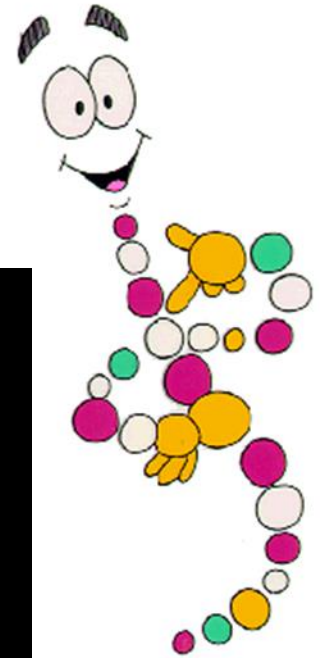
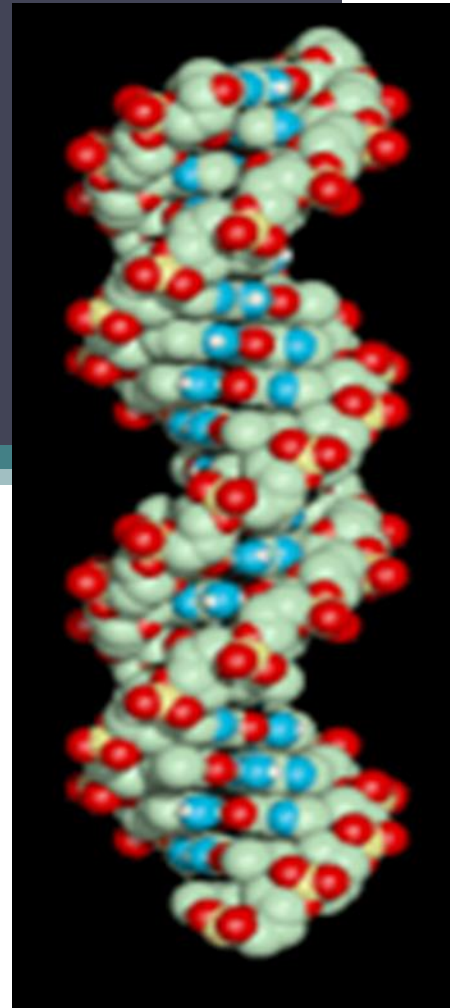


# DNA TECHNOLOGY

January 30, 2015



# Types:

- Gene Spooling
- Gene Splicing
- Recombinant DNA
- Cloning
- Gel Electrophoresis
- DNA Sequencing
- Human Genome Project
- Human Benefits to DNA Technology

# Gene Spooling

## DNA Extraction:

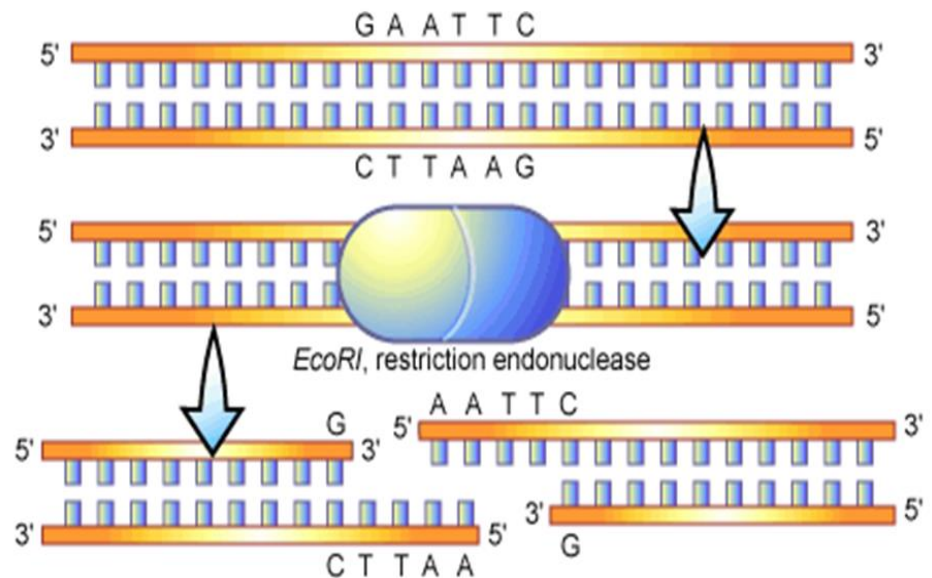
- **Chemical treatments** cause cells and nuclei to burst.
- The DNA is inherently **sticky**, and can be pulled out of the mixture.
- This is called “**spooling**” DNA.



# Gene Splicing

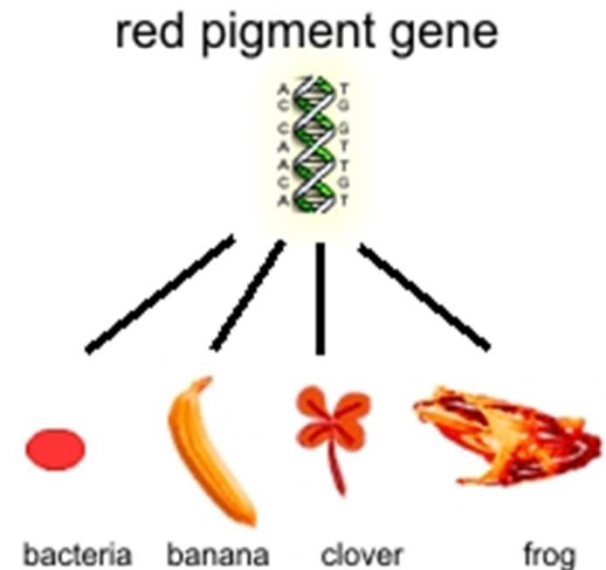
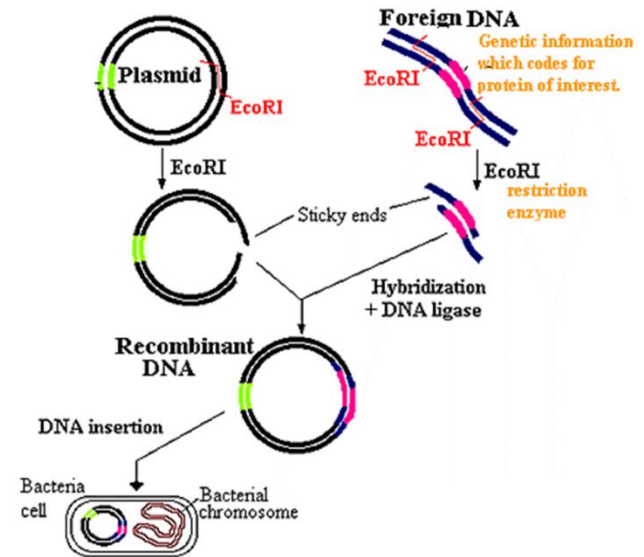
## Cutting DNA:

- ***Restriction enzymes*** cut DNA at specific sequences.
- Useful to divide DNA into **manageable fragments**.

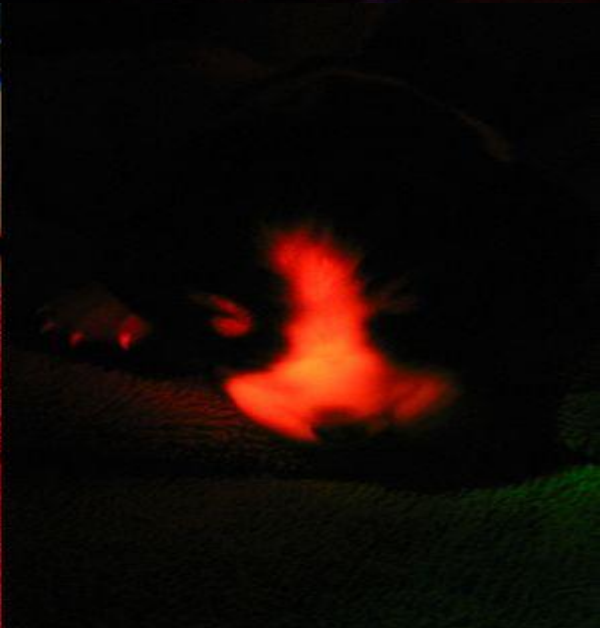
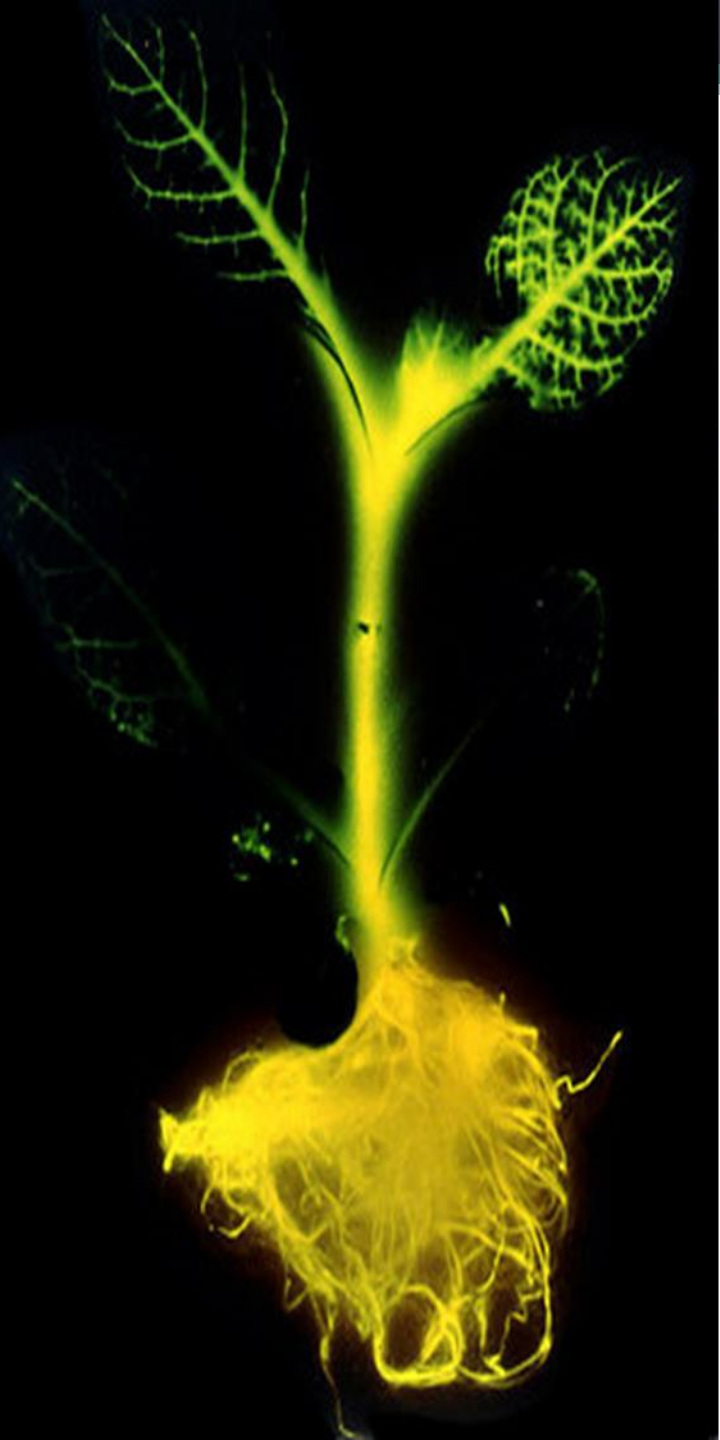


# Recombinant DNA

- Taking DNA from one organism and placing it in another to give it some sort of advantage.
- Recombinant = Recombining





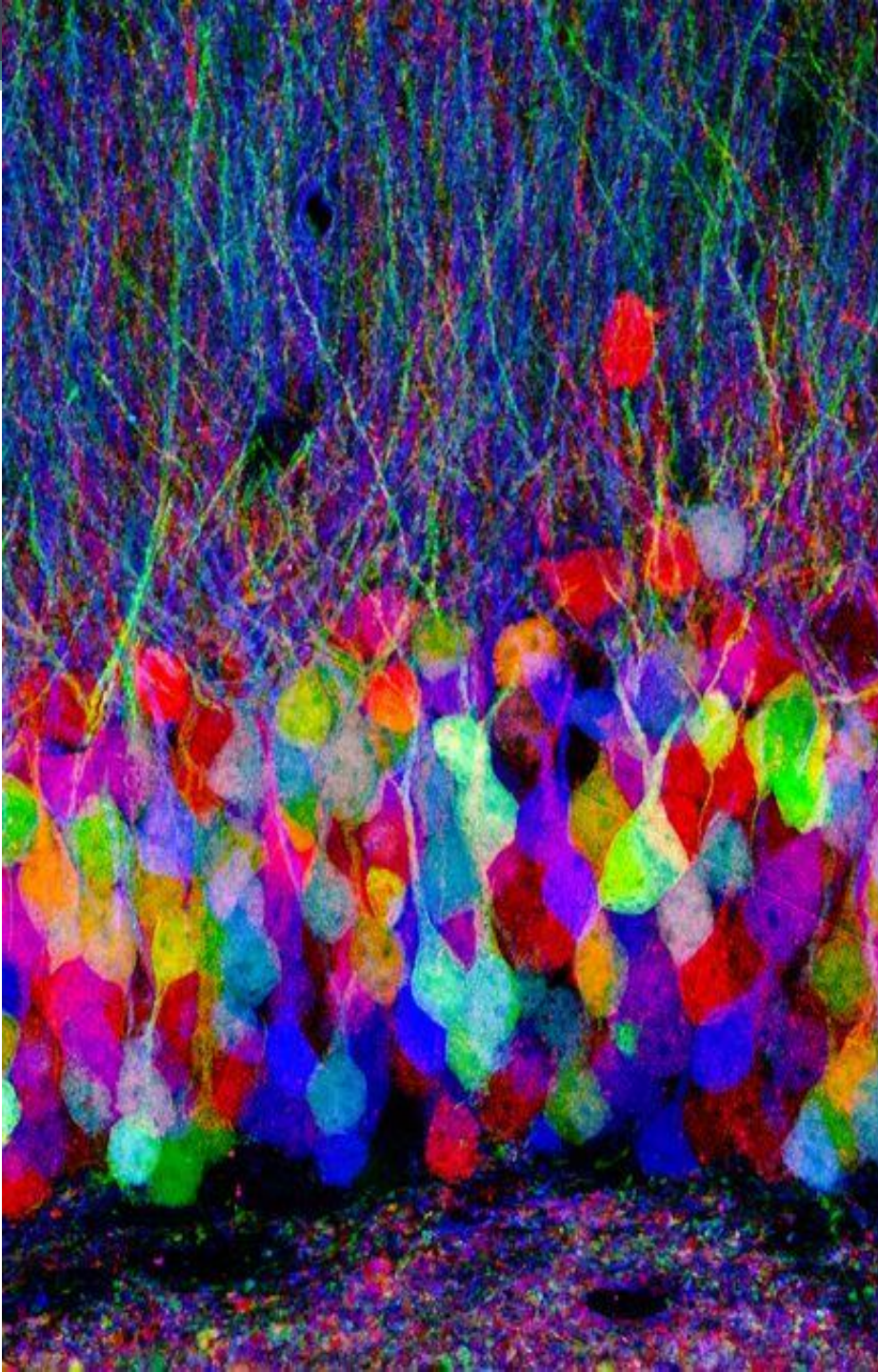












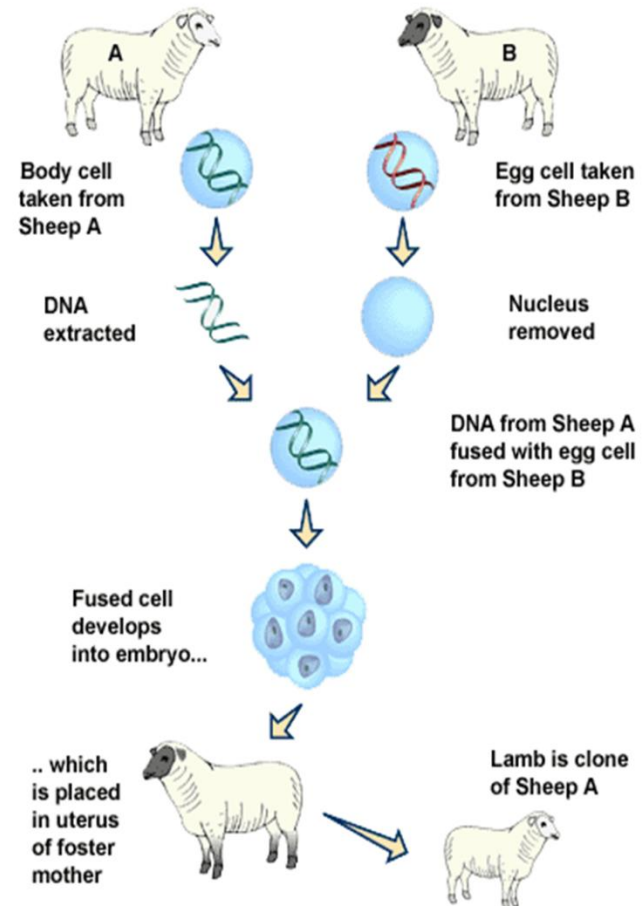
Left: Brain Cells

Below: Bacteria



# Cloning

- **Clone**- a member of a group of genetically identical cells.
- May be produced by **asexual reproduction** (mitosis).
- A **body cell** from one organism and an **egg cell** from another are fused.
- The resulting cell **divides like a normal embryo**.
- Cloning may have uses in preserving endangered species and may become a viable tool for reviving extinct species.





# Cloning “Dolly”

- Female domestic sheep, and the first mammal to be cloned from an adult somatic cell, using the process of nuclear transfer.
- Life expectancy for a domestic sheep is 11-12 years, but Dolly only lived 6.5 years .
- On 14 February 2003, Dolly was euthanized because she had a progressive lung disease (later discovered as cancerous) and severe arthritis or all joints.



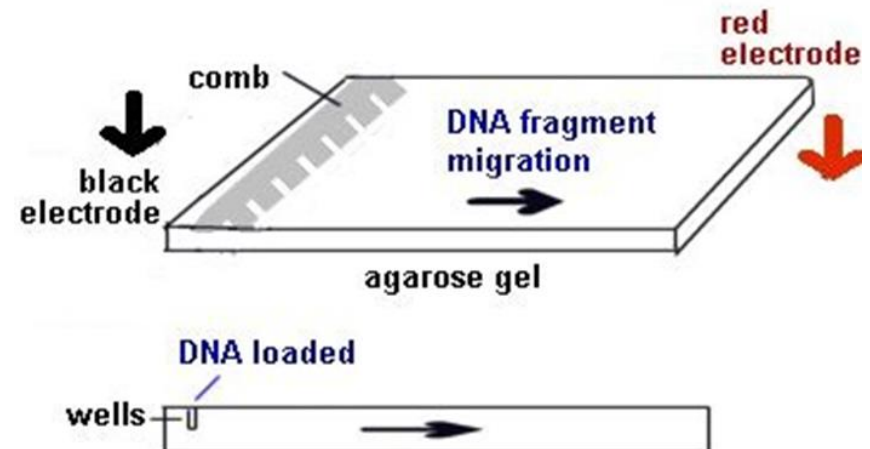
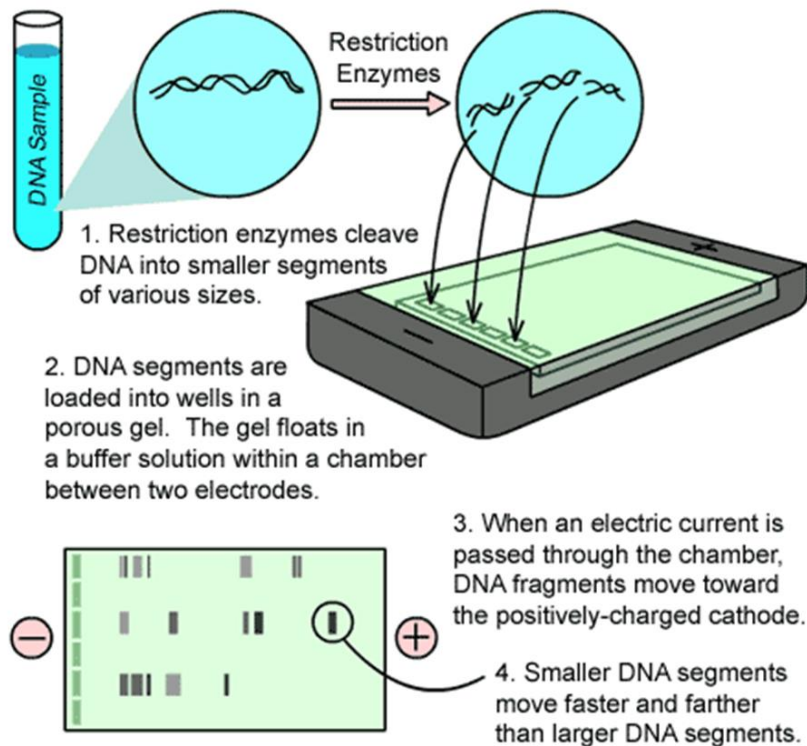




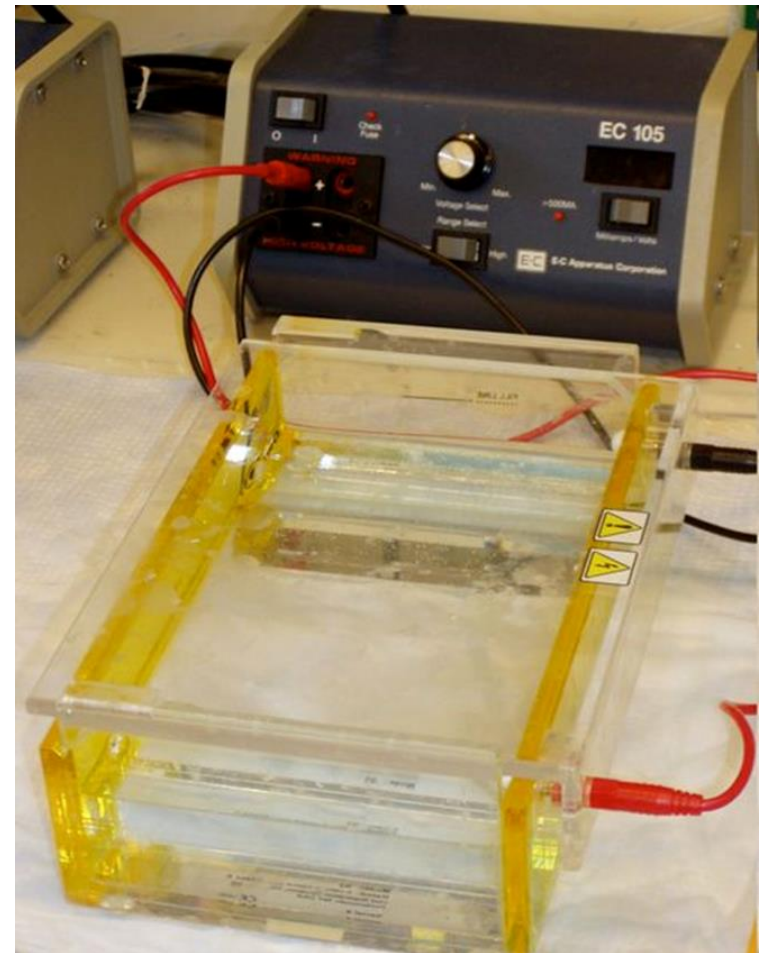
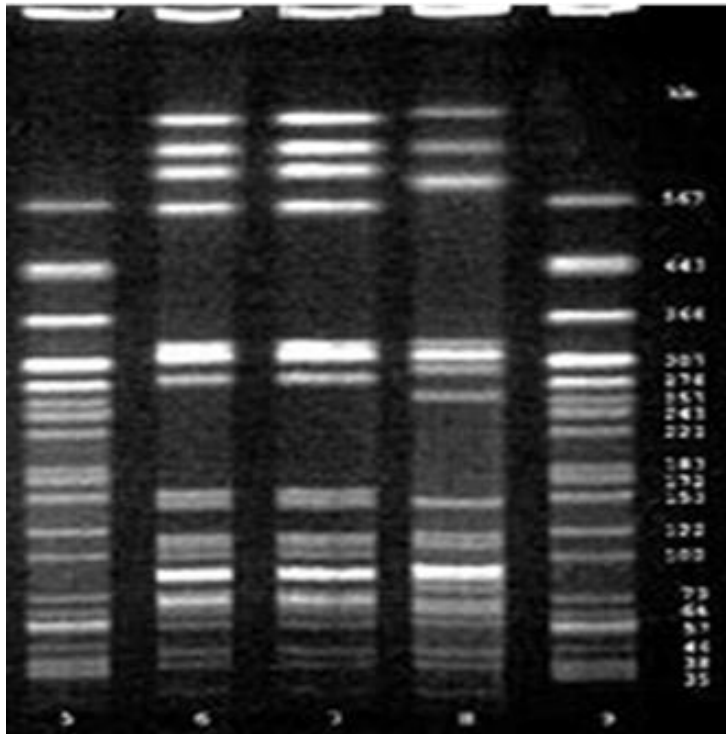
# Gel Electrophoresis

- DNA can be separated based on **size and charge**.
- The **phosphate groups** are **negatively** charged.
- DNA is placed in a **gel** and electricity is run through.
- **Negative DNA** moves toward the positive end.
- **Smaller** fragments move farther and faster.

# Gel Electrophoresis

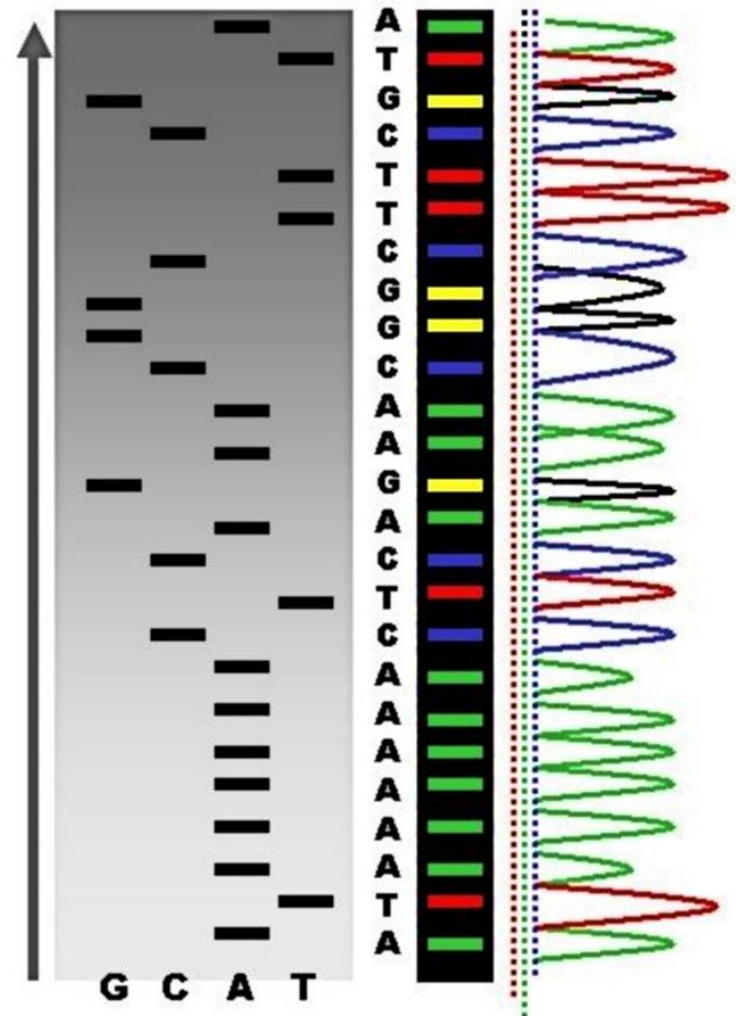


# Gel Electrophoresis



# DNA Sequencing

- The process of determining the precise order of nucleotides within a DNA molecule.
- It includes any method or technology that is used to determine the order of the four bases—adenine, guanine, cytosine, and thymine—in a strand of DNA.
- The first method for determining DNA sequences involved a location-specific primer extension strategy established by Ray Wu at Cornell University in 1970.





# Human Genome Project

- Started in 1990.
- Research effort to sequence all of our DNA (46 chromosomes).
- Over 3.3 billion nucleotides.
- Mapping every gene location (loci).
- Conducted by scientists around the world.

# Human Genome Project

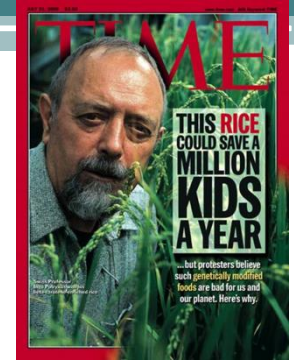
- Only 2% of human genome codes for proteins (exons).
- Other 98% (introns) are non-coding. Only about 20,000 to 25,000 genes.
- Proteome - organism's complete set of proteins.
- About 8 million single nucleotide polymorphisms (SNP) - places where humans differ by a single nucleotide.
- About 1/2 of genome comes from transposons (pieces of DNA that move to different locations on chromosomes).

# Biotechnology

- The use of living systems and organisms to develop or make useful products.
- Any technological application that uses biological systems, living organisms or derivatives thereof, to make or modify products.



# Biotechnology Breakthroughs



- **Insulin (1982)**
  - First commercial biotech product
  - Reliable, inexpensive source of insulin
- **Rice**
  - Enriched with beta-carotene and iron
- **Bananas**
  - Containing edible hepatitis vaccine
- **Potatoes** with higher solid content
- **Garlic** that lowers cholesterol
- **Fruits and vegetables** that reduce risks of cancer and heart disease



Taking it to FAR?

**WHAT'S THE FDA  
TRYING TO FEED US?**



**STOP GENETICALLY  
ENGINEERED FOODS!**



# Human Benefits to DNA Technology

- Biotechnology Provides:
  - Improved **food** products
  - **Medical** advances
  - An enhanced **environment**