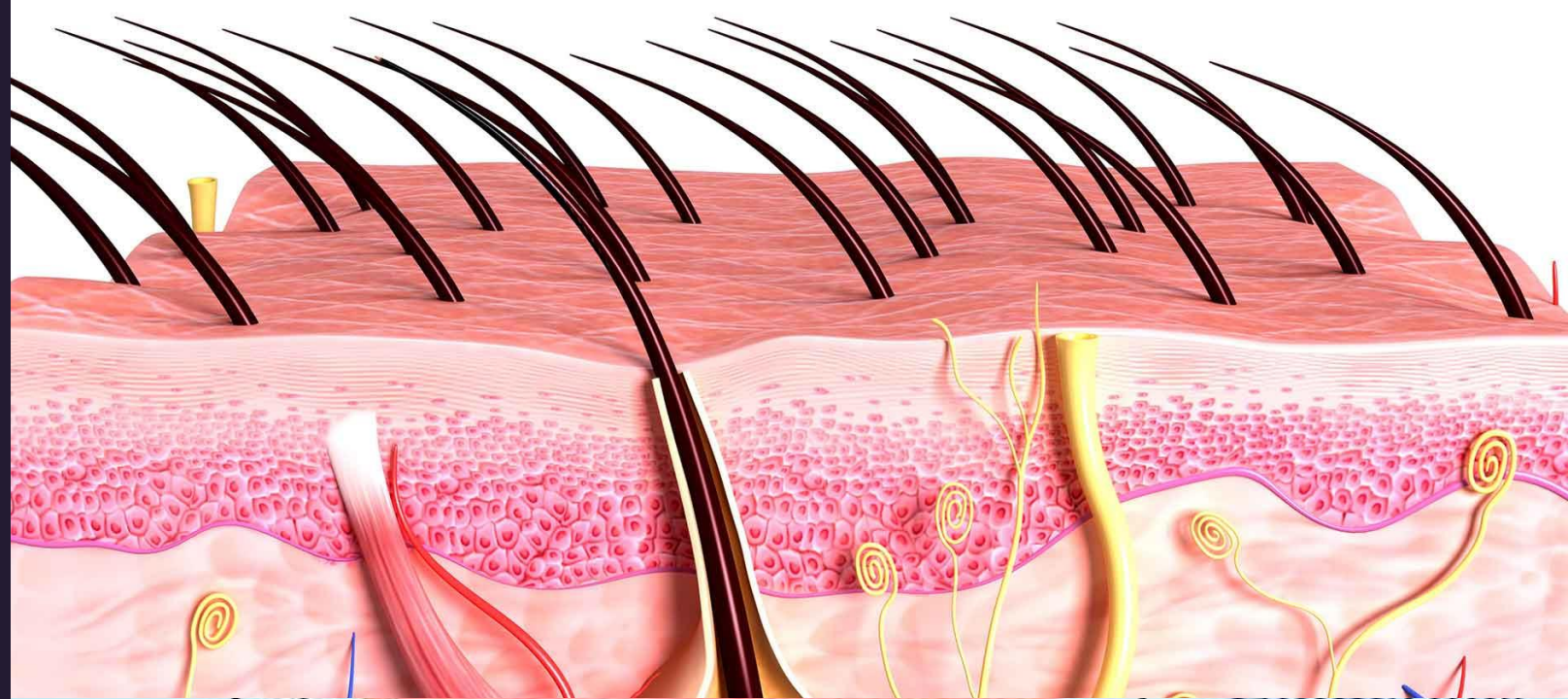
- All surfaces of the skin of humans and their fellow primates have the same epidermis-over-dermis pattern.
- When you consider the whole body, primate skin can be broken into 2 types: thin skin and thick skin.
- Thin skin has 4 main layers of epidermal cells and is found on body surfaces that bear hair follicles and oil glands.
- Thick skin has 5 main layers to its epidermis and is found only on the palms of the hands and soles of the feet, which are scientifically called palmar skin and plantar skin, respectively. Has many sweat glands but no hair follicles or oil glands.





# Palmar and Plantar Skin

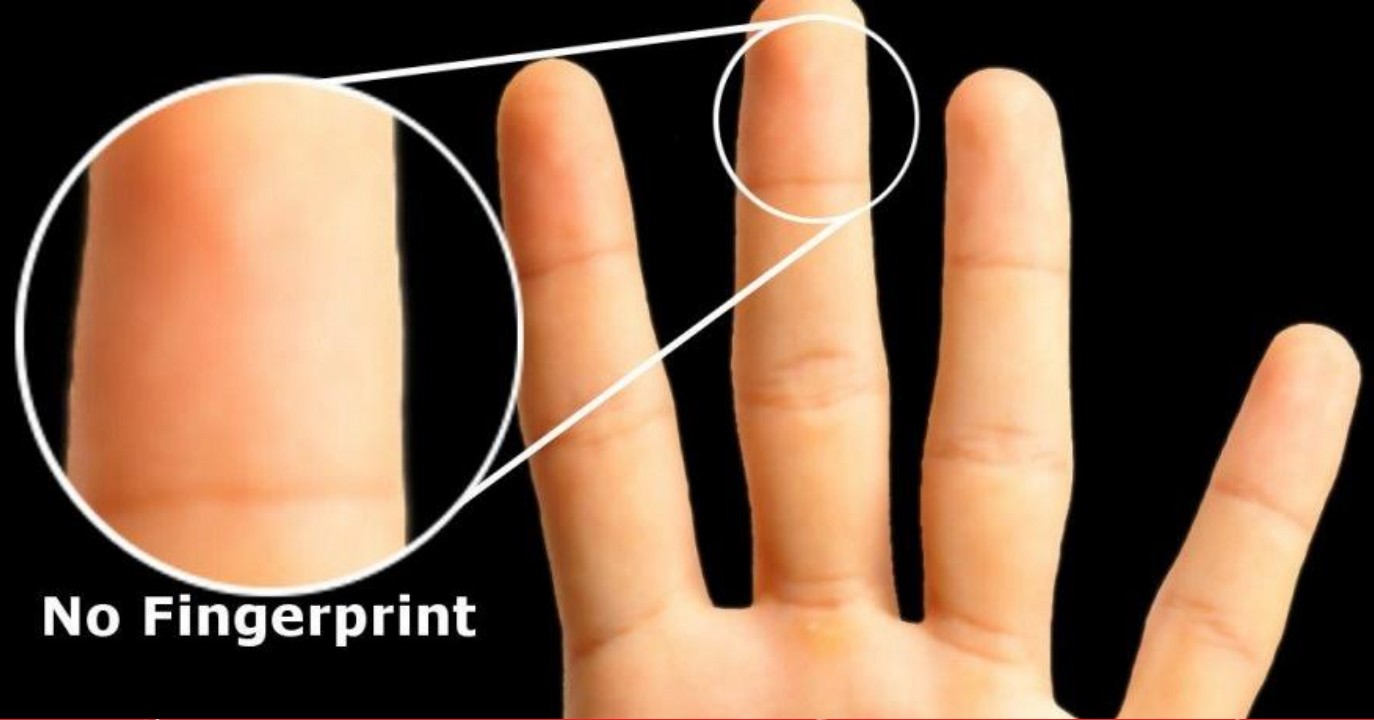
- Dermal Papillae- the interface between the epidermis and dermis has hills and valleys and project through to the epidermis.
- Dermatoglyphs- corresponding surface ridges on palmar and plantar skin.
- All primates have these friction ridges on the pads of their hands and feet; evolutionarily, they are assumed to help in gripping by increasing surface area for contact.
- Rich in sweat glands compared to all other body skin, but the sweat is watery and doesn't directly contribute much to the print.
- The water in sweat, though, becomes a vehicle to pick up other materials that get deposited in the print.





# Fingerprints, Cuts and Burns

- A fingerprint is really made by the junk that winds up in sweat and clings to the ridges on the skin. For Example: skin cells, body oil, dirt, and dust.
- Fact: After about 30 minutes of wearing latex gloves, fingerprints can even be laid down through the gloves.
- Chemical and thermal burns can destroy prints, but they will leave scars behind.
- Deep cuts into the dermis, whether intentional or not, will also leave scars. However, the scars that form can be even more distinctive than the original prints were.



# The Language of Fingerprints



- To compare and discuss fingerprints, scientists developed a common language to describe and classify the patterns of fingertips.
- The 3 major fingerprint classifications first used by Galton—arches, loops, and whorls—are still part of modern dactyloscopy, which is the examination and comparison of fingerprints.
- The part of a fingerprint that's categorized runs from the last joint on the palm side of each finger to its tip and then all the way to either side of the nail bed. In other words, there are sides to fingerprints— which is why fingertips are rolled from side to side when someone is fingerprinted.
- There are major and minor features to any fingerprint pattern, and arch, loop, and whorl are considered major features. These describe the overall pattern of the main ridges in a print, especially how they change direction.



# Arches, Loops and Whorls



**Loop**



**Whorl**



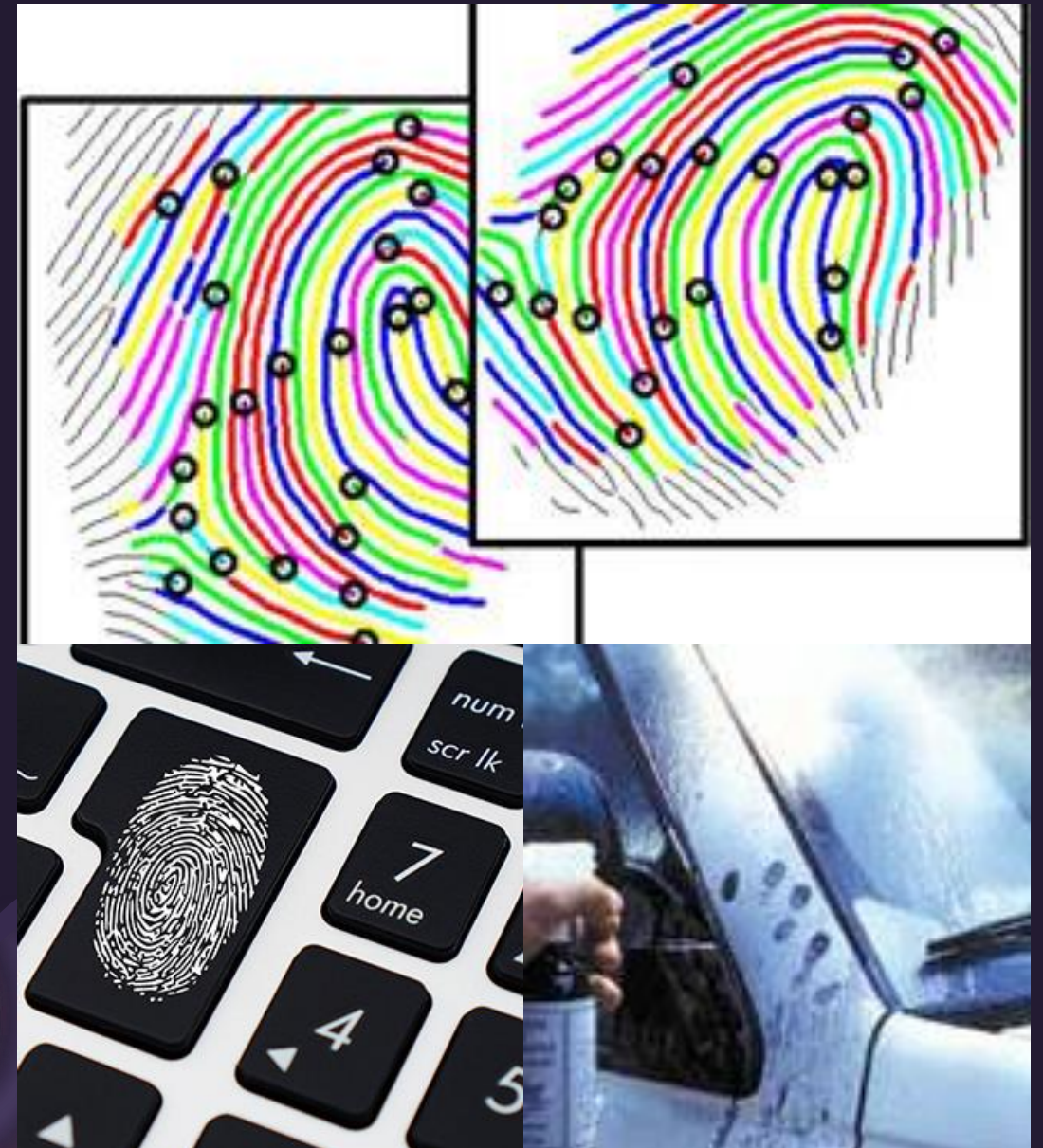
**Arch**

- Some of the 3 main categories are further broken down to give a total of 8 patterns. Smaller features within the major patterns are called minutiae, which add detail to the main pattern of a fingerprint and are behind the comparison science of dactyloscopy.
- There are plain and tented arches, which are differentiated because a tented arch has almost a vertical core.
- Loops are subclassified by the direction that they open in. If a loop opens in the direction of the pinkie finger, it's called an ulnar loop because the forearm bone on the little finger side is the ulna. If a loop opens in the direction of the thumb, it's called a radial loop because the forearm bone on the thumb side is the radius.
- Whorls are more complex and subdivide into 4 types: plain, central pocket, double loop, and accidental.



# Patent, Plastic, and Partial Prints

- **Patent:** can be seen with the unaided eye, made through the friction of skin touching blood, paint, ink, grease, mud, or any semiliquid substance followed by the transfer of that material to a dry surface, can be brought to the lab if they are seen on an object that is easily transported—such as a coffee mug, photo frame, or vehicle—but many crime scenes include prints on surfaces that are difficult or impossible to move—such as a plaster wall or 25-foot-long bank countertop. Collected using only photography
- **Plastic:** fingerprint impressions that are found on some types of soft materials like chewed gum and wet paint.
- **Partial:** could be any type—patent, latent, or plastic—but don't reflect a full fingertip. Most crime-scene prints are partial prints.



# Latent Prints

- Cannot be visualized with the unaided eye and, therefore, must be developed or enhanced with physical or chemical means.
- Must be treated in some way in order to make them visible.
- One way to find latent prints is by projecting ultraviolet light across a nonabsorbent surface where prints may be hidden. The residues in the fingerprints will reflect the UV light in a different way than the surfaces around them, so prints that can't be seen with the unaided eye might appear.
- Must be developed—usually by dusting or through some type of chemical enhancement. Regardless of how prints are developed, they still must be captured in some way as evidence.





Thank You For  
Your Time and  
Attention!

Questions and Comments

