

# Microbial Taxonomy

- **Taxonomy:** Is defined as the science of biological classification.
- It consists of 3 separate but interrelated parts:
  1. Classification
  2. Nomenclature
  3. Identification
- Once a classification scheme is selected, it is used to group organisms into groups called “taxa” based on mutual similarity.

## **NOMENCLATURE:**

- It is the branch of taxonomy concerned with the assignment of names to taxonomic groups in agreement with published rules.

# IDENTIFICATION

- It is the practical side of taxonomy, the process of determining if a particular isolate belongs to a recognized taxon.

# SYSTEMATICS

- This term is often used for taxonomy.
- Many taxonomists define systematics as “ The scientific studies of organisms with the ultimate object of characterizing and arranging them in an orderly manner.”
- Thus it encompasses disciplines such as ‘morphology’, ‘ecology’, ‘epidemiology’, ‘biochemistry’, ‘molecular biology’ and ‘physiology’.

- One of the oldest classification systems was the “ the natural classification”.
- It included arrangement of organisms into groups whose members share many characteristic and reflect as much as possible the biological nature of the organism.
- **CAROLUS LINNAEUS** developed the first natural classification, based largely on anatomical characteristics, in the mid 18<sup>th</sup> Century.
- In practice, the determination of the genus and the species of a newly discovered prokaryote is based on polyphasic taxonomy.
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- It includes the following approaches:
  1. Phenetic classification
  2. Phylogenetic classification
  3. Genotypic classification

## **PHYLOGENETIC CLASSIFICATION**

- It groups organisms together based on the mutual similarity of their phenotypic characteristics.
- The term “phylogeny” is a Greek word where phylon=tribe or race; and genesis= generation or origin.
- It sought to compare organisms based on their evolutionary relationships.

# GENOTYPIC CLASSIFICATION

- It seeks to compare the genetic similarity between organisms by comparing either individual genes or whole genomes.

## **Bergey's Manual: Classifying and Identifying Prokaryotes**

### **1. Bergey's Manual of Determinative Bacteriology:**

- ❖ Provides identification schemes for identifying bacteria and archaea.
- ❖ Morphology, differential staining, biochemical tests.

### **2. Bergey's Manual of Systematic Bacteriology:**

- ❖ Provides phylogenetic information on bacteria and archaea
- ❖ Based on rRNA sequencing

- 1923, David Bergey and 4 colleagues published a classification of bacteria that could be used for identification of bacterial species:

**“THE BERGEY’S MANUAL OF DETERMINATIVE  
BACTERIOLOGY.”**

- The first edition of Bergey’s Manual of Systemic Bacteriology had its classification done on basis of phenetics; but the now present editions are based on phylogenetic studies.

- THE SECOND EDITION OF THE BERGEY'S MANUAL has the following volumes where it doesn't group all the clinically important prokaryotes together as the 1st edition does, here the pathogenic bacteria are placed phylogenetically, and so are distributed throughout in all the volumes:
- VOL.1: The Archae, and the Deeply Branching and the Phototropic Bacteria.
- VOL.2: The Proteobacteria.
- VOL.3: The Low G+C Gram positive Bacteria
- VOL.4: The High G+C Gram Positive Bacteria
- VOL.5: The Planctomycetes, Spirochaetes, Fibrobacters, Bacteroidetes, Fusobacteria, Chlamydiae, Acidobacteria, Verrucomicrobia and Dictyoglomus.