Preface

The **embryophytes** are the most familiar group of plants. They include gymnosperms, ferns, mosses (known as **archegoniates**) and various other **green land plants**. All are complex multicellular eukaryotes with specialized reproductive organs. With very few exceptions, embryophytes obtain their energy through photosynthesis (that is, by absorbing light); and they synthesize their food from carbon dioxide. **Embryophyta** may be distinguished from chlorophyll-using multicellular algae by having sterile tissue within the reproductive organs. Furthermore, embryophytes are primarily adapted for life on land, although some are secondarily aquatic. Accordingly, they are often called **land plants**. Embryophytes developed from complex green algae (Chlorophyta) during the Paleozoic era. Their closest living relatives are the Charales or stoneworts. These alga-like plants undergo an alternation between haploid and diploid generations (respectively called gametophytes and sporophytes). In the first embryophytes, however, the sporophytes became very different in structure and function, remaining small and dependent on the parent for their entire brief life. Such plants are informally called 'bryophytes'. They include three surviving groups:

- Bryophyta (mosses)
- Anthocerotophyta (hornworts)
- Marchantiophyta (liverworts)

All of the above 'bryophytes' are relatively small and are usually confined to moist environments, relying on water to disperse their spores. Other plants, better adapted to terrestrial conditions, appeared during the Silurian period. During the Devonian period, they diversified and spread to many different land environment, becoming the vascular plants or tracheophytes. Tracheophyta have vascular tissues or tracheids, which transport water throughout the body, and an outer layer or cuticle that resists drying out. In most vascular plants, the sporophyte is the dominant individual, and

develops true leaves, stems, and roots, while the gametophyte remains very small. . Many vascular plants, however, still reproduce using spores. They include the following extant groups:

- Lycopodiophyta (clubmosses)
- Equisetophyta (horsetails)
- Psilotophyta (whisk ferns)
- Ophioglossophyta (adders'-tongues and grape-ferns)
- Pteridophyta (ferns)

Other groups, which first appeared towards the end of the Paleozoic] era, reproduce using desiccation-resistant capsules called seeds. These groups are accordingly called spermatophytes or seed plants. In these forms, the gametophyte is completely reduced, taking the form of single-celled pollen and ova, while the sporophyte begins its life enclosed within the seed.

Some seed plants may even survive in extremely arid conditions, unlike their more water-bound precursors. The seed plants include the following extant groups:

- Cycadophyta (Cycads)
- Ginkgophyta (Ginkgo)
- Pinophyta (Conifers)
- Gnetophyta (Gnetae)
- Magnoliophyta (Flowering plants)

The first four groups are referred to as gymnosperms, since the embryonic sporophyte is not enclosed until after pollination. In contrast, among the flowering plants or angiosperms, the pollen has to grow a tube to penetrate the seed coat. Angiosperms were the last major group of plants to appear, developing from gymnosperms during the Jurassic period, and then spreading rapidly during the

Cretaceous. They are the predominant group of plants in most terrestrial biomes today.

Chapter I

GROUP ARCHEGONIATAE

The name of this group has been derived from the name of this organ (archegonium).It comprises three divisions: Bryophyta, Pteridophyta & Gymnospermae (within Spermatophyta).

GENERAL CHARACTERS OF GROUP ARCHEGONIATAE

It characterized by the following:
1-It includes both Living and fossil plants
2-The presence of a female (♀) sexual organ known as archegonium that found almost in all group member (except few Gymnosperms).
3-The presence of a male (♂) sexual organ called antheridium.
4-The members of these group–under normal conditions– have a regular alternation of heteromorphic generations throughout their life cycles in which gametophytic generation (carries archegonium and / or antheridium) alternates with sporophytic generation that produces spores.

Archegonium:

It is a flask – shaped that consists of two main parts: (1) a basic swollen fertile part known as venter that includes two unequal cells ; the larger fertile cell (egg) and a smaller elongated sterils cell (venter canal cell) (2) an upper elongated slender part known as neck that usually contains a row of cells (4-6) known as neck canal cells . The whole structure is protected by a sterile wall formed of one or more layers of cells which extend to cover the neck and venter. This archegonium may be stalked or sessile and its tip is usually covered by four special cells known as cover cells

Antheridium:

It is a stalked club– shaped structure consists of spermatogenous tissue that develops into several cubic sperm–mother cells .These cells produce slightly twisted sperms that may be biflagellated or multiflagellated . After being release from the antheridium, they swim in water and are attracted to the opend channel of archegonial neck (this phenomenon known as chemotaxis) for fertilization of the egg cell.

Life cycle and alternation of generations :

Introduction to Group Archegoniate

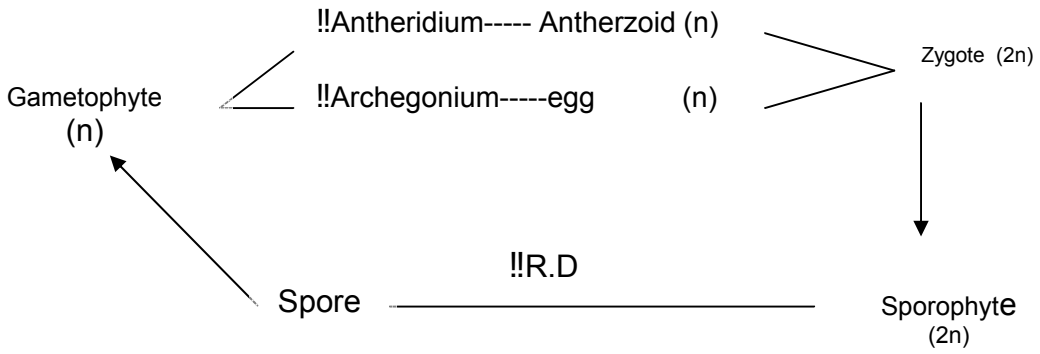
There is a regular alternation between the gamete–producing generation or gametophyte and the sporophytic generation or sporophyte. The male gametes or antherzoids swim in water searching for female gametes or egg cells where they are non- motile and borne singly in the venter of the archegonium.

At maturity of archegonium and shortly before fertilization, the neck-canal cells and venter canal cells degenerate usually from top to downwards forming a mucilaginous mass which imbibes water and swells causing separation of cover cells from one another by breaking the middle lamella of these cells. Thus narrow passage (the neck canal) is formed from the apex of the archegonium to the egg .The fusion between the two gametes results in the formation of a zygote(2n) where its nucleus contains double the number of chromosomes present in the nucleus of both antherzoid and egg. The zygote develops directly by mitotic divisions into the sporophyte which is also diploid (2n). Finally, and after meiosis, a number of non - motile spores are produced from the sporophyte. The spores germinate to give rise to haploid gametophytes. These spores may be of similar or different sizes. In the first case the plant is known as “homosporous” and “heterosporous” in the second one .

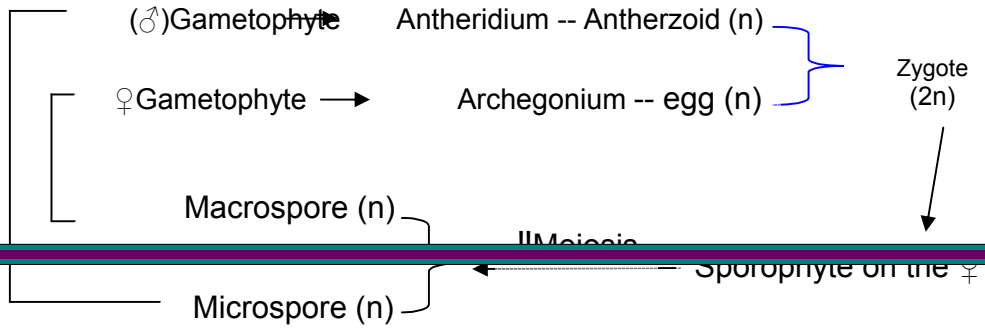
In Heterosporous type the larger spore (megaspore or macrospore) gives rise to female gametophyte and the smaller one (microspore) gives rise to male gametophyte.

One can mentioned that there are two patterns as follows

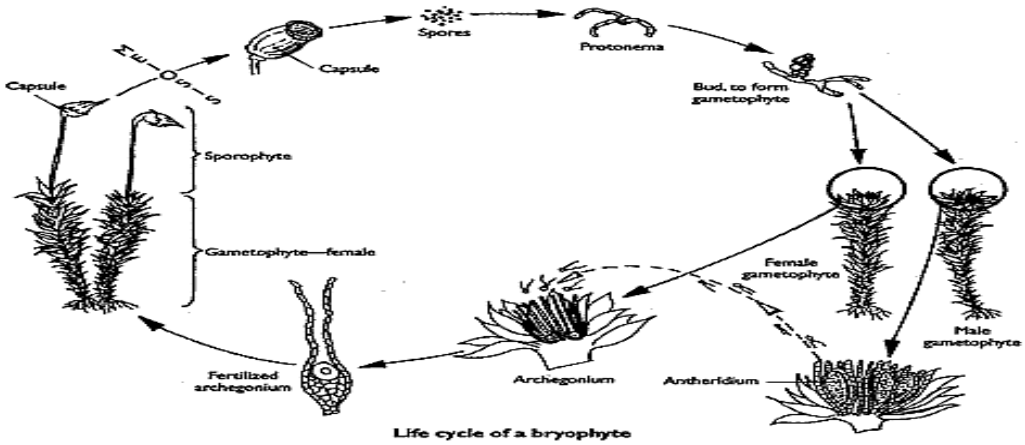
1) Homosporous (all Bryophyta and a part of Pteridophyta) and
2) Heterosporous (a part of Pteridophytes and all Gymnospermae)



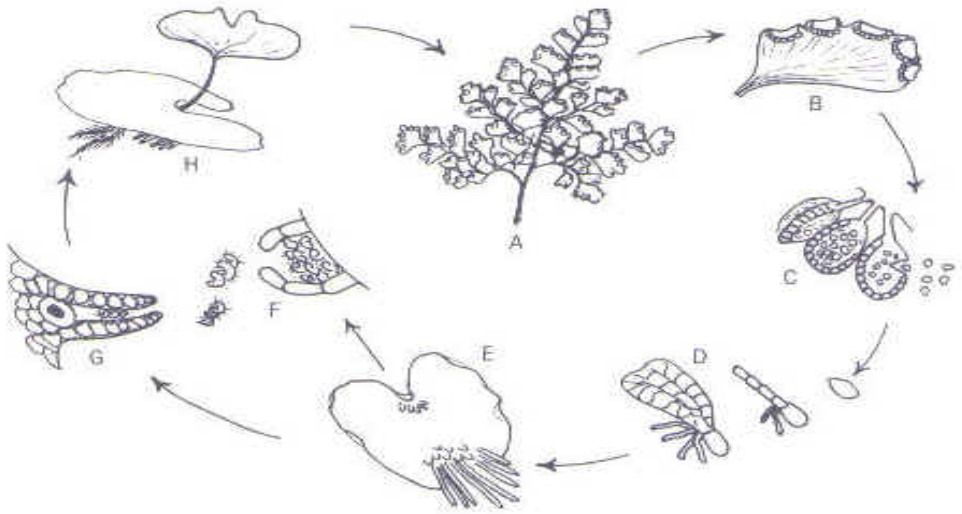
Life cycle of Bryophytes And homosporous Pteridophytes



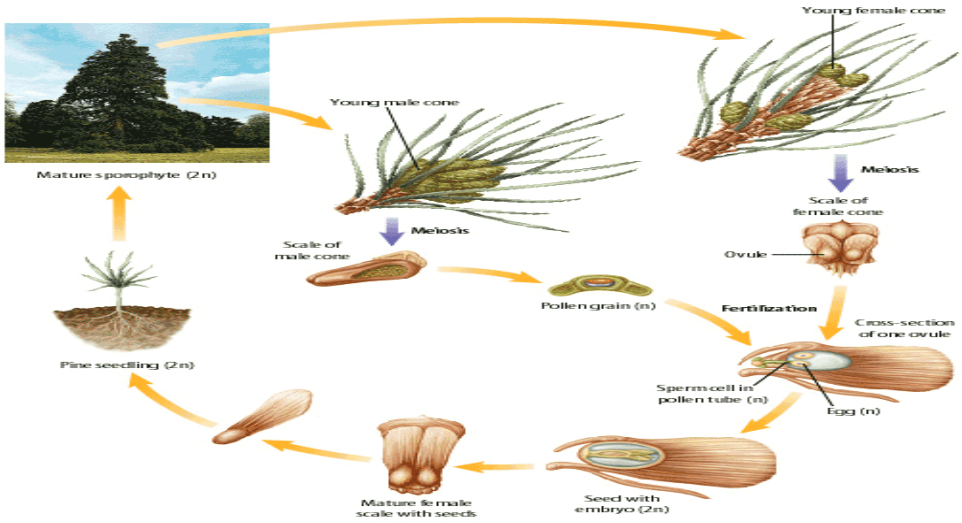
Life – Cycle of Heterosporous pteridophytes and Gymnosperms



Life cycle of a moss



Life cycle of fern



Life cycle of *Pinus*

Diagrammatic patterns of life cycles in group Archegoniate

It is worthy to mention that usually one of the two generations is dominating the other as follows :

1-In members of division Bryophyta, the gametophyte is dominant while the sporophyte is dependent upon the gametophyte through its life.

2-In members of division Pteridophyta, the mature sporophyte and the gametphyte are two independent plants. The young sporophyte (zygote) depends on the gametophytic generation and the dominant generations.

3-In members of subdivision Gymnosperms, gametophyte is very much reduced and depends upon the sporophyte.

A comparison between the three divisions of Archegoniatae group is summarized in the following table

Differences	Bryophytes	Pteridophytes	Gymnosperms
Habit of plant	- tiny or small	- Herbs or Trees	- Mainly Trees
Seed Production	-	-	+
Vascular System	-	+	+

Gametophyte **a-Thalloid**	+	+	+ ♀ is thalloid & ♂ is few cells
b- leafy	+	-	-
c- rhizoids	+	+	-
d- scales	+	-	-
e- Ciliated Sperms	+	+	- (except in few)
Sporophyte **a- rhizoids**	-	+.	-
b- roots	-	+	+
c- homosporous	+	+	-
d- Heterosporous	-	+	-
necessity of water	+	+	-