CLASSIFICATION OF GYMNOSPERMS

- Classification are merely the opinion of different authors gave time from time to time. Classification of gymnosperm is in topsy turvey state (disorder, confused or disorganised state). A number of classification has been prepared but there is unanimity in them, i.e., they all agree about something or all vote for the same thing.
THEOPHARASTUS
(370-285 B.C)

• The term “GYMNOSPERM” was first used by Theophrastus. He wrote a books “HISTORIA PLANTARUM” and “ENQUIRY INTO PLANTS”. In these books he mentioned “GYMNOSPERM” and “ANGIOSPERM”.

THEOPHARASTUS
Further analysis was made by Robert Brown in 1827. He for the first time recognized gymnosperms as a group distinct from Angiosperms due to presence of naked ovules.
BENTHAM AND HOOKER (1862-83)

- Bentham and Hooker considered Gymnosperms equivalent to dicotyledons and monocotyledons. They divided them into three groups as -
  - Cycadaceae
  - Gnetaceae
  - Coniferae
- They placed them in between dicots and monocots.
Eichler (1883), considered gymnosperms as one of the two divisions under Phanerogamae. The second division being Angiospermae. Eichler (1889) classified the seed plants as:

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  Phanerogamae
    Gymnospermae
      cadaceae
      Cordaitaceae
    Angiospermae
      Coniferae
      Gnetaceae
        Pinioidae
          Abietineae
          Cupressineae
        Taxoideae
          Taxeae
          Podocarpineae
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ADOLF ENGLER (1889)

- Adolf Engler, after the discovery of motile sperms in this genus (Hirase 1896), Engler created a new class Ginkgoales for the genus Ginkgo & its fossil representatives.
On the basis of Hofmeister work (1851), on the development & embryology of diverse plants, Van Tieghem remove gymnosperm from this intermediate position & place them as one of two primary division of spermophyta:

1. Gymnosperm (Astigmatic)
2. Angiosperm (Stigmatic).

Van Tieghem treated Gymnosperms as one of the sub-division of Spermatophyta. To accommodate the fossil members subsequently three more classes were created-

- Pteridospermae
- Cordaitales
- Bennettitales
COULTER & CHAMBERLAIN (1910) ENGLER & PRANTL (1926) RENDLE (1926)
They all considered gymnosperms as a division of Spermatophyta, Phanerogamia or Embryophyta and they further divided them into **seven orders** as-

- **CYCADOFILICALES**
- **CYCADALES**
- **BENNETTITALES**
- **GINKGOALES**
- **CONIFERALES**
- **CORDAITALES**
- **GNETALES**
A.C. SEWARD (1919)

A. C. SEWARD had divided gymnosperms into two classes-

Class I - Manoxylic (wood is not compact due to the presence of well-developed pith and cortex and broad medullary rays.)

Orders-
(i) Cycadales
(ii) Cycadeoidales
(iii) Cycadofilicales

Class II - Pycnoxylic (wood is compact as pith and cortex are reduced and medullary rays are narrow.)

Orders-
(i) Cordaitales
(ii) Ginkgoales
(iii) Coniferales
(iv) Gnetales
Prof. Birbal Sahni, an eminent Indian botanist, gave for the first time a phytogenetic system for the classification of gymnosperms. On the basis of the morphological nature of the ovule bearing organs, he had given the following classification of gymnosperms:
GYMNOSPERMS

**PHYLLOSPERMAE** (seeds borne on leaves)

- Cycadofilicales
- Cycadales
- Bennettitales

**STACHYOSPERMAE** (seeds borne on stems)

- Cordaitales
- Coniferales
- Ginkgoales
- Taxales

Sahani did not place Gnetales at any where in his classification. Omission of Gnetales was greatest draw back of this classification.
Chamberlain (1935) classified gymnosperms into:

**Gymnosperms**

- **Cycadophytes**
  - Gymnosperms with fern-like pinnatifid leaves, weakly branched large globose or columnar trunks, having large conspicuously developed pith and cortical zones in stem. Secondary xylem cylinder small, composed mainly of tracheids and abundant parenchyma (manoxylic wood). Group well represented in fossil record. The only surviving representatives are the modern cycads.

- **Coniferophytes**
  - Gymnosperms with profusely branched trunks, leaves simple (needle-like, scale-like or laminate), stems with small pith and cortex. Secondary xylem cylinder massive and less parenchymatous (pycnoxylic wood). The group includes extinct as well as extant orders like:
      - Extinct
      - Extinct and living
Gymnospermae

Cycadophyta
Orders-
(i) Cycadofilicales
(ii) Cycadales
(iii) Bennettitales

Coniferophyta
Orders-
(i) Ginkgoales
(ii) Cordaitales
(iii) Coniferales
(iv) Gnetales
Arnold (1948) recognized three classes under gymnosperms.

- **Cycadophyta**
  1. Pteridospermales
  2. Cycadeoidales
  3. Cycadales

- **Coniferophyta**
  1. Cordaitales
  2. Ginkgoales
  3. Taxales
  4. Coniferales

- **Chlamydomermophyta**
  1. Ephedrales
  2. Gnetales
Prof. D.D. Pant was an excellent teacher as well as a distinguished visionary. He was the founder of a strong school of research in palaeobotany and morphology in the Department Of Botany, Allahabad University. He was fully devoted and dedicated to the cause of botany, even during his retired life. This can be well known by an incident – “He sent an advance letter to the Vice Chancellor of Allahabad University, he expressed his wish for not holding any condolence meeting at his death, so that work is not hampered”.

PROF. DIVYA DARSHAN PANT (1919-2001)-
D.D. PANT’S CLASSIFICATION OF GYMNOSPERM

Gymnosperms

Division: Cycadophyta

Plants with relatively small, usually unbranched or poorly branched aerial or subterranean trunks; leaves usually large and pinnate; stems have large pith, a thick cortex, scanty wood usually with wide medullary rays (manoxylic)

Class 1 Pteridospermopsida
Orders 1. Lyginopteridales
2. Medullosales
3. Glossopteridales
4. Peltaspermales
5. Corysostpermsales
6. Caytoniales

Class 2 Cycadopsida
Order 1. Cycadales

Class 3 Pentoxyllopsida
Order 1. Pentoxylales

Class 4 Bennettitopsida
(Order Cycadeoideopsida)
Order 1. Bennettitales
(Order Cycadeoideales)

Chlamydomespermophyta

Peculiar angiosperm-like forms

Class 1 Gaetopsida
Orders 1. Gnetales
2. Welwitschiales

Coniferophyta (Pinophyta)

Usually large sized trees, with profusely branched stems and simple leaves. Stems have small pith, narrow cortex, abundant compact wood usually with narrow medullary rays

Class 1 Coniferopsida
(Order Pinopsida)
Orders 1. Cordaitales
2. Coniferales
(Pinales)
3. Ginkgoales

Class 2 Epedropsida
Order 1. Ephedrales

Class 3 Czekanowskioipsida
Order 1. Czekanowskiales

Class 4 Taxopsida
Order 1. Taxales

Later publication suggested that separation of Taxopsida-Taxales was not valid in view of the work of Harris (1976) and others and accordingly merged this class and order with his order Coniferales (Pinales) and placed plants of this group under family Taxaceae under order Coniferales.

Sporne (1974) adopted classification of Pilger and Melchior (1954) and recognized following three classes and nine order:

1. *Cycadopsida* : Pteridospermales, Bennettitales, Pentoxylales and Cycadales

2. *Coniferopsida* : Cordaitales, Coniferales, Taxales and Ginkgoales

3. *Gnetopsida* : Gnetales
CLASSIFICATION BY GIFFORD AND FOSTER

GIFFORD
Division - Pinophyta
Class  - Ginkgopsida
Orders -
  Calamopityales
  Callistopityales
  Peltaspermales
  Ginkgoales
  Leptostrobonales
  Caytoniales
  Arberiales
  Pentoxylales
  Ephedrales
Class  - Cycadopsida
Orders -
  Lajenostomesales
  Trigonocarpaceales
  Cycadales
  Bennettitales
  Gnetales
  Welwitschiales
Class  - Pinopsida
Orders -
  Cordaianthales
  Pinales
Kramer & Green (see Kubitzki, 1990) have classified the Division Gymnosperms into two Subdivision as follows:-

Division

Gymnosperms

Subdivision

Cycadophytina

- Classes Cycadaceae
- Order Cycadales
- Families 1. Stangeriaceae
  2. Boweniaceae
  3. Cycadaceae
  4. Zamiaceae

Coniferophytina

- Gnetaleae
  1. Ephedraceae
  2. Gnetaceae
  3. Welwitschiaceae

- Ginkgoaleae
  1. Ginkgoaceae

- Pinaleae (Coniferales)
  1. Taxaceae
  2. Cephalotaxaceae
  3. Phylloccladaceae
  4. Podocarpaceae
  5. Araucariaceae
  6. Sciadopityaceae
  7. Taxodiaceae
  8. Cupressaceae
  9. Pinaceae