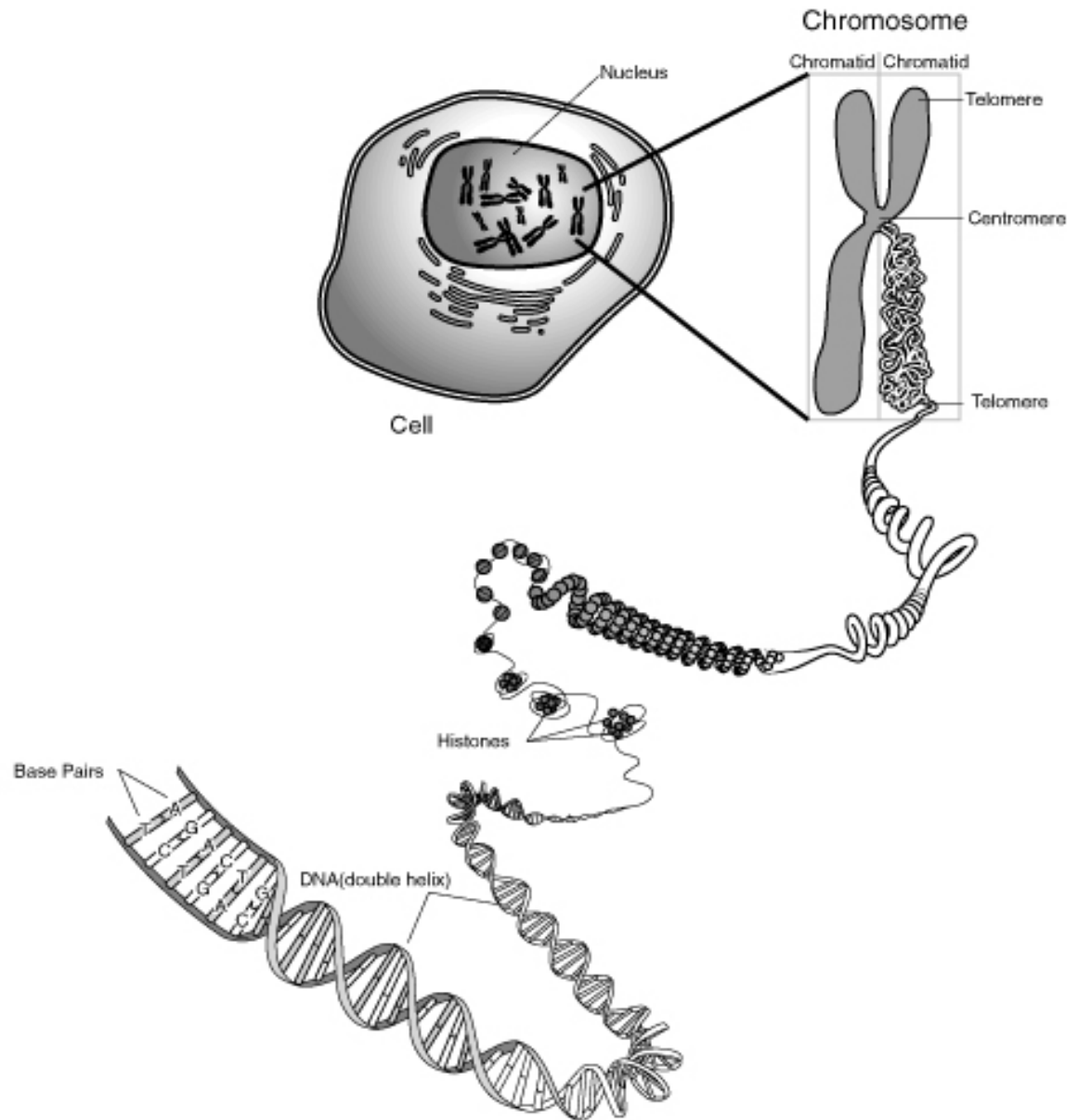




DNA Profiling and Forensic Science

Helena Puche, Ph.D.

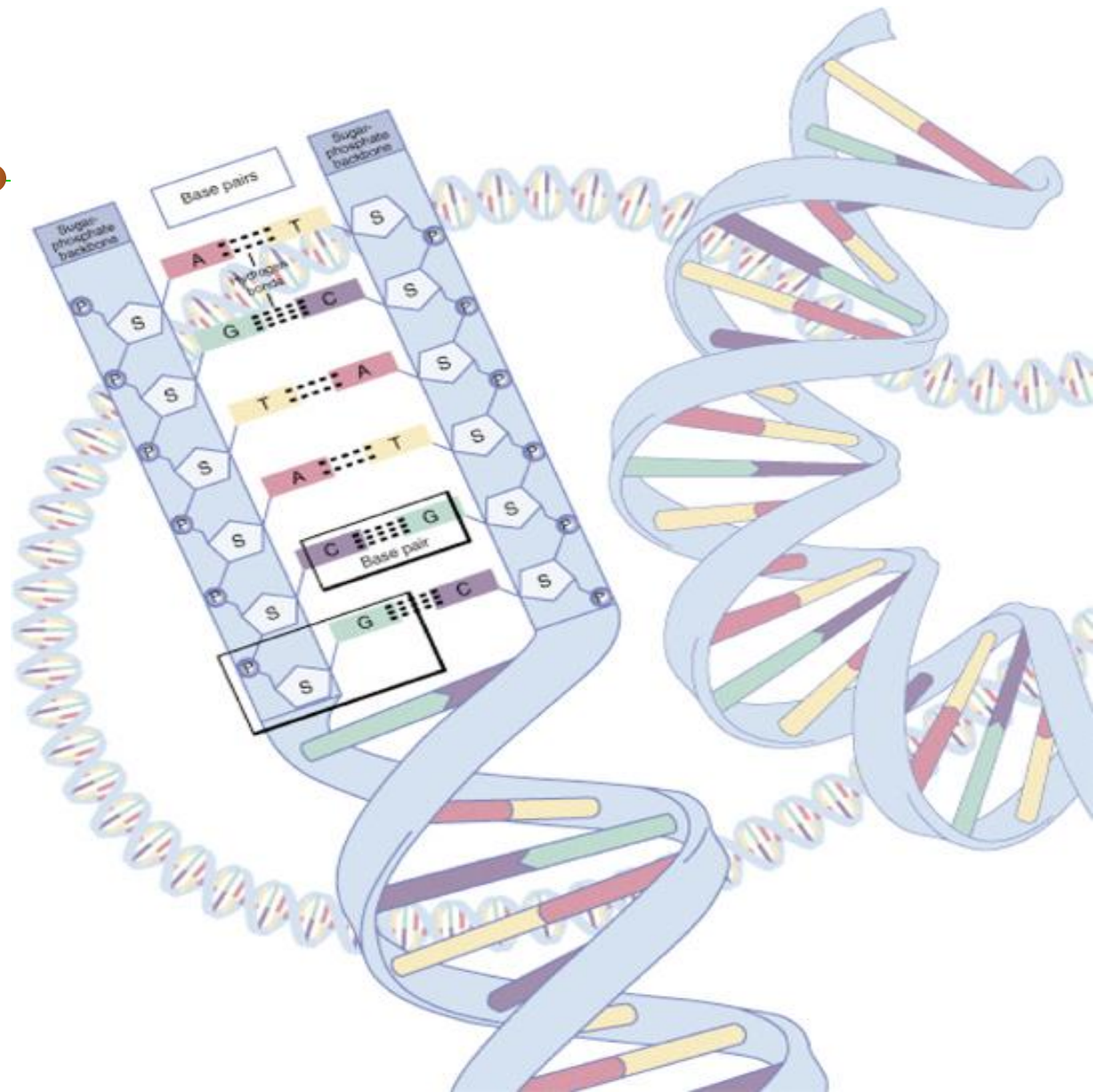
**DNA is Tightly
Packaged into
Chromosomes
Which Reside in
the Nucleus**



Model of DNA

**DNA is
Comprised of
Four Base Pairs:**

**Adenine (A)
Thymine (T)
Guanine (G)
Cytosine (C)**



Evolution is the process of change in all forms of life over generations

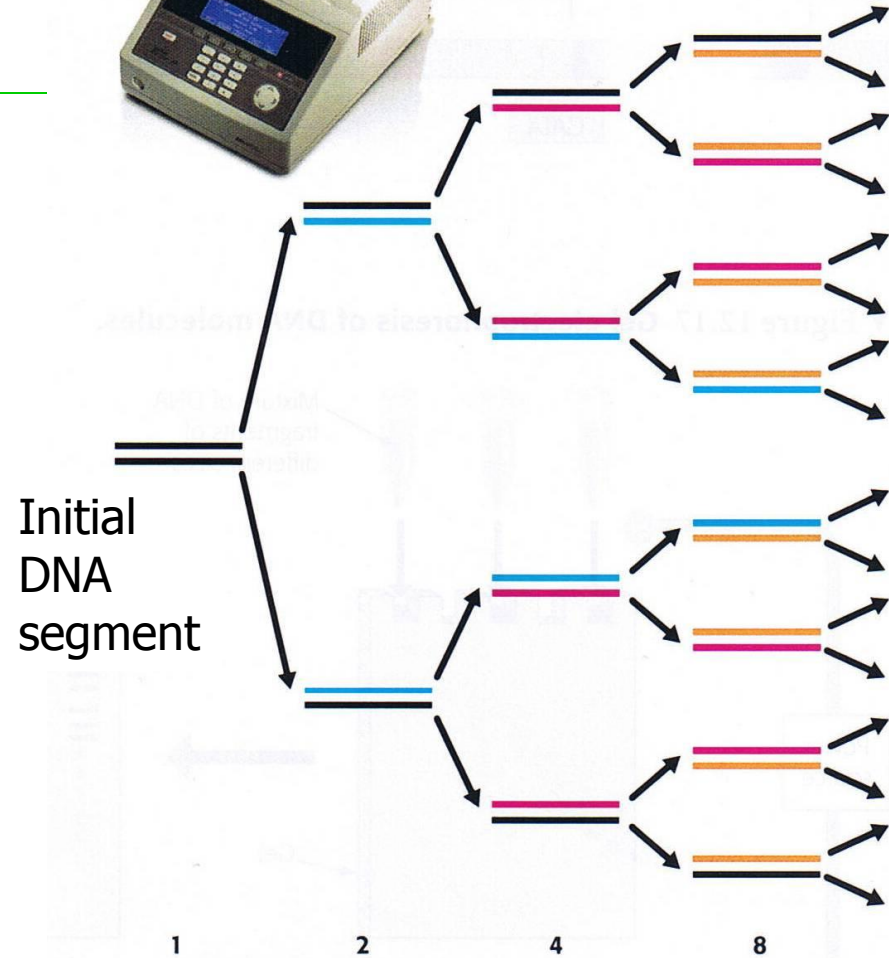
- Occurs through natural selection
- Based on three conditions:
 - All individuals receive hereditary material (genes) from parents, then passed on to their offspring.
 - Organisms produce more offspring than the environment can support.
 - Variations among offspring due to mutations or reshuffling of existing genes.

Sources of Biological Evidence

- **Blood**
- **Semen**
- **Saliva**
- **Urine**
- **Hair**
- **Teeth**
- **Bone**
- **Tissue**

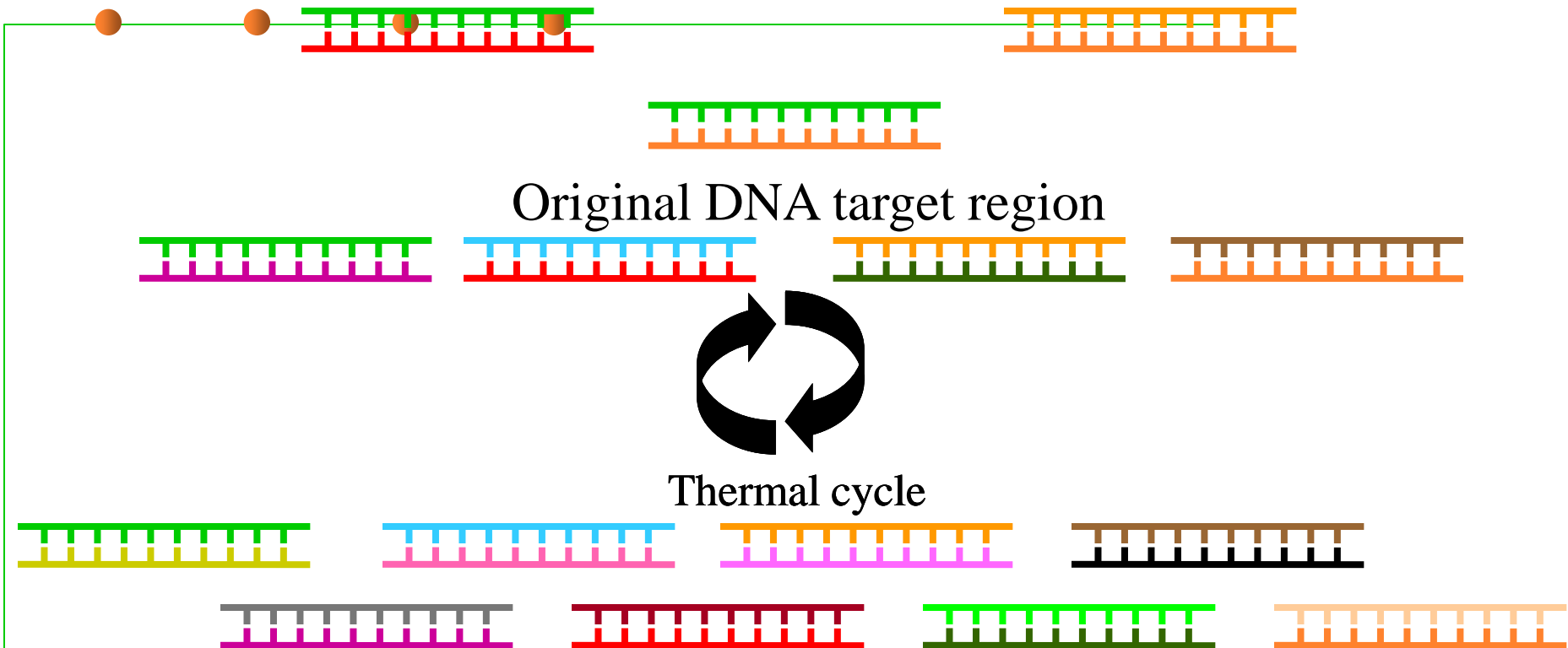


Polymerase Chain Reaction (PCR)



Number of DNA molecules

PCR Copies DNA Exponentially through Multiple Thermal Cycles



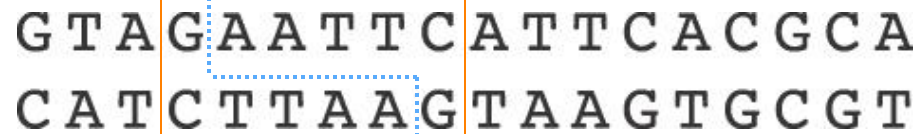
In 32 cycles at 100% efficiency, 1.07 billion copies of targeted DNA region are created

Enzyme Site Recognition

- Each enzyme digests (cuts) DNA at a specific sequence = restriction site
- Enzymes recognize 4- or 6- base pair, palindromic sequences (eg GAATTC)

Restriction site

Palindrome



GTAGGAATTCATTTCACGCA
CATCTTAAGTAAGTGCGT



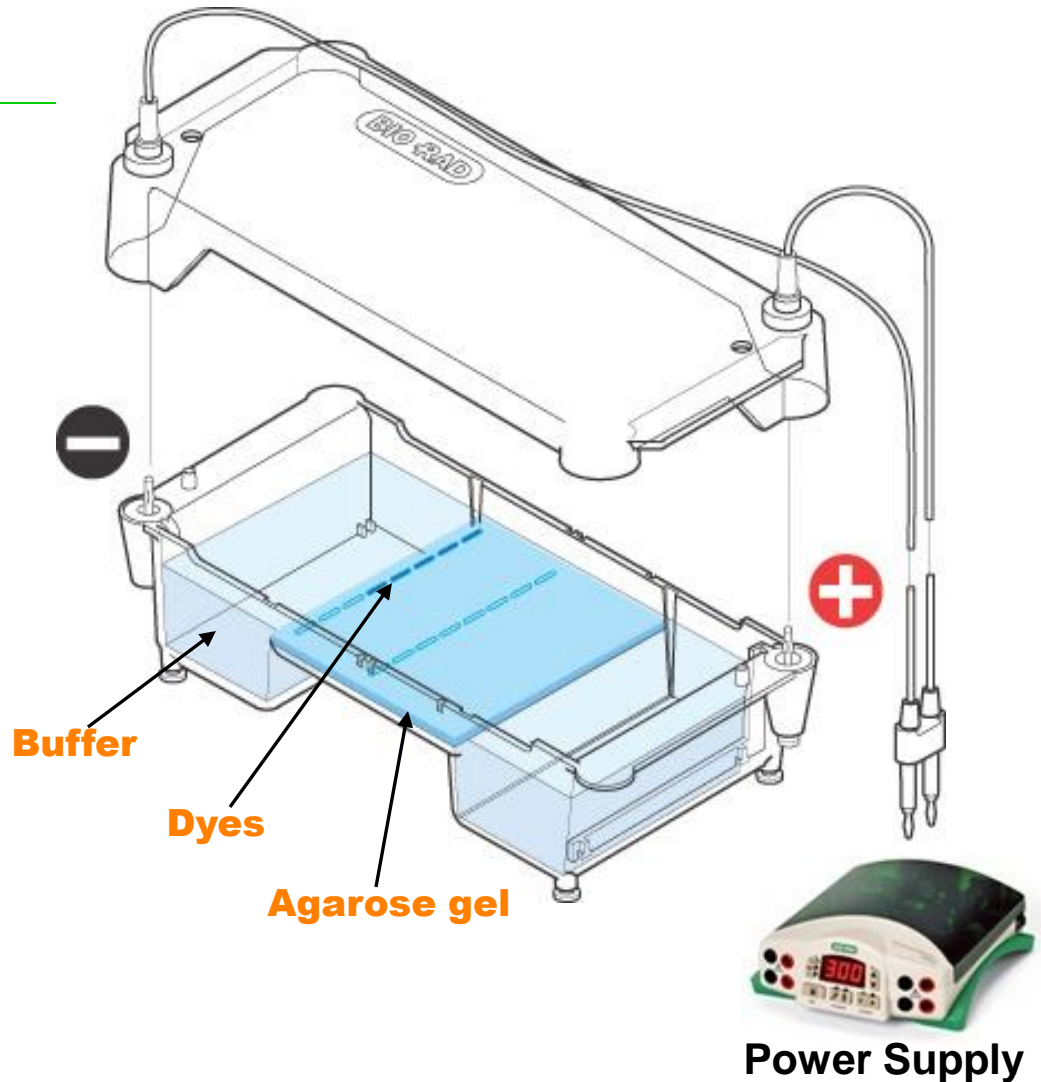
GTAG AATTCATTTCACGCA
CATCTTAA GTAAGTGCGT

Fragment 1

Fragment 2

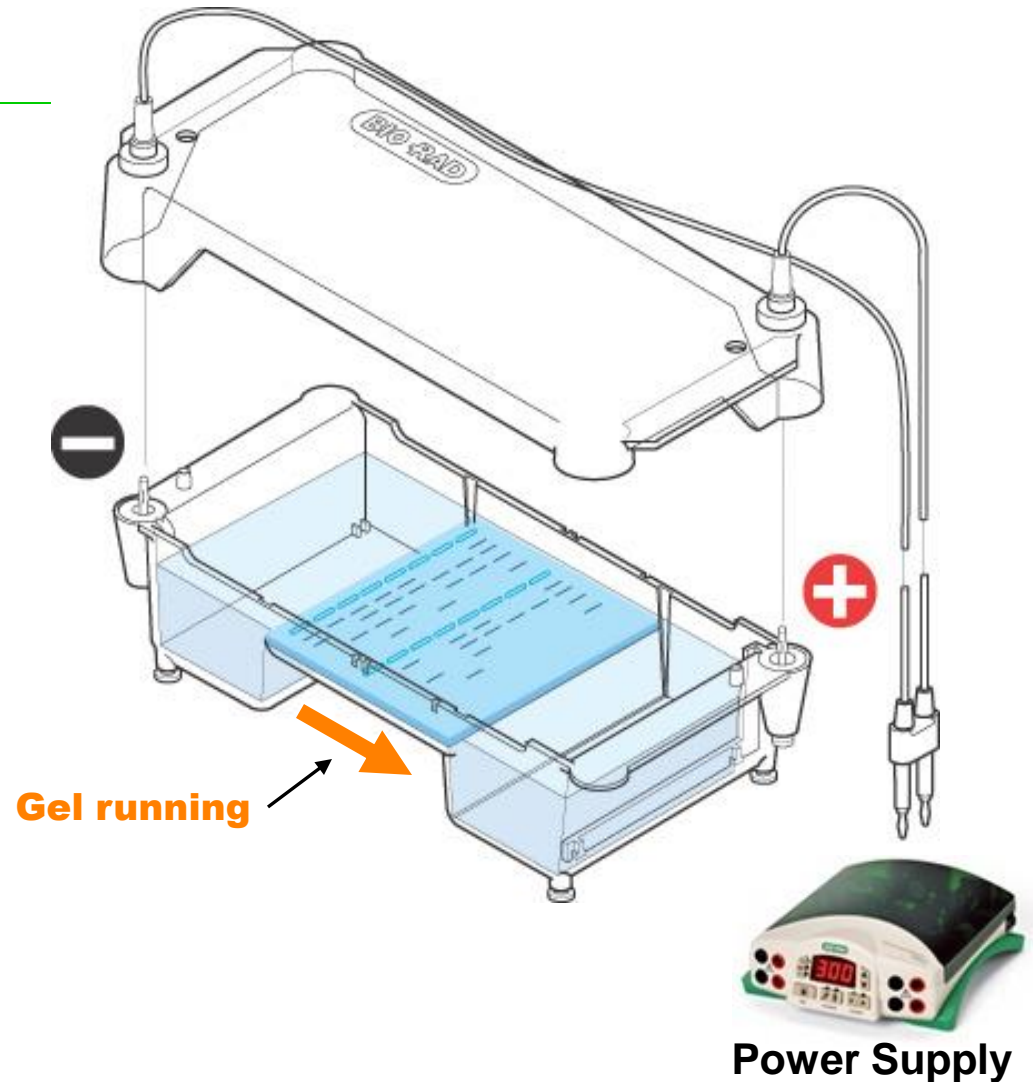
Agarose Electrophoresis Loading

- **Electrical current carries negatively-charged DNA through gel towards positive (red) electrode**



Agarose Electrophoresis Running

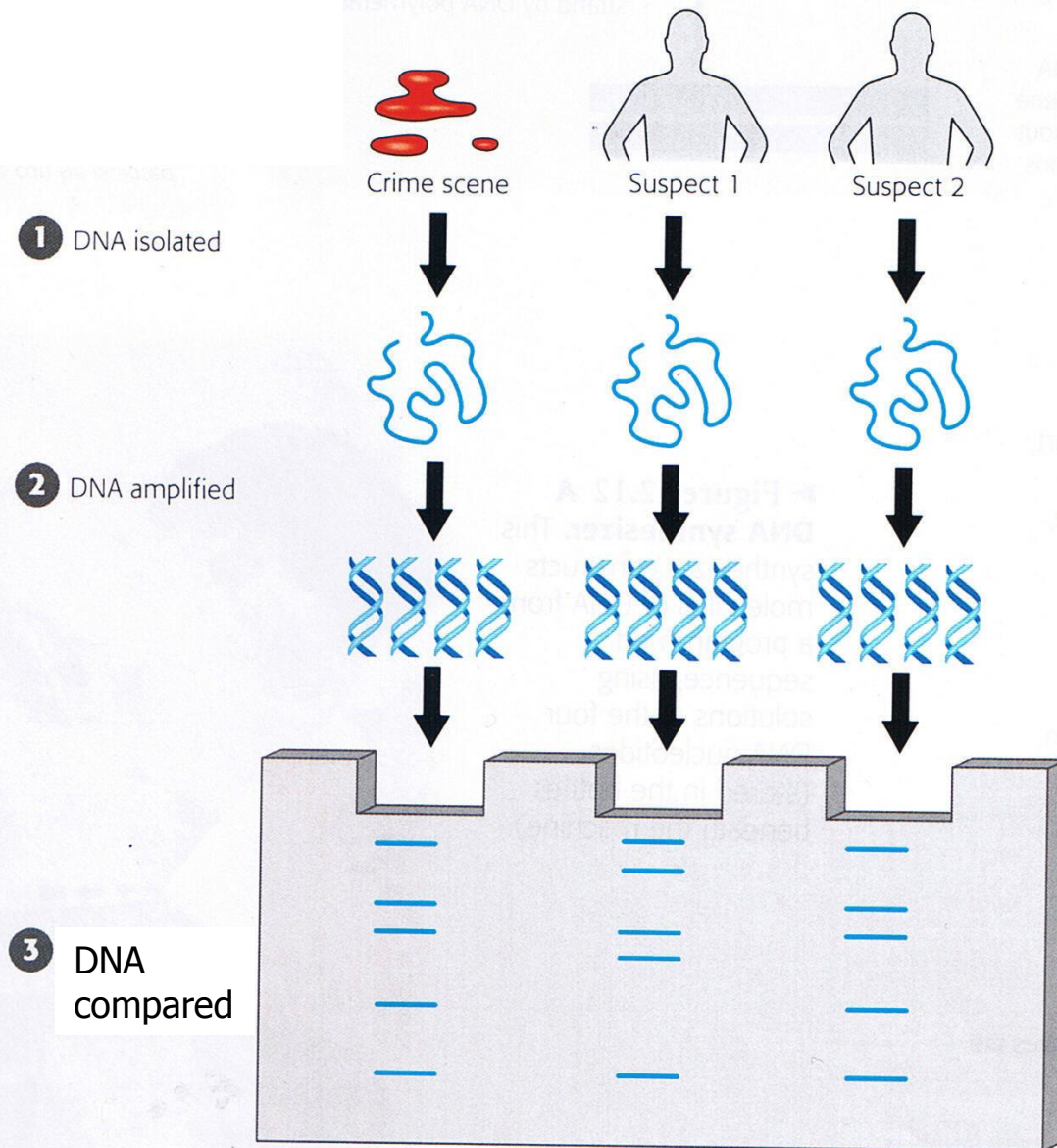
- Agarose gel sieves DNA fragments according to size
 - Small fragments move farther than large fragments

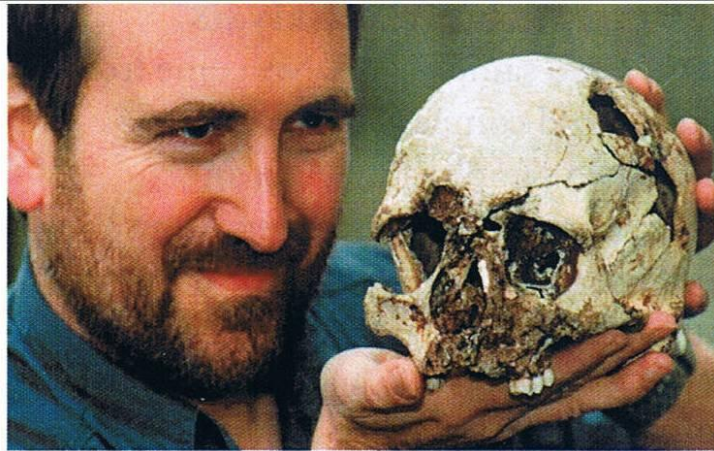


The results are studied to identify parentage or guilt.

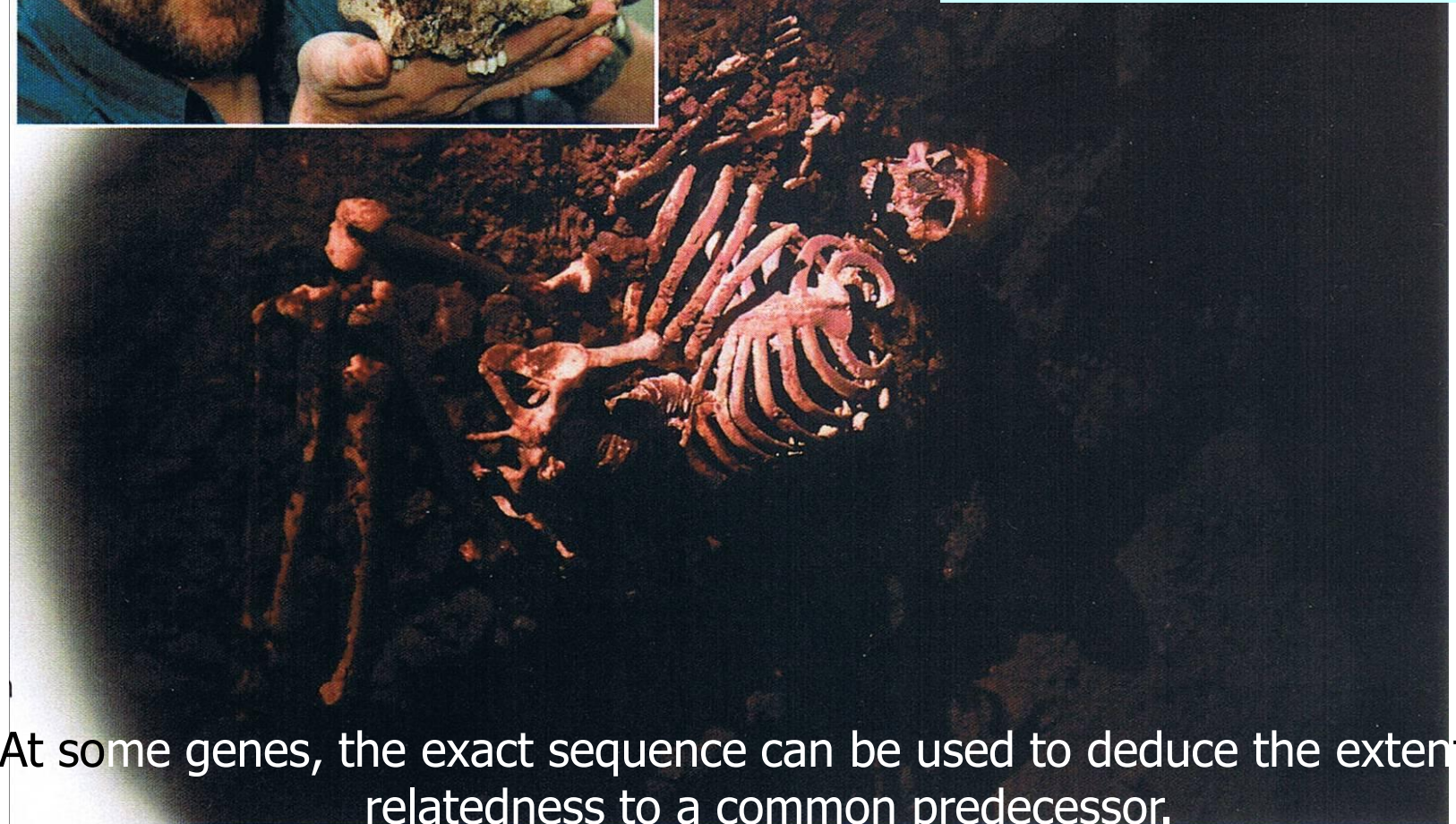


Overview of DNA Profiling





"Cheddar Man"
Is someone in
town related to
him?



At some genes, the exact sequence can be used to deduce the extent of relatedness to a common predecessor.