SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: 19GET277 – Biology for Engineers

IV Year : VII Semester

UNIT III – GENETICS AND IMMUNE SYSTEM

Topic : Variation and speciation-nucleic acids as a genetic material-

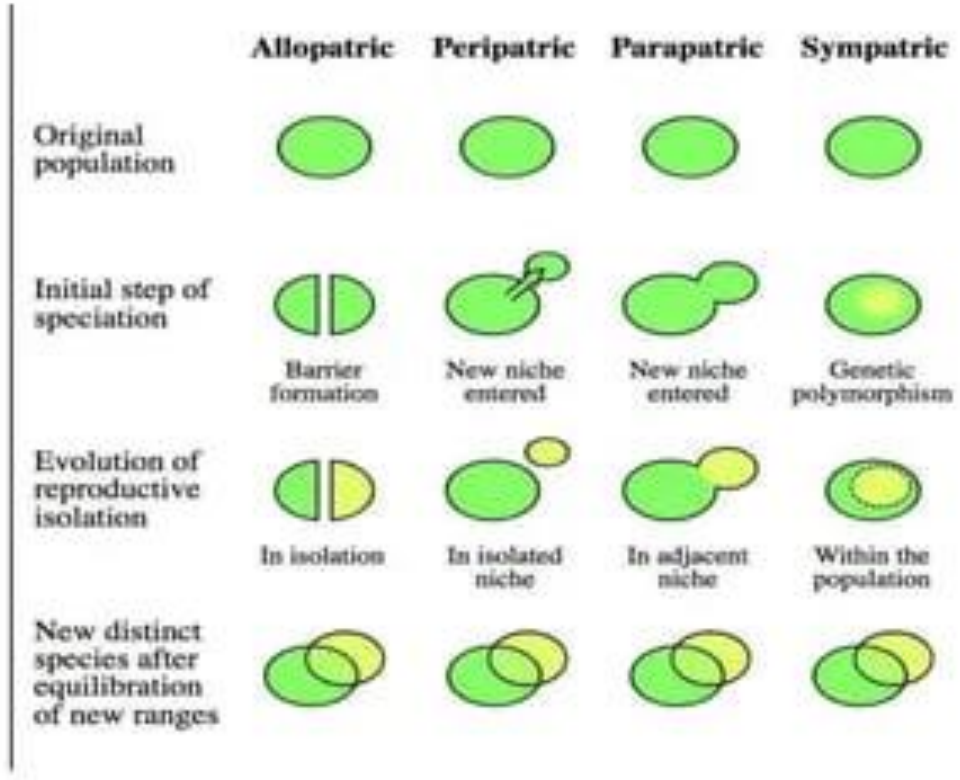
Introduction to Variation and Speciation

- **Variation**: Genetic differences within and among populations, the raw material for evolution.
- **Speciation**: The formation of new species from existing ones, driven by genetic variation, natural selection, and isolation mechanisms.
- **Types of Variation**: Continuous (e.g., height) and Discontinuous (e.g., blood type).

examples of variation within a species (e.g., different beak sizes in Darwin's finches).

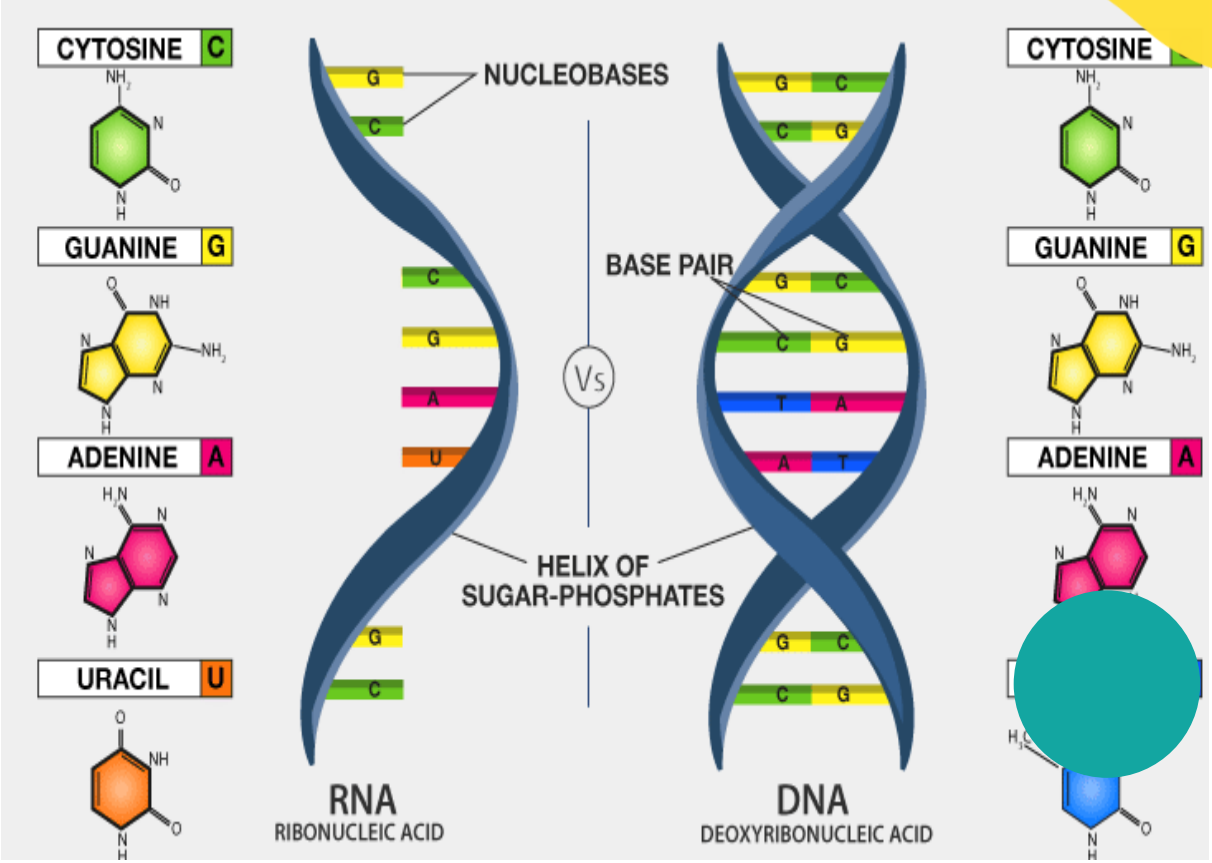
Mechanisms of Speciation

- **Allopatric Speciation**: Occurs when populations ar geographically isolated, leading to the accumulation of genetic differences.
- **Sympatric Speciation**: Speciation without geographic isolation, often due to genetic mutations or behavioral changes.
- **Role of Genetic Variation**: Mutation, recombinatior and genetic drift lead to genetic differences, which over time can result in speciation.



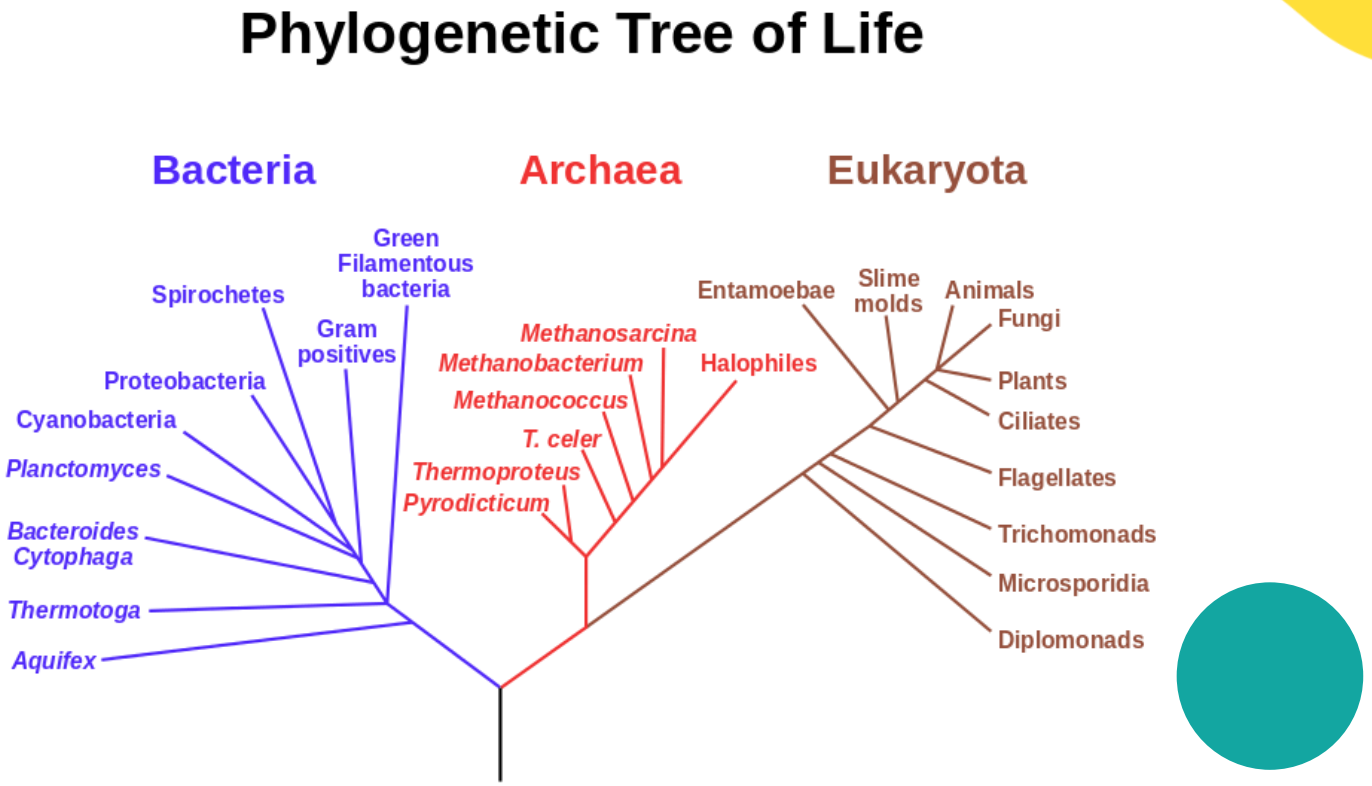
Nucleic Acids as Genetic Material

- **DNA and RNA**: Nucleic acids are the molecules that carry genetic information. DNA stores genetic information, while RNA plays various roles in gene expression.
- **Griffith's Experiment (1928)**: Showed that genetic material could be transferred between organisms (bacteria), laying the groundwork for understanding DNA as the genetic material.
- **Avery, MacLeod, and McCarty (1944)**: Demonstrated that DNA, not protein, is the substance responsible for heredity.



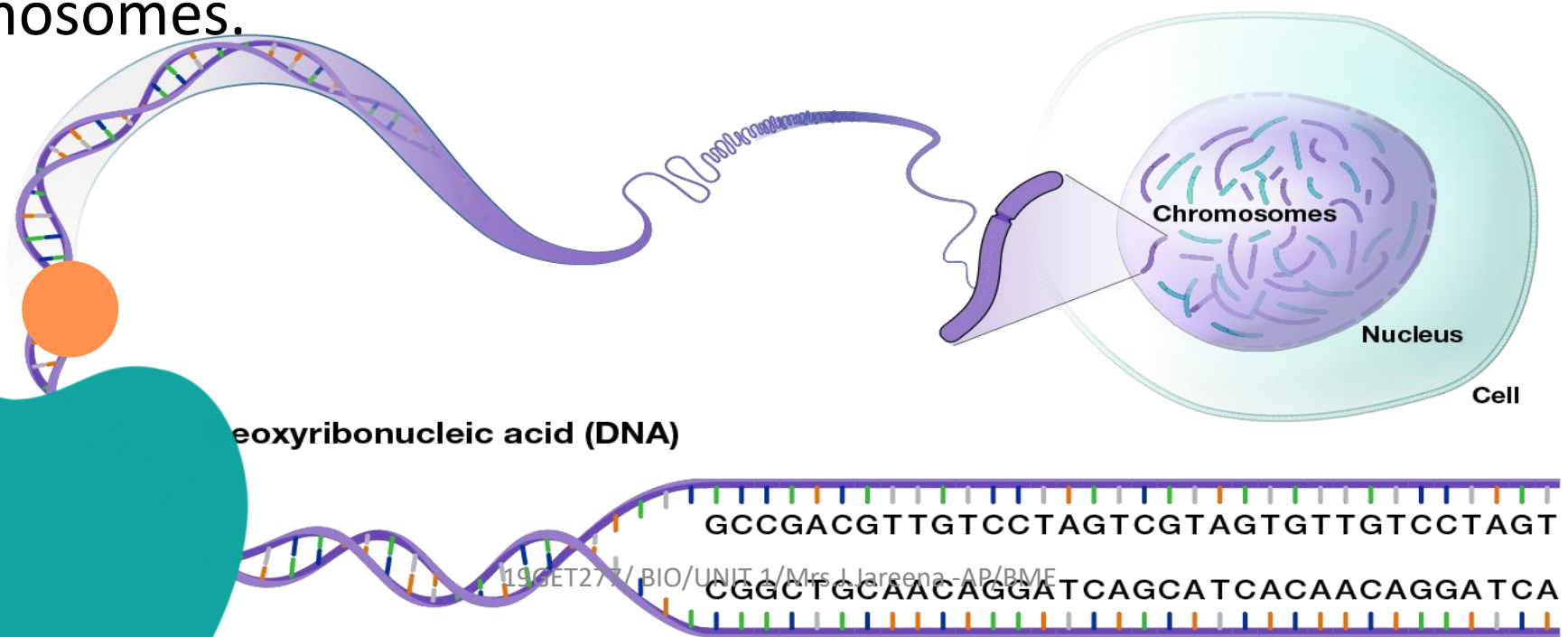
DNA and Evolutionary Processes

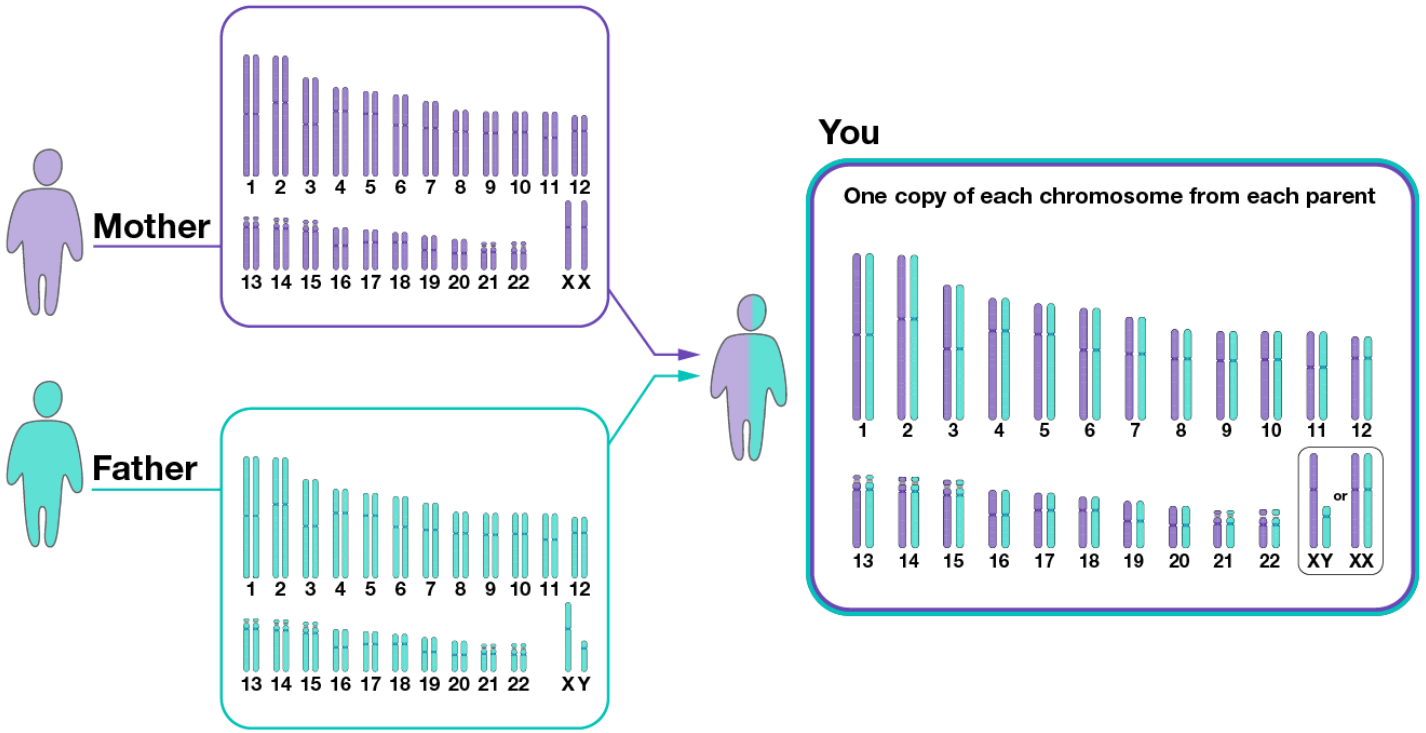
- **Role of DNA in Variation**: Mutations in DNA lead to genetic variation, which is crucial for evolution and speciation.
- **Evidence of DNA's Role in Evolution**: Comparative genomics shows similarities and differences in DNA sequences across species, providing insight into evolutionary relationships.
- **Natural Selection and Mutation**: Beneficial mutations are selected for, driving adaptation and eventually speciation.



Genome

- A genome is the complete set of DNA instructions found i y ce DNA is made of four different chemicals (called nucleotides or bases), each represented by a different letter: adenine (A), thymine (T), cytosine (C) and guanine (G). The order of these letters (i.e., the DNA sequence) encodes the information that instructs each cell what to do and when to do it. The genome's DNA is packed into structures called chromosomes.





A person's genome consists of 23 pairs of chromosomes. One copy of each chromosome is inherited from each parent. For example, chromosomes from the depicted mother are labeled in purple, and chromosomes from the depicted father are labeled in teal. The X and Y chromosomes are known as sex chromosomes. Although there are exceptions, biological females have two X chromosomes (denoted XX) and biological males have one X chromosome and one Y chromosome (denoted XY).