**SYSTEMS OF CLASSIFICATION**

**Binomial nomenclature**

**Carolus Linnaeus gave the system of binomial nomenclature**

Binomial nomenclature is the formal naming system for living things that all scientists use. It gives every species a two-part scientific name. The first part of a scientific name is called the genus. A genus is typically the name for a small group of closely related organisms. The second part of a scientific name is the specific epithet. It is used to identify a particular species as separate from others belonging to the same genus. Together, the genus plus the specific epithet is the full scientific name for an organism.

Binomial Nomenclature Rules

Because scientific names are unique species identifiers, they ensure that there is never any confusion as to which organism a scientist may be referring. Additionally, there are some important rules that must be followed to keep all binomial names standardized:

1. The entire two-part name must be written in italics (or underlined when handwritten).
2. The genus name is always written first.
3. The genus name must be capitalized.
4. The specific epithet is never capitalized.

**Advantages of Binomial Nomenclature:**

**Helps in Communication**

The most vital advantage of binomial nomenclature is the communicative ability. These binomials simply help in communication as these are internationally accepted and used all over the globe.

**Eradicates Confusion**

Confusion or chaos would result if same the same species is designated different names. Common (Vernacular) names can also be cumbersome at times. For example, if the same organism is known as *Escherichia coli*in one country and *Coprobacterium intestinale*in the other country serious confusion would result. Binomial nomenclature provides a same platform to the organism and eradicates the uncertainty that can arise if the same organism is studied in different countries.

**Surely Better than the Polynomials**

Binomials are far easier to remember and understand in comparison to the formerly used polynomials. Polynomials were cumbersome and they could be swayed very easily by different taxonomists around the globe. For example, The European honey bee once had a 12 part polynomial, *Apis pubescens thorace subgriseo abdomen fusco pedipus posticus glabris utrinque margine ciliatis.* In contrary to the binomial *Apis mellifera*that is far much easier to pronounce and remember.

**Descriptive**

Beside the binomials are easy to understand and remember they are descriptive as well. For example, *Thiomargarita namibiensis, Thiomargarita*meaning “Sulfur pearl” contains microscopic granular sulfur that scatter the incident light and thus providing a glowy pearl like appearance to the cell and *namibiensis* (of Namibia) depicts its specific epithet. Thus, the binomial name also provides a descriptive nature.

**Grouping and Classification**

It is through binomial nomenclature we can relate different organisms. By knowing the generic name one can access the family tree of particular organisms. For example, the genus Streptococcus contains multiple species like *Streptococcus pneumonia, Streptococcus viridians, Streptococcus vestibularis*etc.

**FIVE KINGDOM CLASSIFICATION**

 R.H Whittaker proposed the five-kingdom classification in 1969. The most common system of classification in use today is the Five Kingdom Classification. In this system all living organisms are divided into five kingdoms on the basis of:

* Structure of Cells - {prokaryotic or eukaryotic}
* Structure of Organism - {unicellular or Multicellular}
* Mode of nutrition - Photosynthesis in green plants, absorption in fungi and ingestion in animals.

The classifications of living organisms according to Whittaker into five kingdoms namely are as follows:

**KINGDOM: MONERA**

Kingdo Monera - It consists of primitive organisms. The organisms are very small and single celled. They consist of prokarytotes which includes species like the bacteria, archae bacteria, cyanobacteria and mycoplasma.  Example: bacteria.

**KINGDOM: PROTISTA**

Protista are single-celled eukaryotes and are mainlky aquatic. It includes diatoms, golden algae, euglena and protozoans like amoeba, paramoecium, plasmodium etc. They are mostly marine and photosynthetic.  Example: paramoecium

**KINGDOM: FUNGI**

Kingdom Fungi consists of network of thread-like structures called as mycelium. The bodies consist of long, thread-like structures which are called hyphae. These organisms are mostly saprophytes or parasites and also symbionts. This kingdom of fungi also includes lichens, mycorrhiza, etc.  Example: aspergillus

**KINGDOM: PLANTAE**

Kingdom Plantae are eukaryotic, mutlicellular plants, They contain chlororphyll pigment, which helps them prepare their own food by the process of photosynthesis. This kingdom includes all types of plants like herbs, shrubs, trees, flowering and non flowering plants.  Example: rose plant, mango tree, etc.

**KINGDOM: ANIMALIA**

Kingdom Animalia are heterotrophic, eukaryotic, multicellular organisms. They lack cell wall. This kingdom includes all types of animals. Example: lion, peacock, etc.



**Utility of five kingdom classification**

* Easy to read and understand
* Good way to generally organize all organisms
* The other hierarchies of the classifications of life are based on the five kingdoms, so it all fits together
* Easily trace ancestry and relationships between seemingly unrelated organisms

**Three domain classification**

The Three Domain System, developed by Carl Woese in 1990, is a system for classifying biological organisms.

The [Three Domain System](http://www.ucmp.berkeley.edu/alllife/threedomains.gif), groups organisms primarily based on differences in ribosomal [RNA](https://www.thoughtco.com/rna-373565) (rRNA) structure. Ribosomal RNA is a molecular building block for [ribosomes](https://www.thoughtco.com/ribosomes-meaning-373363).

 It shows how different kingdoms are related to each other. It also explains archaebacteria much better. Under this system, organisms are classified into three domains and [six kingdoms](https://www.thoughtco.com/six-kingdoms-of-life-373414). The domains are **Archaea**, **Bacteria**, and **Eukarya**. The kingdoms are **Archaebacteria** (ancient bacteria), **Eubacteria** (true bacteria), **Protista**, **Fungi**, **Plantae**, and **Animalia.**

### ARCHAEA DOMAIN

This domain contains single-celled organisms known as Archaebacateria. [Archaeans](https://www.thoughtco.com/archaea-373417) have [genes](https://www.thoughtco.com/genes-373456) that are similar to both [bacteria](https://www.thoughtco.com/bacteria-shapes-373278) and [eukaryotes](https://www.thoughtco.com/what-are-cells-373361). Like bacteria, Archaea are [prokaryotic organisms](https://www.thoughtco.com/prokaryotes-meaning-373369). These are organisms that do not have a membrane bound [nucleus](https://www.thoughtco.com/the-cell-nucleus-373362).

 Archaea differ from bacteria in [cell wall](https://www.thoughtco.com/cell-wall-373613) composition and differ from both bacteria and eukaryotes in [membrane](https://www.thoughtco.com/cell-membrane-373364) composition and [rRNA](https://www.thoughtco.com/rna-373565) type. Archaeans are [extreme organisms](https://www.thoughtco.com/extremophiles-extreme-organisms-373905) that live under some of the most extreme environmental conditions. This includes within hydrothermal vents, acidic springs, and under Arctic ice.

**1.**[**Methanogens:**](http://methanogens.pdx.edu/)“methane-makers”
Use only CO2, H and N to produce energy to live, and as a result give off methane gas. Live in swamps, marshes, gut of cattle, termites, etc. **Methanococcus jannaschii**, isolated from the deep sea Alvin probe, was the first Archaean whose genome was sequenced. Methanogens are decomposers; and can be used in sewage treatment. Methanogens may someday be used to produce methane as fuel!

**2.**[**Extreme Halophiles**](http://pasteur.bio.geneseo.edu/)**:**“salt lovers”
Require an environment as salty or even10x saltier than ocean water. Some prefer up to 30% salt concentrations! These bacteria live in the Dead Sea, the Great Salt Lake, salt evaporation ponds.

**3.**[**Extreme Thermophiles:**](http://members.eb.com/bol/topic?eu=121718&sctn=1#s_top) “heat / cold lovers”
Prefer temperatures above 60 degree C (up to 110 degree C for hyperthermophiles!) or near or below freezing. (Some thermophiles will die at roon temperature).
Thermophiles live in hot sulfur springs, [Yellowstone Park](http://whyfiles.org/022critters/hot_bact.html), deep sea hydrothermal vents “black smokers”, geothermal power plants. Also live in ocean waters around Antarctica, under the polar ice caps, etc. Thermus aquaticus and Pyrococcus furiosis and two species.

### BACTERIA DOMAIN

Bacteria are classified under the Bacteria Domain. [Bacteria](https://www.thoughtco.com/surprising-things-you-didnt-know-about-bacteria-373277) have a unique cell wall composition and rRNA type. They are grouped into five main categories:

* **Proteobacteria:**Phylum with the largest group of bacteria. Includes [*E.coli*](https://www.thoughtco.com/e-coli-bacteria-373281), [*Salmonella*](https://www.thoughtco.com/antibiotics-defined-373274), *[Heliobacter pylori](https://www.thoughtco.com/extremophiles-extreme-organisms-373905)*,  and [*Vibrio*](https://www.thoughtco.com/bacteria-shapes-373278) bacteria.
* [Cyanobacteria](https://www.thoughtco.com/all-about-photosynthetic-organisms-4038227): These bacteria are capable of [photosynthesis](https://www.thoughtco.com/photosynthesis-373604). They are also known as blue-green algae because of their color.
* **Firmicutes:**Gram-positive bacteria including [Clostridium](https://www.thoughtco.com/dangerous-superbugs-373522), Bacillus, and mycoplasmas (bacteria without cell walls).
* **Chlamydiae:** These parasitic [bacteria reproduce](https://www.thoughtco.com/bacterial-reproduction-373273) inside their host's cells. Organisms include Chlamydia trachomatis (causes chlamydia STD) and Chlamydophila pneumoniae (causes [pneumonia](https://www.thoughtco.com/scary-diseases-caused-by-bacteria-373276)).
* **Spirochetes:**These corkscrew-shaped bacteria exhibit a unique twisting motion. Examples include Borrelia burgdorferi (cause Lyme disease) and Treponema pallidum (cause syphilis).

### EUKARYA DOMAIN

The Eukarya domain includes [eukaryotes](https://www.thoughtco.com/what-are-cells-373361), or organisms that have a membrane bound nucleus. This domain is further subdivided into the kingdoms Protista, Fungi, Plantae, and Animalia. Eukaryotes have rRNA that is distinct from bacteria and archaeans. [Plant](https://www.thoughtco.com/parts-of-a-flowering-plant-373607) and [fungi](https://www.thoughtco.com/interesting-facts-about-fungi-373407) organisms contain [cell walls](https://www.thoughtco.com/cell-wall-373613) that are different in composition than bacteria.

Eukaryotic cells are typically resistant to antibacterial [antibiotics](https://www.thoughtco.com/antibiotics-defined-373274). Organisms in this domain include protists, fungi, plants, and animals. Examples include [algae](https://www.thoughtco.com/major-types-of-algae-373409), [amoeba](https://www.thoughtco.com/the-life-of-an-amoeba-4054288), fungi, molds, yeast, ferns, mosses, [flowering plants](https://www.thoughtco.com/parts-of-a-flowering-plant-quiz-4072124), sponges, [insects](https://www.thoughtco.com/top-bugs-that-feed-on-humans-373908), and [mammals](https://www.thoughtco.com/mammal-species-373504).