What is today's objective?

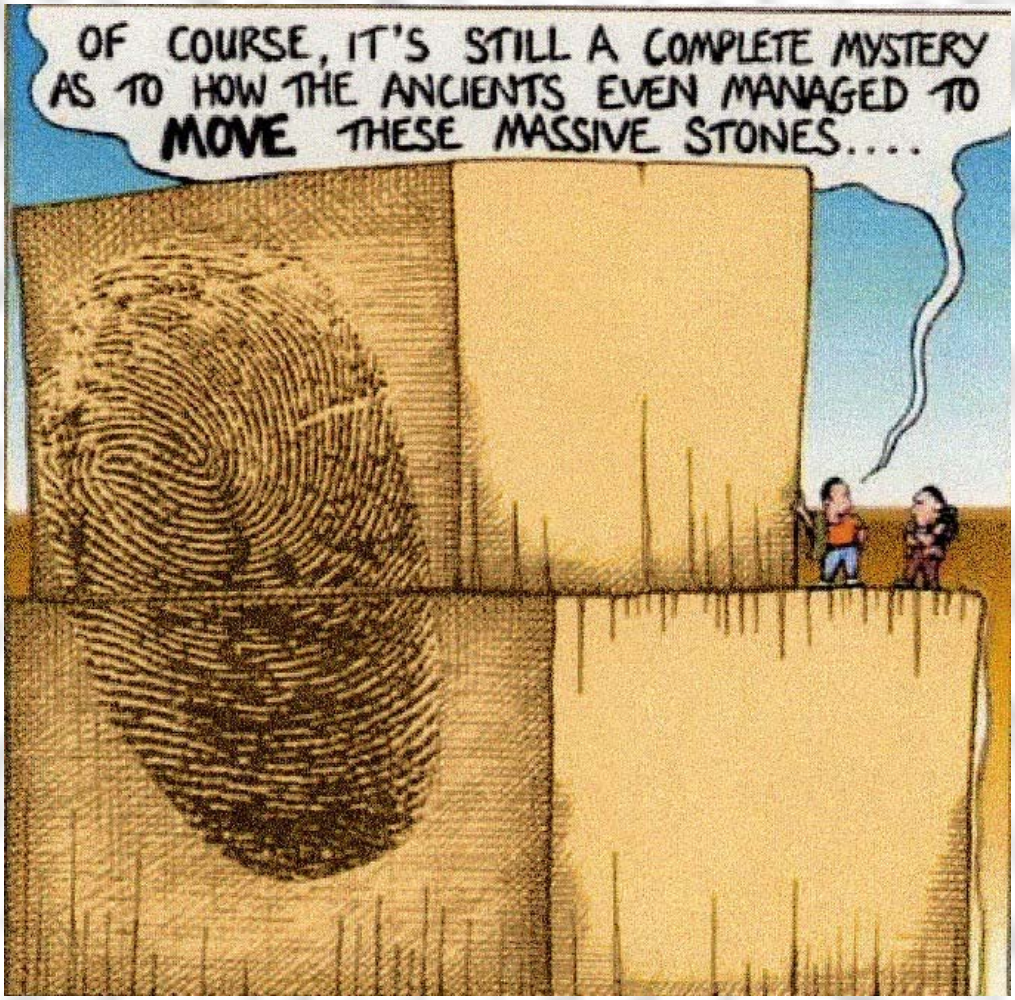
To understand the basics of fingerprints

FP BASICS

"Fingerprints can not lie,

but liars can make fingerprints."

—Unknown



HISTORY of FPs

- Dates bck to China **>2K yrs ago**
- Wasn't alwys stndrd prctce

- In **US**, 1st systmtc & official use of FP for **personal ID** was adopted by the NYC Civil Service Commission in **1901**

For yrs, scntsts used the **Bertillon System** (*aka* **anthropometry**) – records the dmnsns of crtn skltl body prts to ID

The West Case

But in **1903**, Leavenworth Federal Penitentiary (in KS) received a prisoner by the name of **Will West**

Will had almst the same Bertillon msrmnts as anthr prsnr serving a life sntnce for murder

Anthropometric measurements of "the two Will Wests" as reportedly recorded at Leavenworth, 1903.

Measurement	Head length	Head breadth	Middle finger	**Foot length**	Forearm length	Height	Little finger	Trunk	Arm span	Ear length	Cheek width
Will West	19.7	15.8	12.3	**28.2**	50.2	178.5	9.7	91.3	187.0	6.6	14.8
William West	19.8	15.9	12.2	**27.5**	50.3	177.5	9.6	91.3	188.0	6.6	14.8

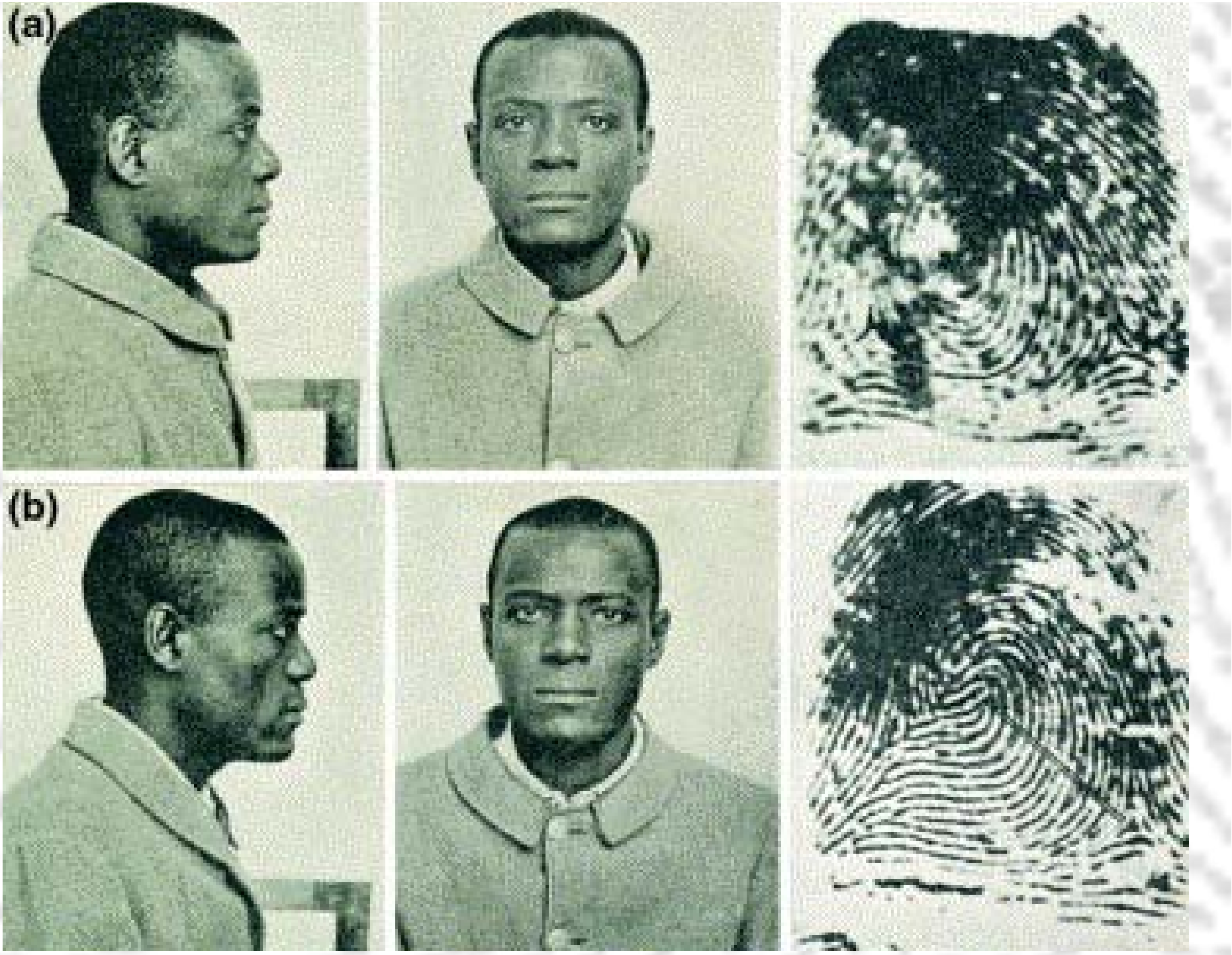
"From the Bertillon measurements thus obtained, [the record keeper] went to the file, and returned with the card the measurements called for, properly filled out...and bearing the name, "William West." This card was shown to the prisoner, who grinned in amazement, and said, "That's my picture, but I don't know where you got it, for I know I have never been here before." The record clerk turned the card over, and read the particulars there given, including the statements that this man was already a prisoner at the same institution, having been committed to a life sentence on September 9, 1901, for the crime of murder.

- Authors Harris Hawthorne Wilder and Bert Wentworth (1918)

The 2 unrltd crimnls also looked idntcl, had similar names, but FPs were dffrnt.

FPs were ~ the ONLY way they could dstngsh the 2 prisnrs

Thanks to this case, FP became the standard for personal ID


(a)
(b)

In 1948, the First Mass Fingerprinting Operation Snagged a Horrific Child Killer

Cheryl Eddy

Filed to: FORENSIC SCIENCE 10/20/15 1:11pm

25,973 14

What causes a FP?

- A fingerprint is a transferred pattern
- The fingerprint itself are the oils and sweat that have been released from your pores

- VIDEO: How Sweat Glands Work

  https://m.youtube.com/watch?v=KbgJ2BGdHUg

Fngrs, palms, soles of Hu & primates have **friction ridge skin**

On skin:

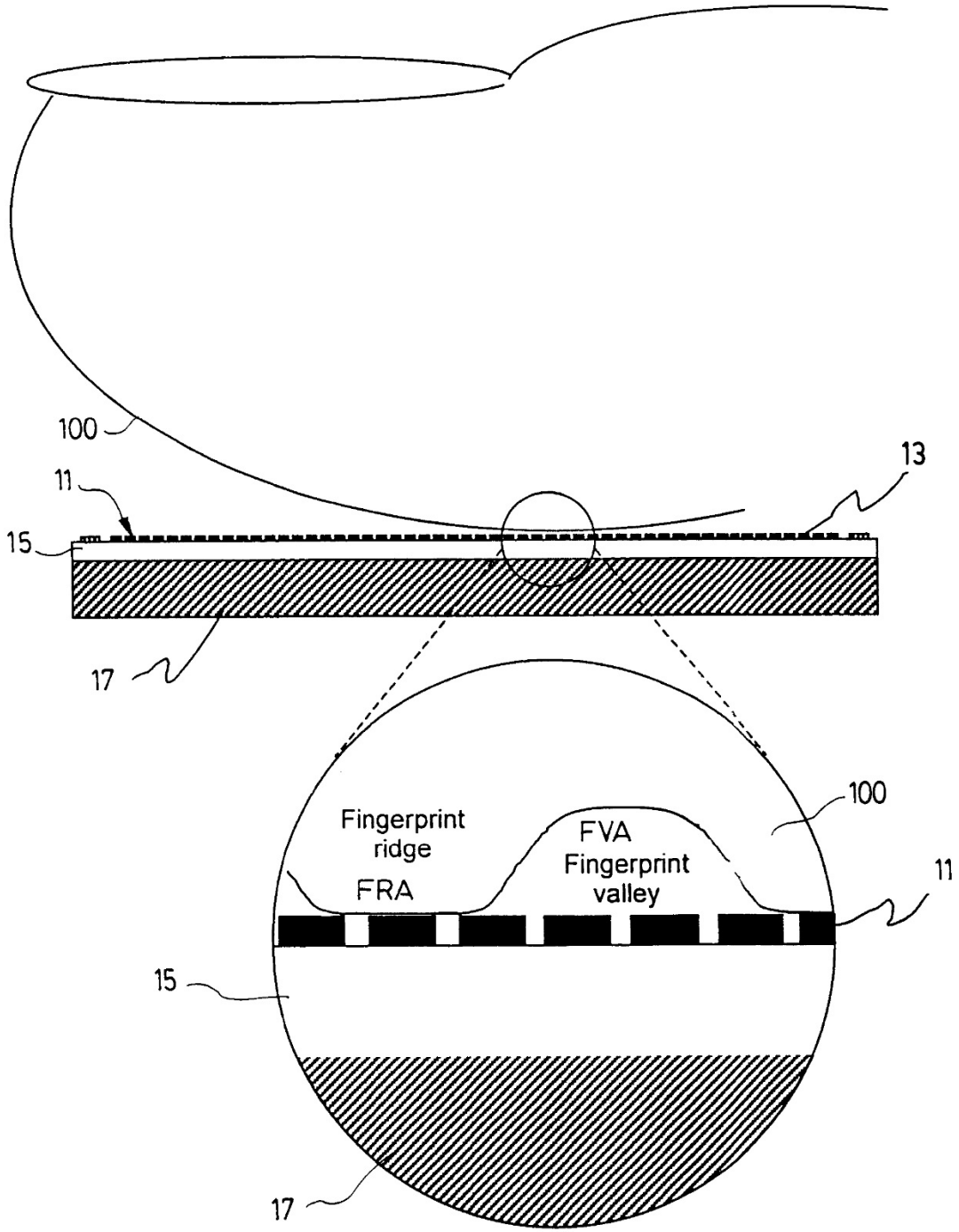
GROOVES (or furrows): narrow valleys

RIDGES: hills ←***what makes print***

DNA dtrmne FPs & other fctrs

- **Idntcl twns have dffrnt FPs**


RIDGE
GROOVES


100
11
13
15
17
Fingerprint
ridge
FRA
FVA
Fingerprint
valley
100
11
15
17

3 Classes of FP

1. **ARCHES**: ridgelines rise in the center to create a wavelike pattern

   2 types: **TENTED** and **PLAIN**

Tented arches: sharper central rise than plain

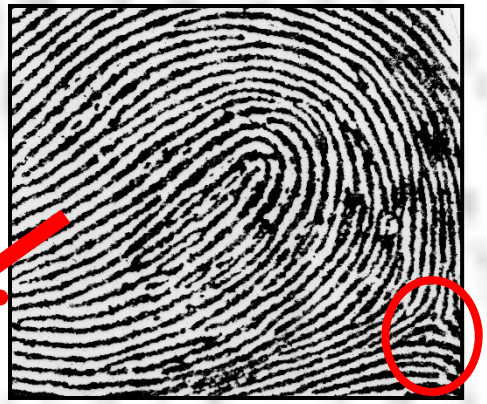
PLAIN ARCH

TENTED ARCH

2. LOOPS: must have one delta and one or more ridges that enter and leave on the same side. *(These patterns are named for their positions related to the radius & ulna bones.)*

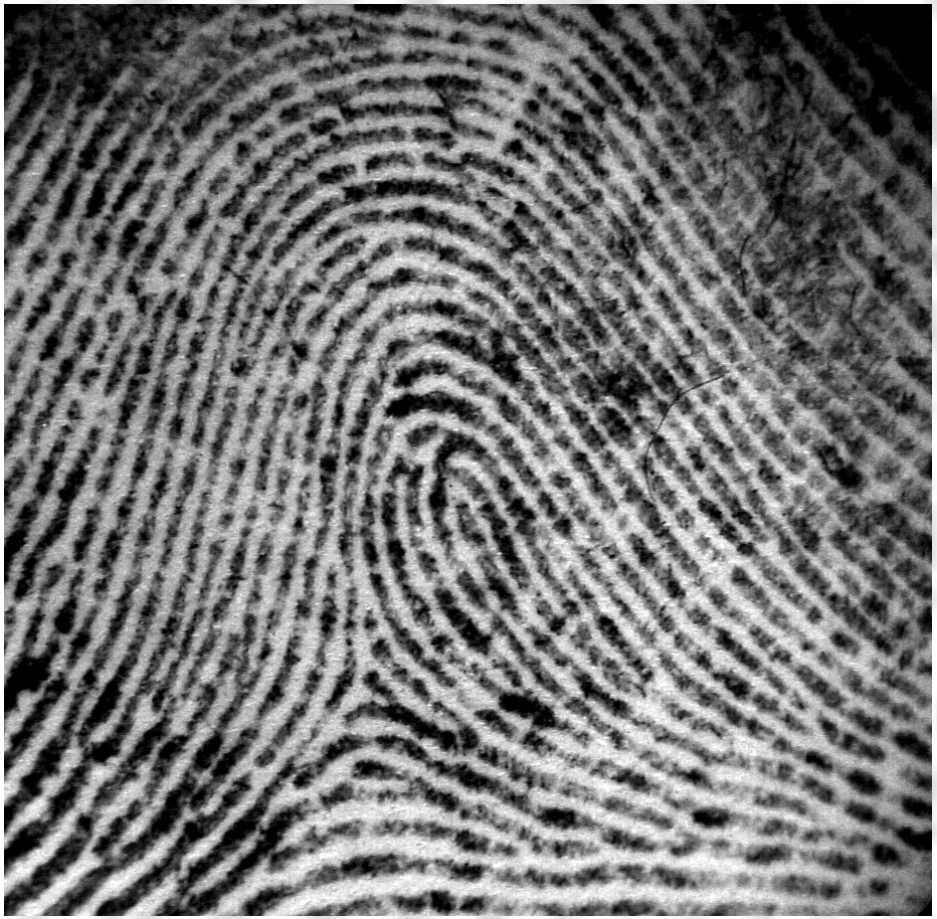
Ulnar Loop
(Right Thumb)
Loop opens toward right or the ulna bone.

Delta



Radial Loop
(Right Thumb)
Loop opens toward the left or the radial bone.

NOTE: On the left hand, a loop that opens to the left would be an ulnar loop, while one that opens to the right would be a radial loop.



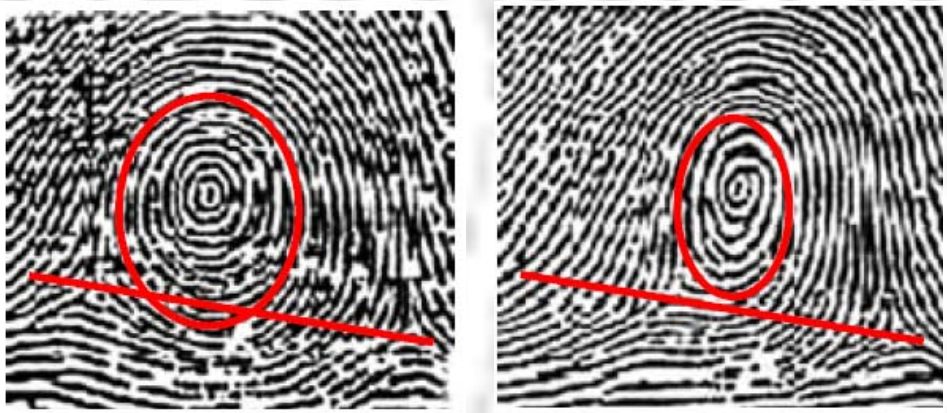
Both are prints from right hand

ULNAR

RADIAL

3. WHORLS have at least one ridge that makes (or tends to make) a complete circuit. They also have at least 2deltas. If a print has more than two deltas, it is most likely an accidental.

Plain Whorl



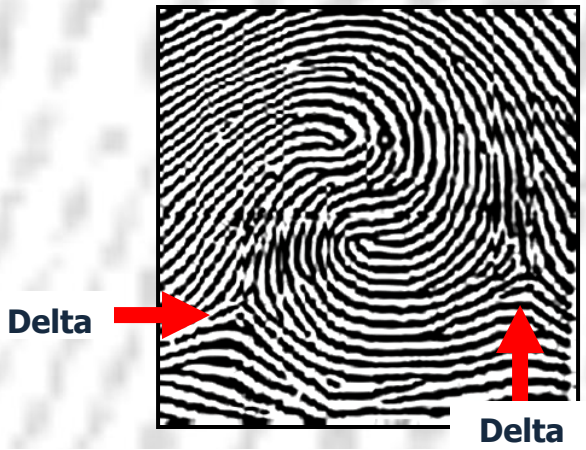
Central Pocket Whorl

Draw a line between the two deltas in the plain and central pocket whorls. If some of the curved ridges touch the line, it is a plain whorl. If none of the center core touches the line, it is a central pocket whorl.

PLAIN WHORL

CENTRAL POCKET LOOP

Double Loop Whorl



Double loop whorls are made up of any two loops combined into one print.

Accidental Whorl

Accidental whorls contain two or more patterns (not including the plain arch), or does not clearly fall under any of the other categories.

DOUBLE LOOP

FP Factoid:

60% of fingers have loops, 35% have whorls,

and 5% have arches

Did you know?

Dactyloscopy is the study of fingerprint identification. Police investigators are experts in collecting "dactylograms", otherwise known as fingerprints.

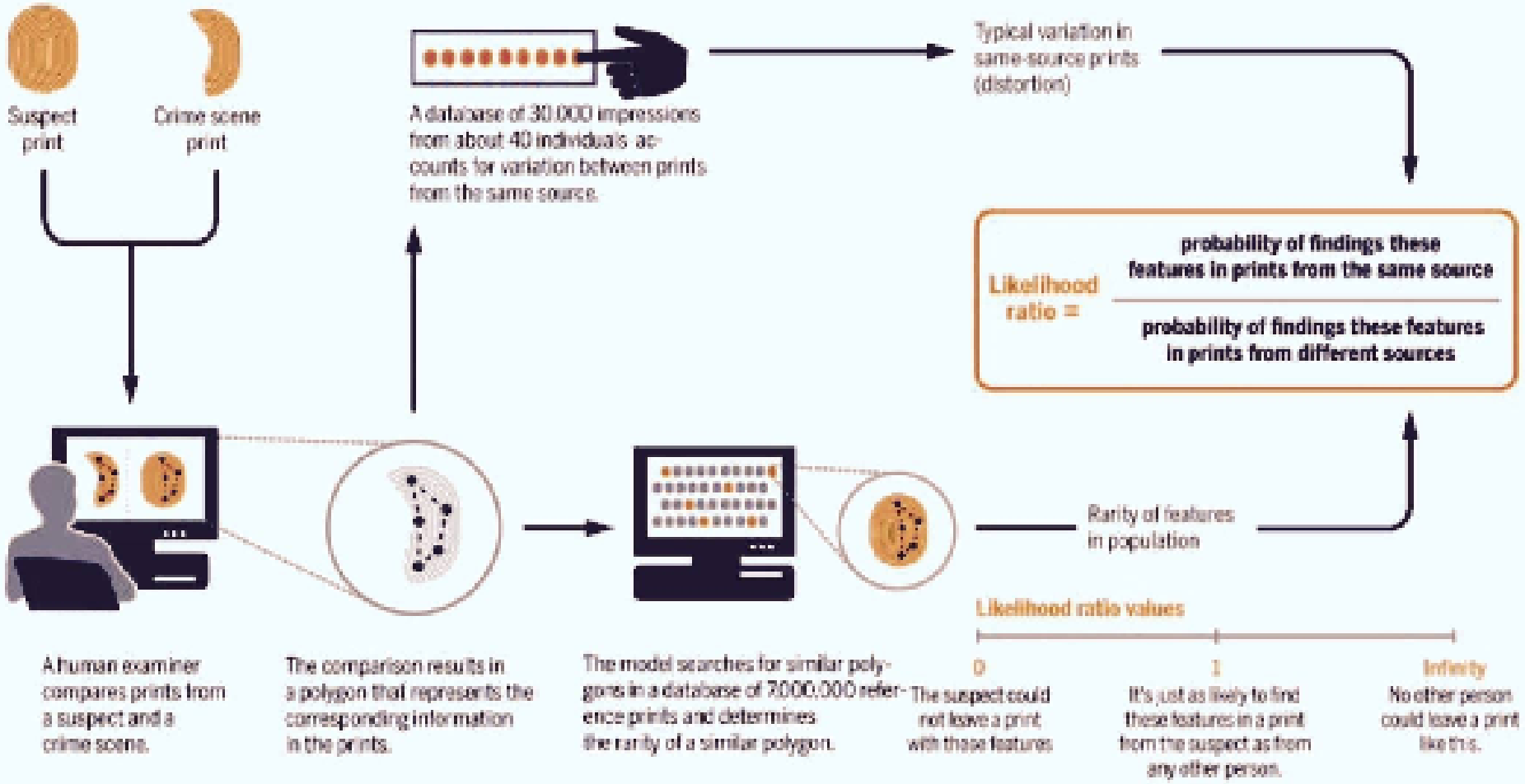
ADD TO NOTES

Man chews off his own fingerprints in an attempt to not be identified by police

BY: Jason Davis
POSTED: 10:19 AM, Aug 1, 2015
UPDATED: 8:28 PM, Aug 1, 2015

How strong is the resemblance between those fingerprints?

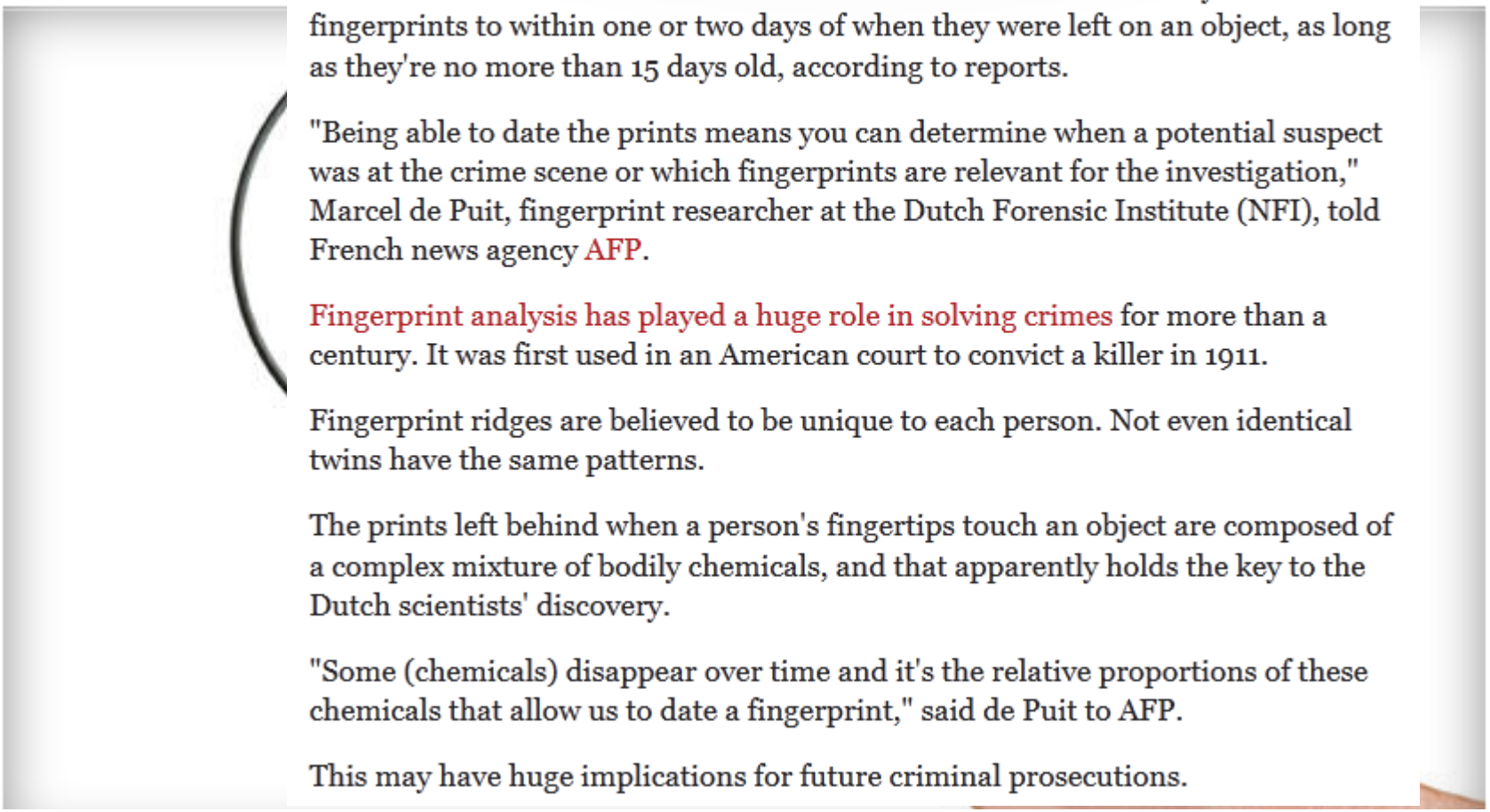
Many statisticians aim to express the strength of forensic evidence as a likelihood ratio, which contrasts the probability of observing a given pattern under different scenarios. This model, under development by researchers at South Dakota State University, uses two large databases to evaluate similarities between fingerprints.



By **HANI SHAWWA** / **CBS NEWS** / *June 5, 2014, 3:42 PM*

How old is that fingerprint? Forensic science figures it out

It's potentially a powerful new tool for law enforcement.



A team of Dutch forensic scientists has discovered how to accurately date fingerprints to within one or two days of when they were left on an object, as long as they're no more than 15 days old, according to reports.

"Being able to date the prints means you can determine when a potential suspect was at the crime scene or which fingerprints are relevant for the investigation," Marcel de Puit, fingerprint researcher at the Dutch Forensic Institute (NFI), told French news agency AFP.

Fingerprint analysis has played a huge role in solving crimes for more than a century. It was first used in an American court to convict a killer in 1911.

Fingerprint ridges are believed to be unique to each person. Not even identical twins have the same patterns.

The prints left behind when a person's fingertips touch an object are composed of a complex mixture of bodily chemicals, and that apparently holds the key to the Dutch scientists' discovery.

"Some (chemicals) disappear over time and it's the relative proportions of these chemicals that allow us to date a fingerprint," said de Puit to AFP.

This may have huge implications for future criminal prosecutions.

Fingerprints reveal whether you're black or white: Distinctive patterns show whether a person is of African or European descent

- **Ridges patterns are different in people of European and African ancestry**
- **Researchers say these could be used to help with profiling suspects**
- **They say it could also provide valuable information for anthropologists**
- **However, they warn more work is needed before it can be reliably used**

By RICHARD GRAY FOR MAILONLINE

PUBLISHED: 05:48 EST, 29 September 2015 | **UPDATED:** 11:21 EST, 29 September 2015

Palm readers claim to be able to see a person's future in the patterns on their hands, but it seems it is possible to also learn about their ancestral past too from their fingers.

Fingerprints – already used as a way to identify individuals – appear to encode information about a person's ancestral background.

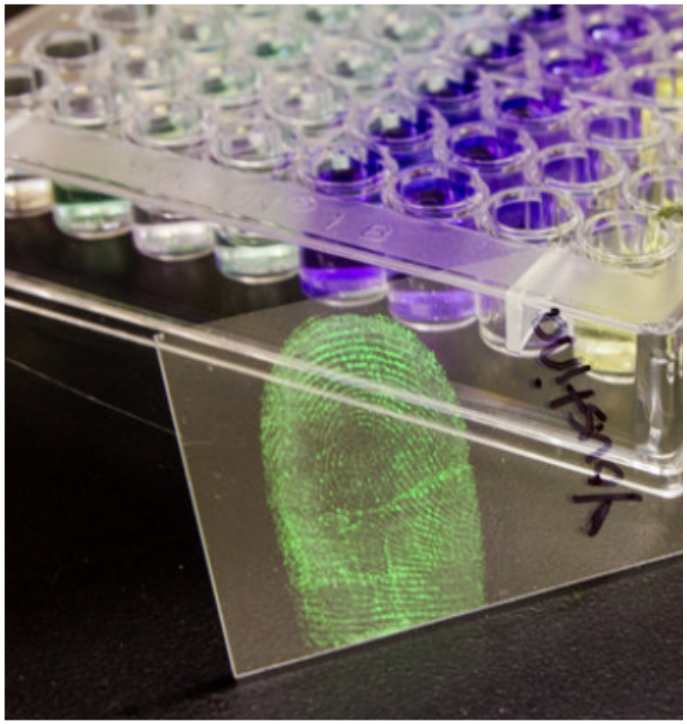
Researchers have found there are distinct differences in how fingerprint ridges split between people of European and African ancestry.

The fine detail of fingerprints encode information about an individual's ancestral background, according to the results of a new study which found it was possible to distinguish prints left by people of African American ancestry from those with European ancestry (pictured)

The researchers claim their findings could prove useful not just for anthropologists but also for modern law enforcement when trying to profile suspects.

The New York Times

New Technique Can Identify Gender From a Fingerprint



Fingerprints in the lab of forensic scientists who have developed a techniq
came from a man or a woman.
PAUL MILLER / UNIVERSITY AT ALBANY

NOVEMBER 20, 2015

Observatory

By SINDYA N. BHANOO

A simple test performed at a crime scene may help forensic scientists determine whether a fingerprint belongs to a man or a woman, a new study reports.

The test is based on certain amino acids found in the fingerprints. Levels are twice as high in the sweat of women as in that of men.

"Fingerprints have really been treated as pictures for more than a hundred years," said Jan Halamek, a forensic scientist at the State University of New York at Albany and one of the study's authors. "The only major improvements in recent years have been due to software and databases that make it faster to match fingerprints."

Mr. Halamek and his colleagues tested fingerprints on a doorknob, a laminate desktop, a composite bench top and a computer screen. Regardless of the surface type, they found it was possible to tell whether the fingerprint belonged to a woman by testing levels of residual amino acids.

The report was published in the journal Analytical Chemistry. The study involved only a few fingerprints, however, and a larger sample is required to ensure the results are statistically significant, Dr. Halamek said.

He and his colleagues are developing additional fingerprint tests based on protein markers found in blood samples. "We want to create a very simple kit which can determine on the spot whether the person was young or old, male or female, and their ethnicity," Dr. Halamek said.

These tests, he cautioned, could not replace DNA tests, which are reliable but also time-consuming and expensive.