Telome Theory

Zimmerman's proposed the Telome theory or Telome concept in 1959. Thelome theory is a synthesis of informations accumalated prior to 1938. According to him, Rhynia type present a primitive vascular plant morphology that by evolution modification of its parts produce more highly evolved vascular plants with root, stem, leaves more complex vascular sys. & protected sporangia.

Acc to zimmerman, the primitive land plants originated are differentiated into readily constracted dichotomously branched marine algae and cambrian and silurion era. These ancestral type of algae develop from heteromorphic ~~after~~ alternation of generestion and vasculanization and these dichotomously become more elaborate and thus gave rise to the sporophytic plant body of primitive vasculanised plant such as Psilophyta.

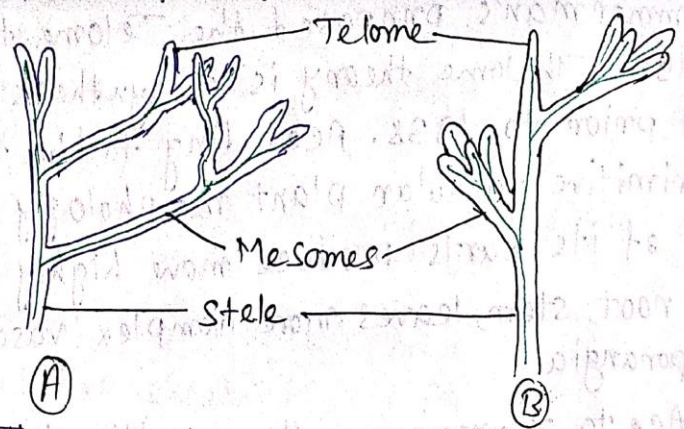
Acc to this theory sporophyte of various vascular plant group (Licopsida, Spheropsida and Filicopsida) evolved from early land plants (Psilophyta) by certain evolutionary processes.

These proceeses includes:-

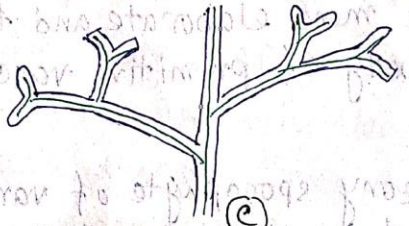
1. Overtopping
2. planation
3. syngenesis (Fusion or webbing)
4. Reduction
5. cervation

① Overtopping: In this process one branch of 2 dichotomous of a telome overgrmous the other, becomes stronger and erect forming the main axis of increased activity of the apical menistem. The other branch become short & lateral. The main axis become the stem and the overtopping branches turne from overtopping may be pseudomonopodial. Extra pollation of the overtopping process acc. by reduction of the lateral results in a branching system where there is a recognisab male stem rachis or midrib. The process of reduction of an overtopping telome truss has been used by zimmerman to

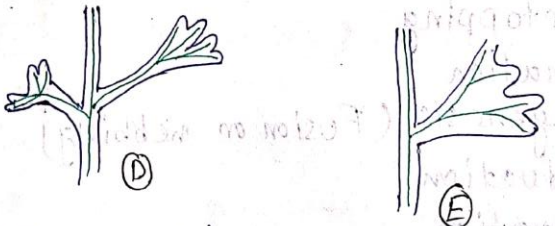
as needle like leaves of conifers.



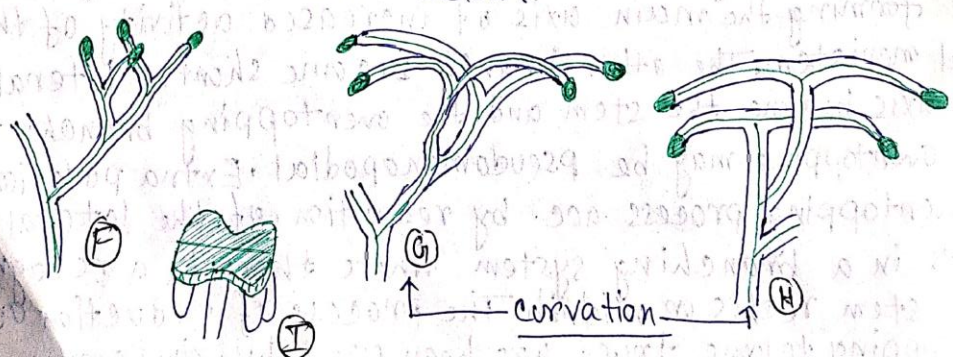
② Planation :- The process caused the telome & mesomes of the truss to shift from a three dimensional pattern to one in which branches occur in a single plane - this process is associated with the formation of leaves.



③ Syngensis or webbing :- It is the process of infilling with photosynthetic & other parenchymatous tissue between the flattened bof-like structure with a diachotomously veined lamina.



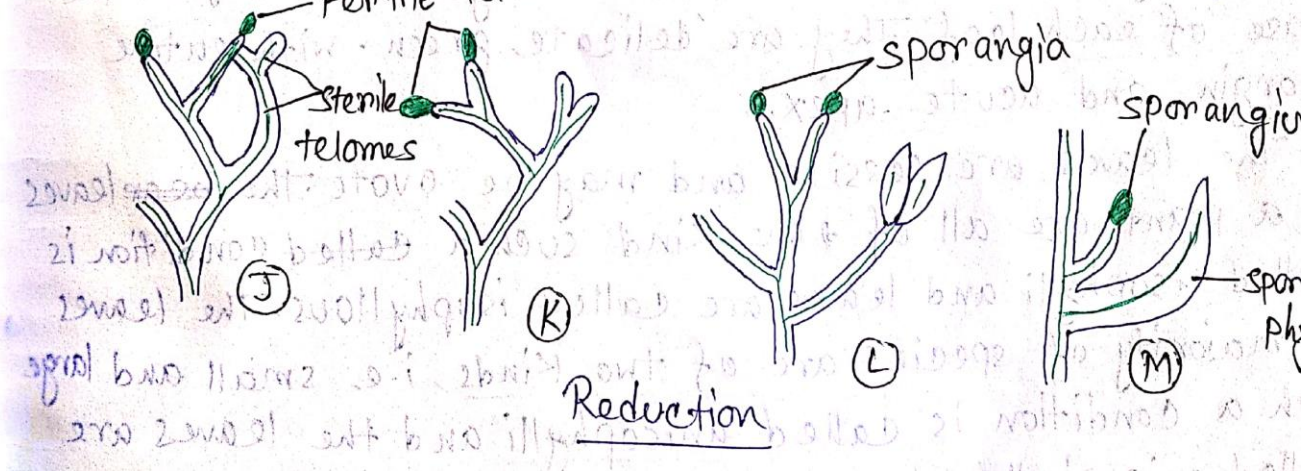
Zimmerman explained the formation of syrangia by the tangetial fusion and reduction of feritile and sterile telome as shown below :-



syngenesis may be folian or axial. In folian syngenesis planated telomes truss give rise to leaves with open dichotomoses venation. In axile syngenesis several telome trusses fuse-together to form various complex types of steles.

④ Reduction :- In this there is a reduction of telome trees resulting in a single telome which leaves to the needle-like microphyllous leaves of lycopsida, sphenopsida and on conifer Reduction is the tusult of the actively of the terminal ~~meriat~~ meristem or if ~~them~~ telome or each truss is suppressed so that branching wik be decreased or climinated s telome or mesomes becoms shorten.

⑤ curvation :- This process occur infertile telomes where bending of the terminal sporangia takes place resulting in the ~~inv~~ inversion.



Reduction

Selaginella

Morphology:-

1) Many species of sellaginella are herbaceous, perennials (বহুবর্ষজীবী) few are annuals. (বীরুৎ)

2) Majority are dorsiventral and grow prostrate (Selaginella chrysocaulos), a few are radial and grow erect (S. rupestris).

3) Some dorsiventral species are caudescent with erect stem arising from creeping rhizomes.

4) The stem divides dichotomously into two equal limbs that bears spirally arranged isophyllous leaves.

5) The leaves are microphyllus. Each leave is traversed by a single-unbranched mid-rib. A tegule arises from the base of each leaf*. They are delicate, green (শুষ্ক) with entire margin and acute apex.

6) The leaves are sessile and may be ovate. The ~~bear~~ leaves in a plant are all of one kind such a ~~called~~ condition is called isophylli and leaves are called isophyllous. The leaves in majority of species are of two kinds, i.e. small and large such a condition is called anisophylli and the leaves are called anisophyllous.

7) The phyllotoxy or the arrangement of the leaves on the stem is always spiral in the isophyllous species of selaginella. In the anisophyllous species of selaginella chrysocaulos the small and large leaves formed four longitudinal rows.

8) The legule developes quite early during the ontogeny of the leaves and arises from its base on the supper side. It is wedged shaped, lobed, lanciolate or may even have fringed margins.

9) Rhizophores is a structure of controversial morphological nature and present in most of the dorsiventral selaginella. They are leafless and positively Geotrophic organs that have ~~as~~ usually a localised origin.

Anatomy :-

Stem :- The vascular region or the stelar system in selaginella exibits comidrable variation in the different species or even in different part of the stem in different species. T.S shows the following structures :—

a) **Epidermis :-** It is made up of thin walled regular or barral shaped cells and is covered by a thin layer of cuticle. The cells are colourless. There are no stomata.

b) **Cortex :-** It consists of many layers of cells. The outermost layer of cells develop thick walls in the older region of cells and form a sclerenchymatous hypodermis. The rest of the cortex is made up of thin-walled chlorenchymatous and polygonal cells. They enclose smalls intercellular spaces.

c) **Air space :-** Next to the cortex there is large air space in the centre of which lies the stele suspended by means of traluculae. The trabeculae are modified endodermal cells and prosses caspanian strips.

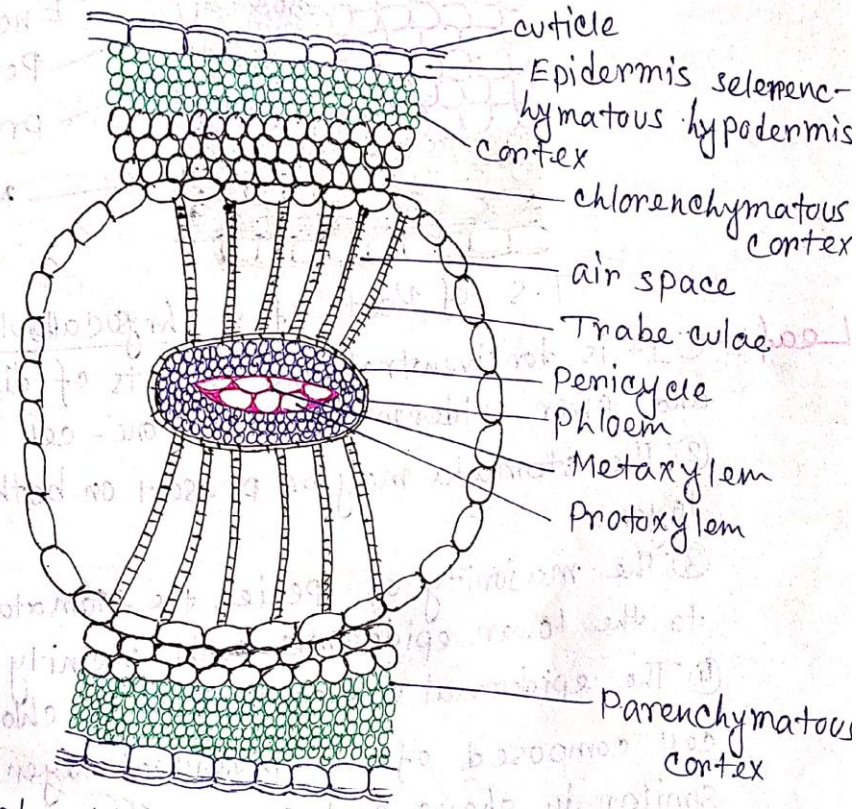
Stele :- There is single central stele suspected in the air space by trabeculoe. The stele in this species is flattened like a ribbon and is called a protostele because these is no pith in the centre. It consists of —

(a) A singler layer of thin walled cells called the Pericycle.

(b) Next to the pericycle is phloem. Phloem comprises encircles the central xylem.

(c) The centre of the stele is occupied by the xylem tissue. The xylem therefore forms the core of the stele, there being no pith. The xylem consists of ~~ma~~meta and protoxylem. The xylem is therefore exare, since there are two groups of protoxylem at either end of the xylem is regarded at diarch.

Rhizophore:- In a T.S, the rhizophore reveals a single-layer whose cells may be thick-walled. The cortex is extensive & is usually distinct Isto an outer thick-walled or sclerenchymatous cortex and inner thin-walled or parenchymatous cortex. Last layer of the cortex is endodermis cortex. Last layer of the cortex is endodermis and is followed by a single layer of parenchymatous cell called Pericycle. The endodermis is not very clean. The stele is typically protostele.



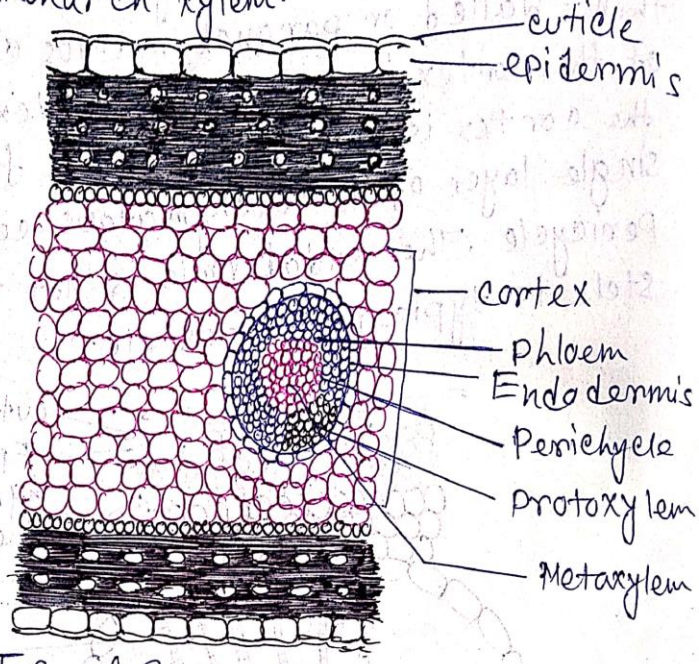
Root:- ① The root epidermis is a single-layer and is covered b a thin cuticle. Root hairs are present.

② The cortex is white and extensive and usually consist of an outer sclerenchymatous cortex of 3-5 layers.

③ In the younger roots the sclerenchyma is peripheral in position & is followed by thin walled cortex.

④ A distinct air space has also been reported in inner cortex of *selagenella densa*. It is traversed by trabecu lae that are not endodermal cells but cortical cells that elongate radially.

⑤ This airspace is absent in other species.
⑥ The endodermis is distinct. Next to the endo
mis is a single layer of pericycle.
⑦ The stele is a typical protostele with exar
and monarch xylem.



T.S of Root of S. chrysocaulos

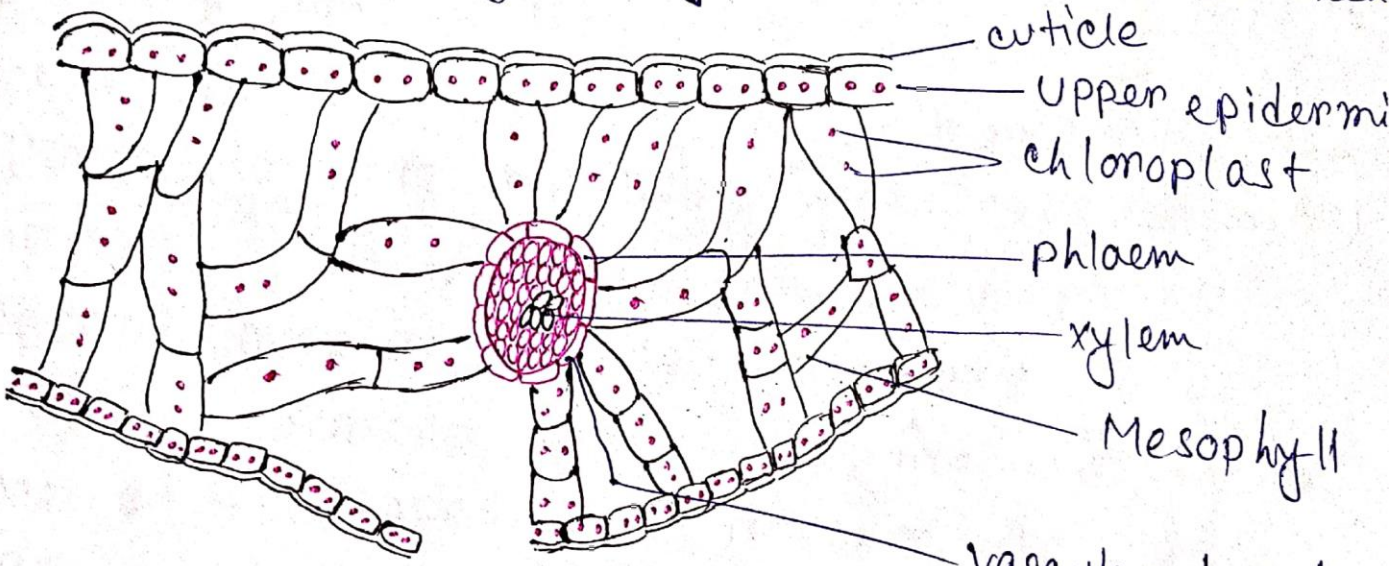
eaf:- ① It is dorsiventral and consists of distinct upper
and lower epidermis that are one-cell in thickness.
② The stomata may be present on both the epiderm
layer.
③ The majority of species the stomata are restrict
to the lower epidermis in the vicinity of the mid-ri
④ The epidermal cell consists of the chloroplast. The
cell composed of two epidermal layers may be
similar in shape and size or they may show some
difference.
⑤ The epidermal cell of some species bear hair-li
appendages.
⑥ Mesophyll is composed of thin walled cells that
loosely arranged and enclosed small or large airsp
⑦ In majority of the species it is made up of simi
cells and is well developed in regions around the
midrib. The mesophyll cells consists of available

⑧ The chloroplast contain no. of spindle-shaped bodies that ultimately become transformed into starch grains.

⑨ They appear like pyrenoids.

⑩ The vascular ~~is~~ bundle is very simple and is surrounded by phloem. The xylem has tracheids only and there is no distinction into proto or metaxylem.

⑪ There is a single layer of cells composed encircles the phloem. It may be regarded as the bundle shea



T.S of leaf of S. Lrausiana

Selaginella

organisation of strobilus:—

① The strobilus is the sporangia bearing region of the sporophyte.

② The sporangia arise in the axils of leaves called sporophyll. The sporophyll are like ordinary vegetative leaves bears may differ in shape and size.

③ There are two kinds of sporangia in selaginella
- (a) Microsporangia
- (b) Mega sporangia

④ The sporophylls ~~bears~~ bearing microsporangia may be called microsporophylls and those bearing megasporangia are called megasporophylls.

⑤ There is no morphological and anatomical differences between micro and macrosporophylls.

⑥ The strobilus is always terminal in position. It's formation usually results in cessation in apical growth.

⑦ In some cases, however that axis of the strobilus resumes growth i.e. if proliferates and outgrowth and the strobilus to form a dorsiventral ~~&~~ shoot (S. guandis) ×

⑧ In selaginella, the strobilus is cylindrical & sporophylls are spirally arranged, isophyllous.

⑨ In a large no. of species the strobilus is tetragenus or four-angled.

⑩ stobili are usually bisporangiate, i.e they bear both mega and microsporangia in the axils of the respective sporophylls.

⑪ In S. craussina there is only one megasporophyte at the base of the strobilus & the rest are micro-~~phy~~sporophyll.

(c) Megaspore

(12) They are produced in microsporangia & megasporang which arise in the axils of microsporophylls and megasporophylls.

(13) Structure of microsporangia-

A microsporangia may be oval or reniform or spherical in shape and varies in colour from red yellow to brown.

(a) The outline of the sporangium is smooth & almost regular. It is smaller in size than the megaspor gium & has a short multicellular stalk that various in width in different species.

(b) The wall of the ~~spor~~ microsporangium is two-layered thick.

(c) Next to the inner wall ~~knorm~~ is the tapetu which is nutritive in function.

(d) The wall layers & the tapetum enclose a lar no. of microspore mother cell.

(e) The mother cells are diploid & are the large cells of the diplophase or the sporophytic generation.

(f) This undergoes meiosis and forms numeros microspores tetrads. The microspores in a tetrad are tetraheadrally arranged 4 later on seperate from eac other.

(g) The cavity of the sporophylls is now fille with numerous microspores.

(14) structure of Megasporangia-

(1) It is a comparitively layer in size, 4-lobed shortly stalked or may be in green or cream colovred in some species & white or dark brown in colour.

(2) It ~~is~~ has a two-layered wall & the third inner wall is called the tapetum.

(3) out of the spore mother cells ~~ch~~ only one rema

functional and divides meiotically to form a tetrad of four haploid mega spores.

④ By this type the tapetum usually disorganisises, but this is by no means true for all species.

⑤ The meagaspores seperates & grow considerably in size so as to fill up the whole sporangium.

⑥ In Selaginella Willdenovii, the no. of megaspores varies between 4-24 or even 36-40.