

# Fighting crime with DNA PROFILING

## An introduction to scientific principles

Dr. Carolyn Hancock

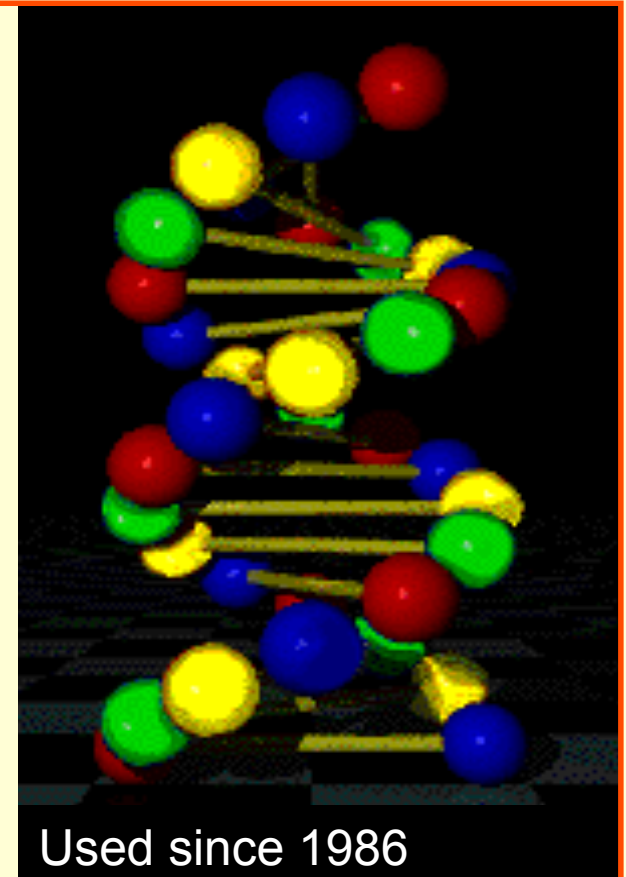
Traditional method used to link suspects  
to a crime scene: **FINGERPRINTING**

Fingerprints have been used since 1901



Current forensic  
tool of choice:

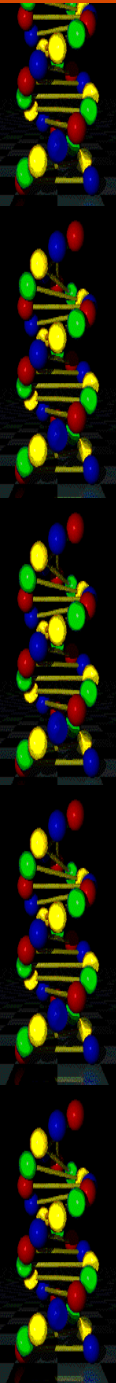
**DNA PROFILING**



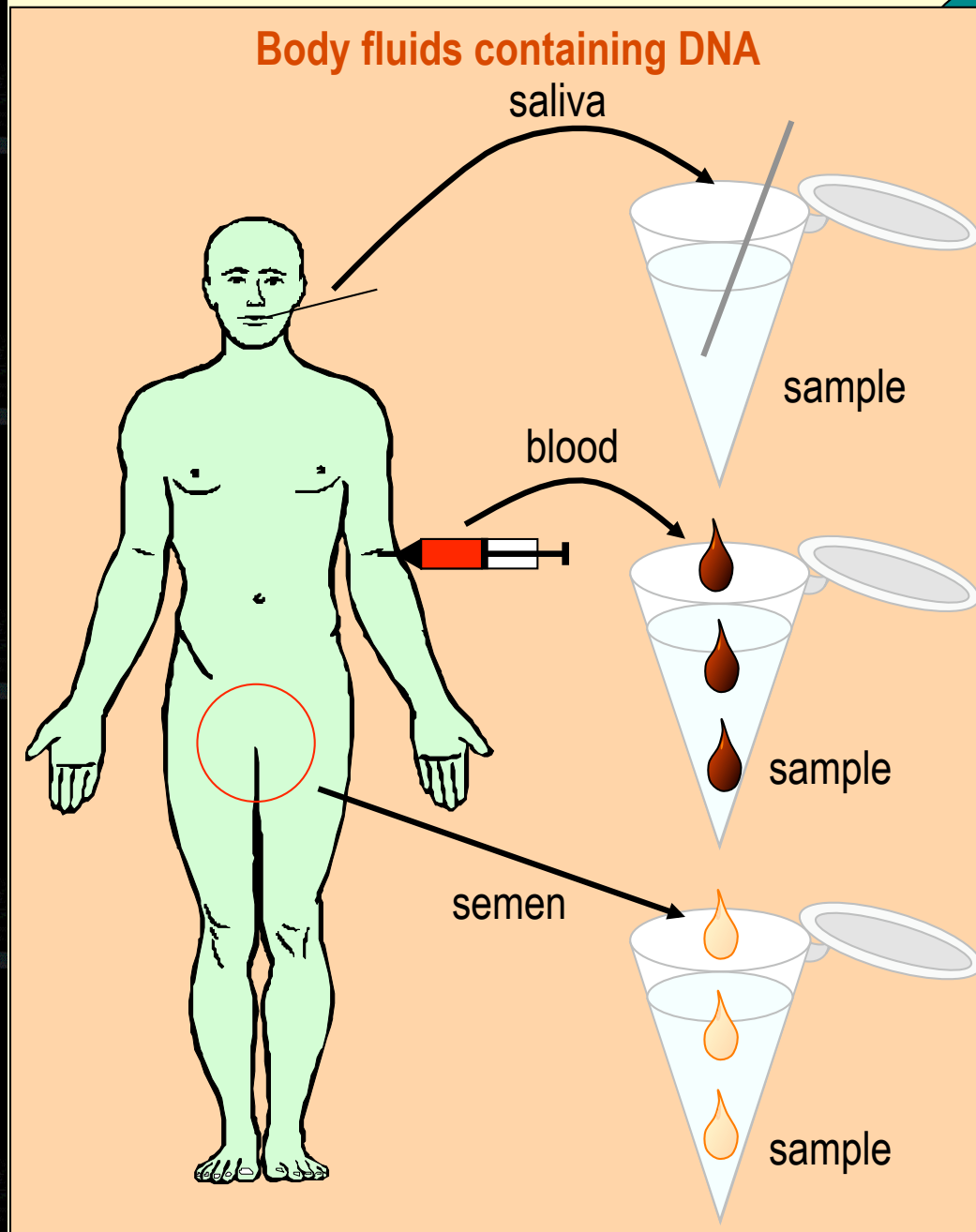
Used since 1986

# Useful characteristics of DNA

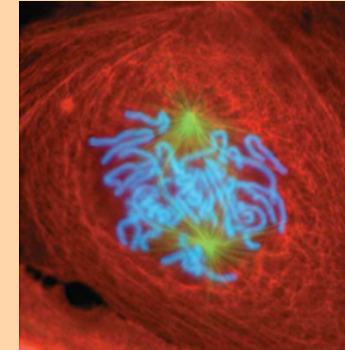
- ✓ Everyone has a unique DNA profile (except identical twins)
- ✓ DNA in every cell of an individual is identical
- ✓ An individual's DNA profile remains unchanged throughout life



# Body fluids used in DNA fingerprinting

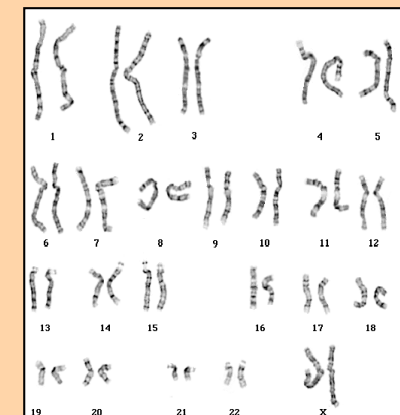


## Cells

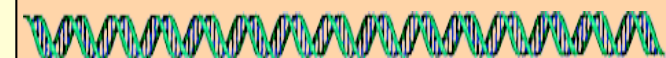


Each body cell:  
contains 46 chromosomes

## Chromosomes

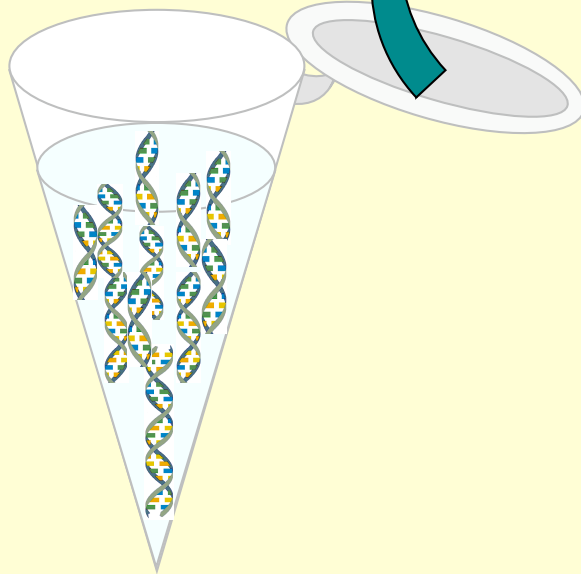


Each chromosome:  
contains one DNA molecule



# DNA

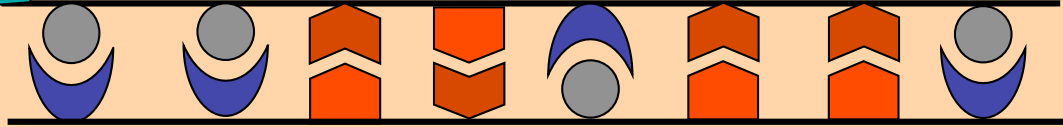
46 chromosomes



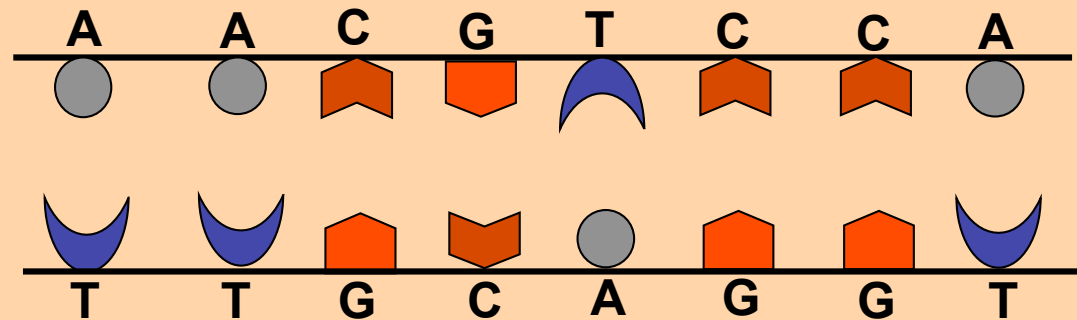
5% functional genes

95% non functional DNA

DNA is double stranded



4 different molecules for building blocks (A, C, G and T)



Sequences are specific for **functional genes**

Too little variation to be useful for fingerprinting

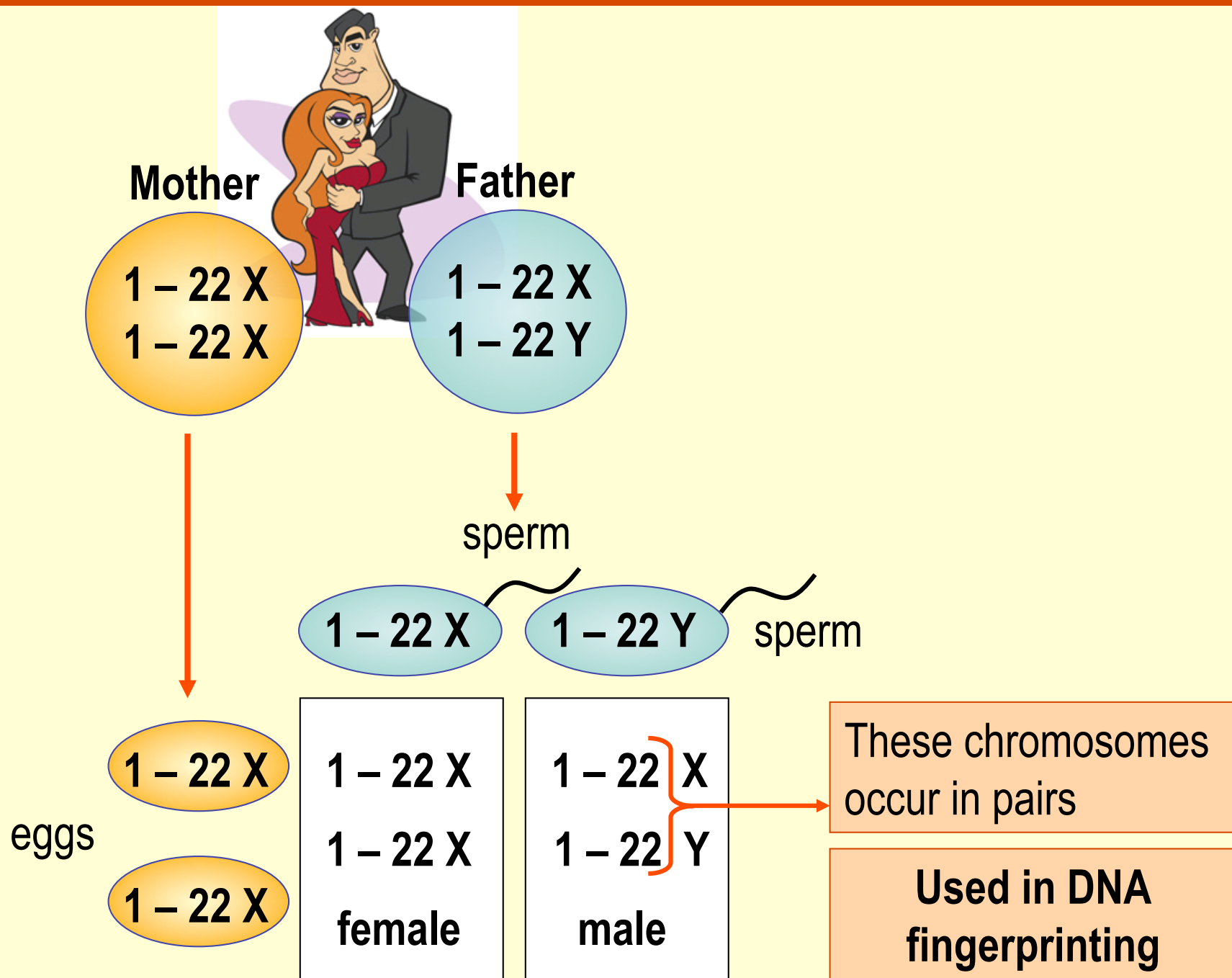
**Non functional DNA:**

High proportion of sequence variation

Enough differences to make DNA of each person unique

**Used for DNA fingerprinting**

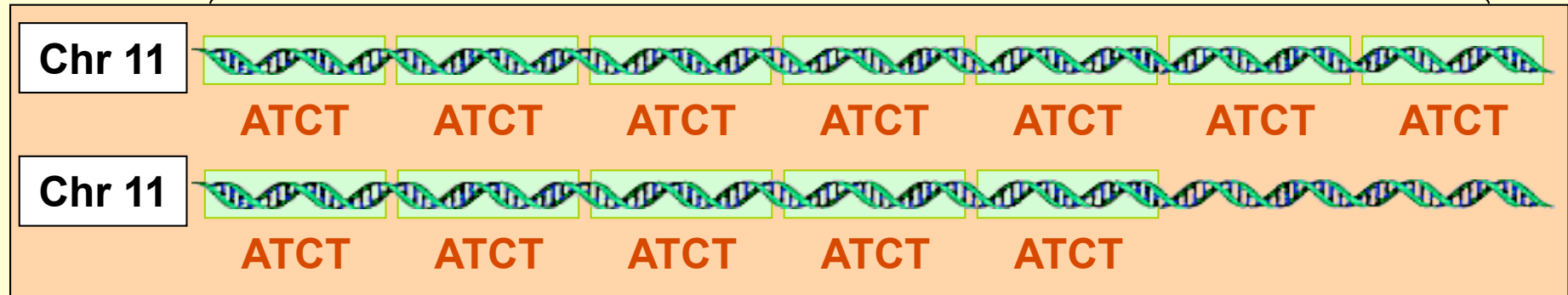
# Inheritance of chromosomes





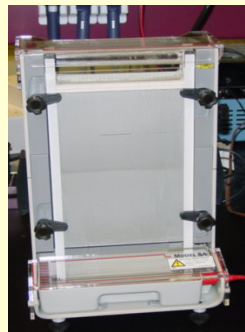
# DNA fingerprinting: How it works

Region (locus) on Chromosome 11 with repeated segments – referred to as microsatellite - STR

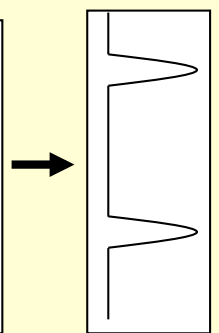


Extract DNA out of sample and amplify DNA segments

Separate and visualize DNA fragments in conducting gel



**Machine  
Profile**

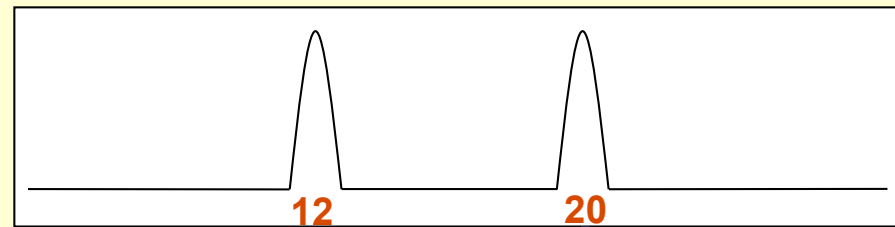


**Digital  
Profile**

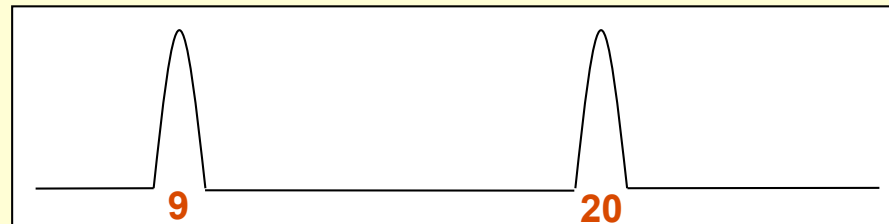
Store  
profile  
as  
Numbers  
5/7



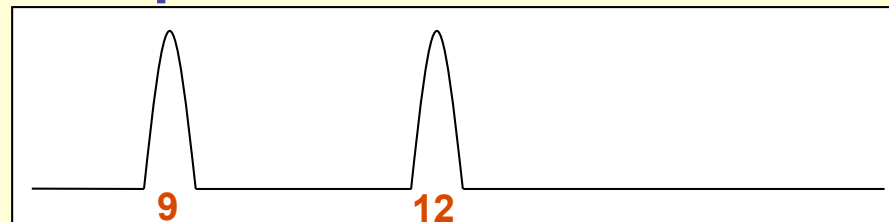
# Inheritance of one Microsatellite locus



**DAD**



**CHILD**

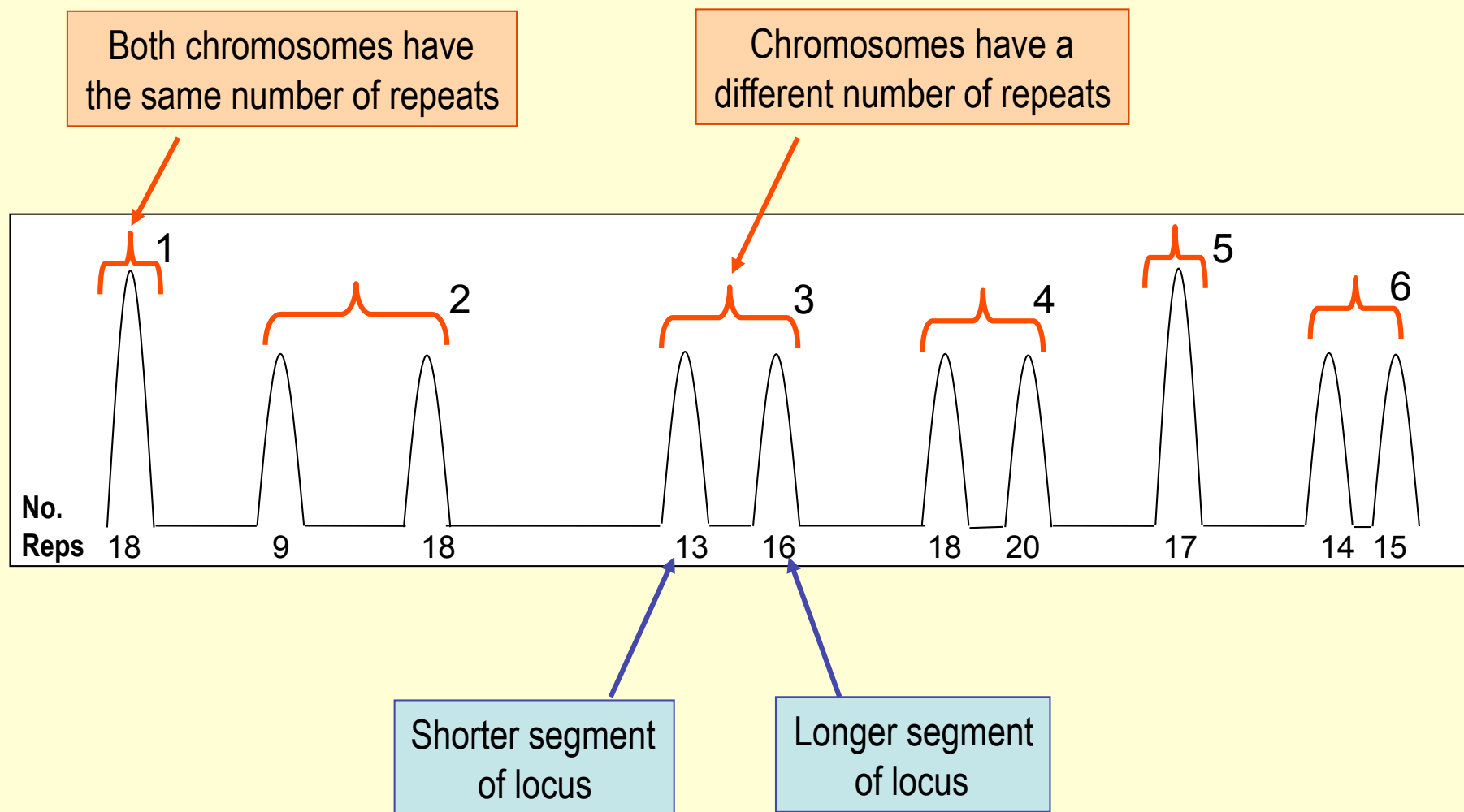


**MOM**

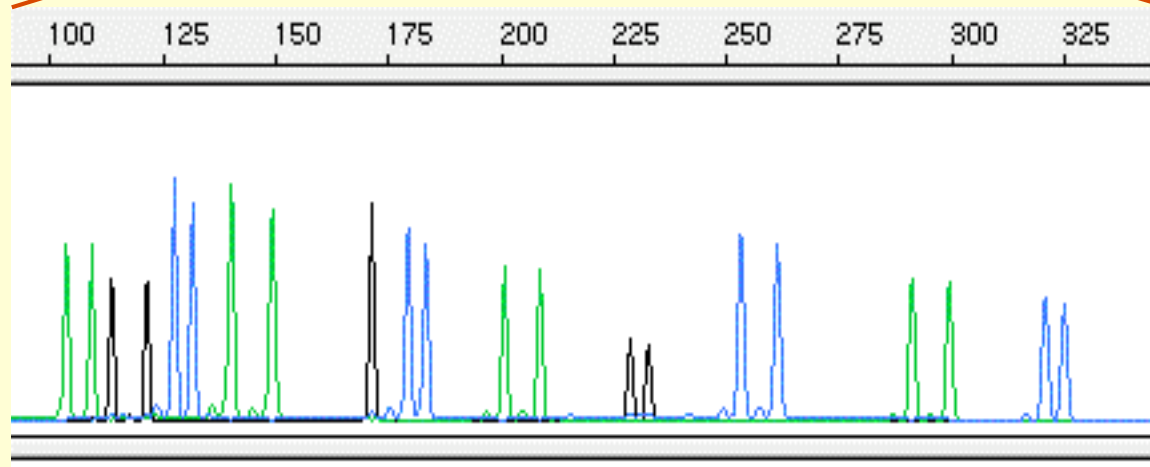
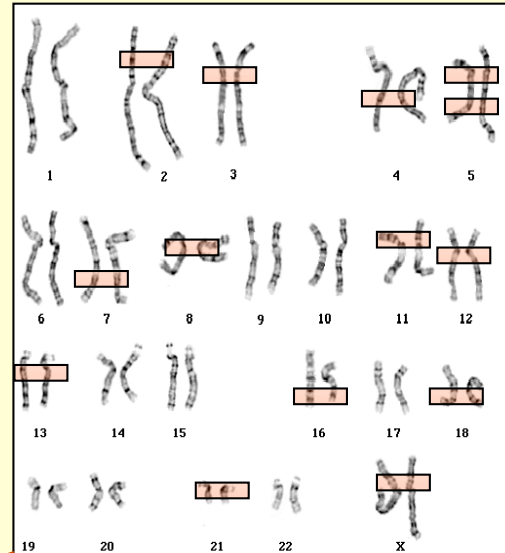


# Interpreting a DNA profile

## DNA profile of 6 loci



# Fingerprinting multiple loci



Digital profile shows loci in colour

**Computer  
stored profile**

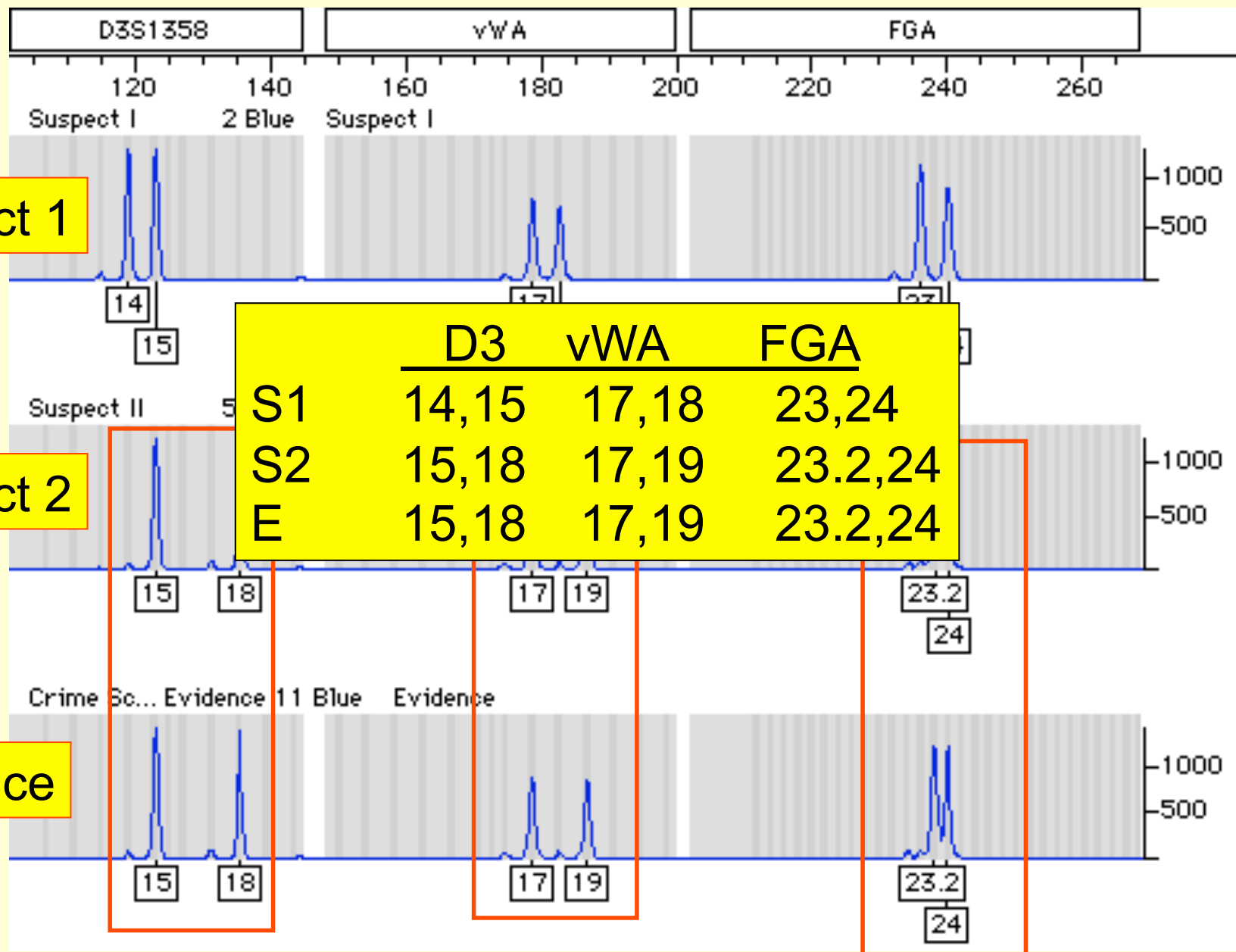
Locus	Reps
VWA	15 -15
TH01	10 – 13
TPOX	18 – 23
FGA	13 – 15
Etc.	Etc.

# Crime scene Two suspects

Suspect 1

Suspect 2

Evidence



## Information contained in a DNA profile

- A DNA profile is stored on the Database as a list of numbers.
- These numbers are not generally thought to be associated with any physical trait, genetic disease or human behavioral pattern.

