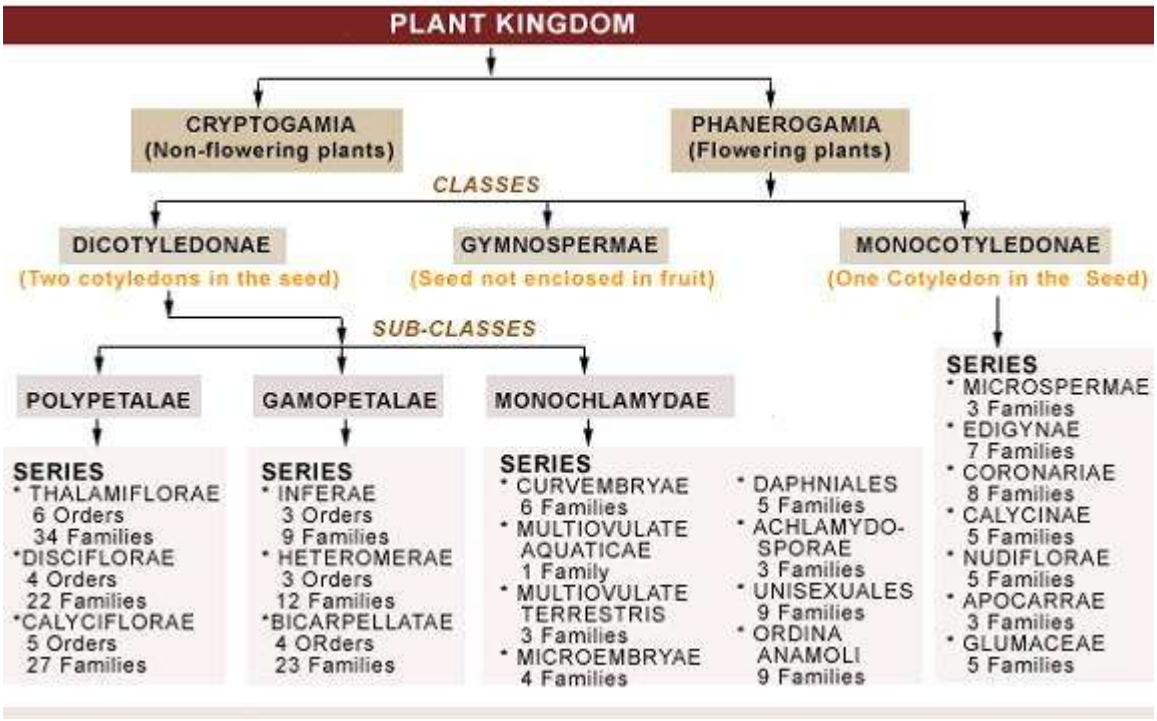
Bentham and Hooker’s system of classification

George Bentham and Joseph Dalton Hooker - Two English taxonomists who were closely associated with the Royal Botanical Garden at Kew, England have given a detailed classification of plant kingdom, particularly the angiosperms.

They gave an outstanding system of classification of phanerogams in their Genera Plantarum which was published in three volumes between the years 1862 to 1883. In the Genera Plantarum they named described and classified 97,205 species of flowering plants. They grouped these species into 202 orders (now called as families). Every genus was described with the help of herbaria. So they provided all the information about all genera known at that time. It is a natural system of classification based on de Candolle’s and Jussieu’s systems.

In the classification system key characters have been listed for each of the families. These key characters enable the students of taxonomy to easily identify and assign any angiosperm plant to its family.

Bentham and Hooker have grouped advanced, seed bearing plants into a major division called Phanerogamia. This division has been divided into three classes namely:



They were able to provide distinct diagnostic key characters to each of these families. This is the reason for the popularity of Bentham and Hooker's classification particularly amongst the taxonomists.

1. DICOTYLEDONS – 2 cotyledons

1.1. POLYPETALAE – petals separate

1) THALAMIFLORAE – Sepals, Petals and Stamens all attached to Thalamus.

a) Ranales – Gynoecium apocarpous.

ANNONACEAE

2) DISCIFLORAE – Ovary superior, immersed in disk of flower.

a) Geraniales – Stamens are attached to the disk.

MELIACEAE

3) CALYCIFLORAE – Thalamus is cup shaped. Stamens fused to Calyx of flower

b) Myrtales – Ovary syncarpous; usually inferior.

MYRTACEAE

1.2. GAMOPETALAE – petals fused

1) INFERAE – Ovary inferior; stamen no. = petal no.

a) Rubiales – Stamens epipetalous; locules 2-many; ovules 1-many.

RUBIACEAE.

3) BICARPELLATAE – Ovary superior, with 2 carpels.

a) Gentianales – Corolla regular; leaves opposite.

ASCLEPIADACEAE

b) Polemoniales – Corolla regular; leaves alternate.

114. SOLANACEAE.

1.3. MONOCHLAMYDEAE – only 1 kind of perianth

Unisexulaes- Flowers unisexual.

EUPHORBIACEAE

2. MONOCOTYLEDONS – 1 cotyledon.

Coronarieae- Corolla-like flowers

LILIACEAE

class	Subclass	series	Characters	Other groups
I.Dicots	1. Polypetalae	1) Thalamiforae	Embryo with two cotyledons calyx and corolla present petals free. 1) Thalamus prominent 2) Sepals separate free from ovary 3) Ovary superior	3 series 6 orders 34 families
		2) Disciflorae	1) Disc below the ovary. 2) Ovary superior 3) Stamens definite in number inserted upon or at the inner base of the disc.	4 orders 21 families
		3) Calyciflorae	1) Sepals united 2) Ovary Epigynous	5 orders 27 families
	II. Gamopetalae	1) Inferae	1) Calyx and corolla present. 2) Petals are united. 3) Flowers are epigynous 4) Ovary inferior	3 order 9 families
		2)Heteromerae	Ovary superior carpels more than 2	3 orders 12 families

		3)Bicarpellatae	Ovary superior carpel's 2	4 orders 24 families
	III Monochlamydeae		only one whorl of perianth petals absent	8 series 36 families
II Gymnosperms	-	-	Ovaries naked (not enclosed by Ovary)	3 families 1.Gnetaceae 2. Coniferae 3.Cycadaceae
III Monocots	-		Embryo with single cotyledon	No orders 7 series 34 families

Merits and demerits of Bentham and Hooker's classification of plants

Merits

1. Bentham and Hooker's classification of plants act as natural system with practical utility and based on the study of actual specimens. 2. Popularly being adopted in several herbaria. 3. Recognition of Gymnosperms as a separate group. 4. Placing the highly evolved Monocotyledons at the end. 5. Placing Gamopetalae after Polypetalae. 6. Creating a new series Disciflorae. 7. Arranging the polypetalous families in an evolutionary sequence from hypogynous condition to epigynons condition. 8. Treating the primitive Ranales as the first order in Dicotyledons. 9. Placing the unisexual families after the bisexual families in Monochlamydeae and Monocotyledons. 10. Best system for easy identification of plants.

Demerits

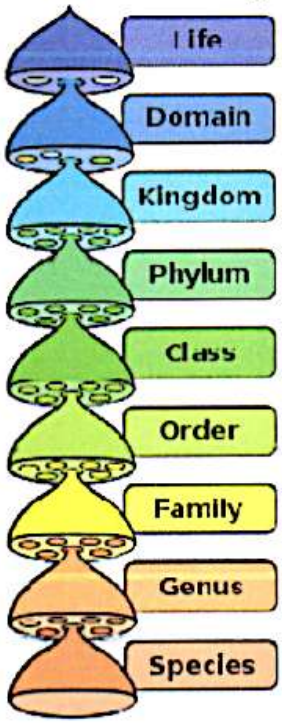
1. Anomolous position of Gymnosperms in between dicots and monocots. 2. Artificial grouping of Monochlamydeae based on a single character. 3. Monochlamydeae and Monocotyledons are not divided upto order level. 4. Improper placement of highly advanced families like Asteraceae and orchidaceae. 5.In the group Gamopetalae placing the series Inferae in which the families contain epigynous flowers, before the series Heteromerae and Bicarpellatae in which the families contain hypogynous flowers.

Acronym for species classification in Biology

Domain = Dumb
Kingdom= Kids
Phylum= Prefer
Class = Candy
Order = Over
Family = Fresh
Genus = Green
species= salad*

K-P-C-O-F-G-S is an abbreviation of how species are classified in biology

* Note that species is lower case



6 kingdoms

Plants
Animals
Archaebacteria - no O_2
Eubacteria - single celled
Fungi - mushrooms, mold
Protists - slime mold algae

The Six Kingdoms

When Linnaeus developed his system of classification, there were only two kingdoms, **Plants and Animals**. But the use of the microscope led to the discovery of new organisms and the identification of differences in cells. A two-kingdom system was **no** longer useful.

Today the system of classification includes six kingdoms.

The Six Kingdoms:
Plants, Animals, Protists, Fungi, Archaebacteria, Eubacteria.
How are organism placed into their kingdoms?

- Cell type, complex or simple
- Their ability to make food
- The number of cells in their body

Plants

You are probably quite familiar with the members of this kingdom as it contains all the plants that you have come to know - flowering plants, mosses, and ferns. Plants are all **multicellular** and consist of complex cells.

With over 250,000 species, the plant kingdom is the second largest kingdom. Plant species range from the *tiny* green mosses to *giant* trees.

In addition plants are **autotrophs,** organisms that make their own food.

Without plants, life on Earth would not exist! Plants feed almost all the heterotrophs (organisms that eat other organisms) on Earth. Wow!

Animals

The animal kingdom is the largest kingdom with over ***1 million known species***.

Sumatran Tiger - Kingdom: Animalia, Phylum, Chordata, Class Mammalia, Order Carnivora, Family Felidae, Genus *Pathera*, Species *tigris*

All animals consist of many complex cells. They are also heterotrophs.

Members of the animal kingdom are found in the most diverse environments in the world.

Archaebacteria

In 1983, scientists tool samples from a spot deep in the Pacific Ocean where hot gases and molten rock boiled into the ocean form the Earth's interior. To their surprise they discovered unicellular (one cell) organisms in the samples. These organisms are today classified in the kingdom, **Archaebacteria.**

Archaebacteria are found in extreme environments such as hot boiling water and thermal vents under conditions with no oxygen or highly acid environments.

Finding Archaebacteria: *The hot springs of Yellowstone National Park, USA, were among the first places Archaebacteria were discovered. The biologists pictured above are immersing microscope slides in the boiling pool onto which some archaebacteria might be captured for study.*

Eubacteria

Like archaebacteria, eubacteria are complex

and single celled. Most bacteria are in the **EUBACTERIA** kingdom. They are the kinds found everywhere and are the ones people are most familiar with.

Eubacteria are classified in their own kingdom because their chemical makeup is different.

Most eubacteria are helpful. Some produce vitamins and foods like yogurt. However, these eubacteria, Streptococci pictured above, can give you strep throat!

Fungi

Mushrooms, mold and mildew are all examples of organisms in the kingdom **fungi.**

Most fungi are **multicellular** and consists of many complex cells.

Fun Facts about Fungi

Some fungi taste great and others can kill you!

*Fungi are organisms that biologists once confused with plants, **however, unlike plants, fungi cannot make their own food.** Most obtain their food from parts of plants that are decaying in the soil.*

Protists

Slime molds and algae are protists. Sometimes they are called the odds and ends kingdom because its members are so different from one another. **Protists** include all

microscopic organisms that are ***not*** bacteria, ***not*** animals, ***not*** plants and ***not*** fungi.

Most protists are **unicellular.** You may be wondering why those protists are not classified in the Archaebacteria or Eubacteria kingdoms.

It is because, unlike bacteria, protists are complex cells.

These delicate looking diatoms are classified in the protist kingdom.