TELOME THEORY

Zimmermann (1952 and 1959), who proposed that all of the main plant organs can be derived from simple *Rhynia*-like axes called mesomes and telomes. The derivation of megaphylls in this scenario is that the dichotomously-branching axis develops an unequal branching form called overtopping. The lateral branch system then becomes planar and webbing elaborates between the axes. Thus, a megaphyll is not a structure that evolved*de novo* but was assembled from existing structures. Tomescu (2008) argures that such a sequence for megaphyll evolution must have occurred multiple times thus calling into question the homology of early megaphyllous appendages.

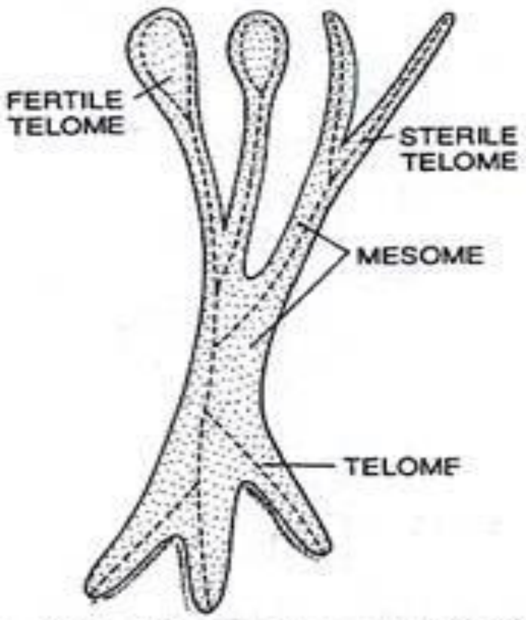
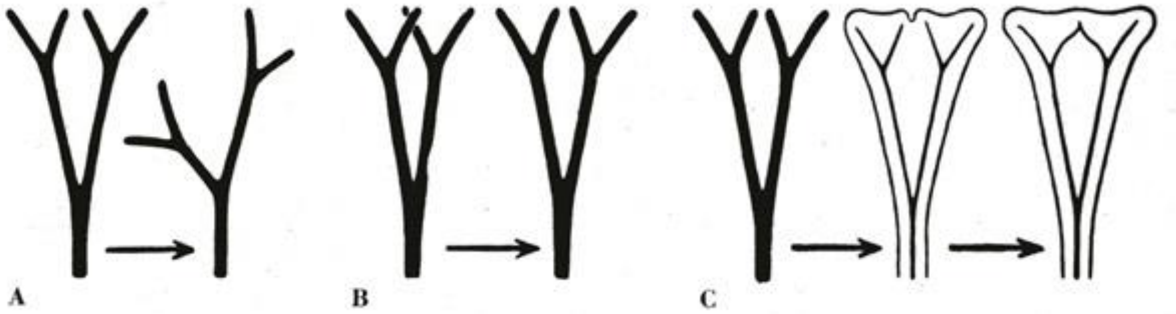


Fig. 32.10. Diagram of the organization in a theoretically primitive vascular plant showing a body built of telome and mesome limbs, the telomes being both fertile and sterile. (After Zimmermann).

Zimmerman goes back to the earliest and simplest type of vascular plant known, that in the Psilophytales in which the body consists of branching leafless axes, which are all substantially alike. In some cases these may be arranged dichotomously in others monopodially, and the difference may have arisen by 'overtopping', but in either case these naked axes as the primitive units of construction of the cormophytes, which is thus regarded as primarily a system of axes.

Telome

Each of the terminal branches in such a system is called a telome. Each telome is an ultimate branch on an older axis or mesome. Some telomes are sterile; others bear terminal sporangia and are therefore fertile. Telomes also tend to unite into groups, called, syntelomes, which may be all sterile, all fertile or mixed.



Overtopping **Planation** **Webbing**

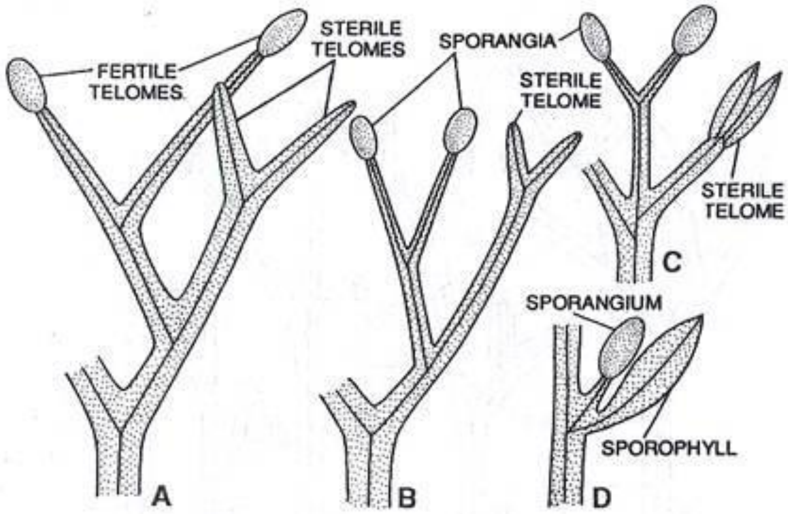


Fig. 32.11. Telome theory (concept). A, illustrates the aggregation of sterile and fertile telomes; B-C, shows reduction of supporting mesomes and reduction of sporangium number, D, shows one phylloid with axillary sporangium, (seen in origin of Lycophyta)

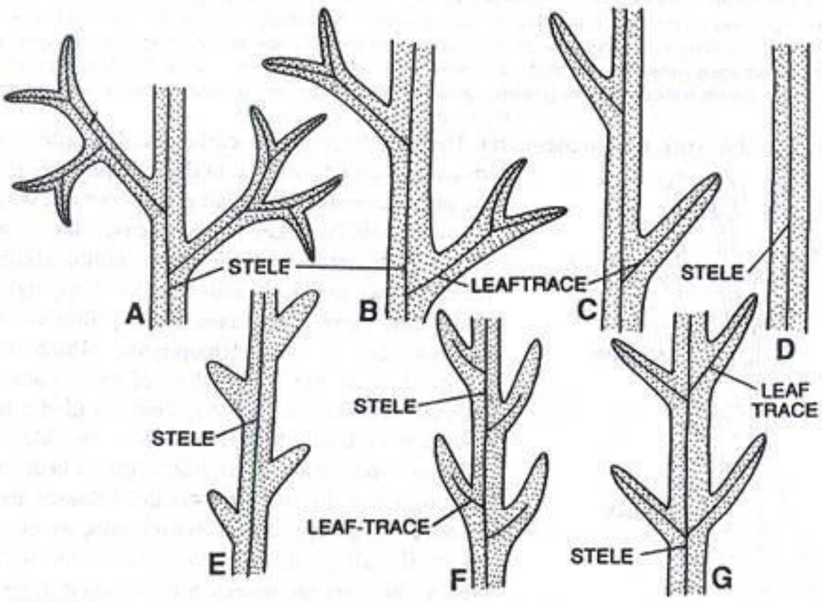


Fig. 32.12. Telome concept. A-D, reduction of syntelomes to single needle like lateral appendage.

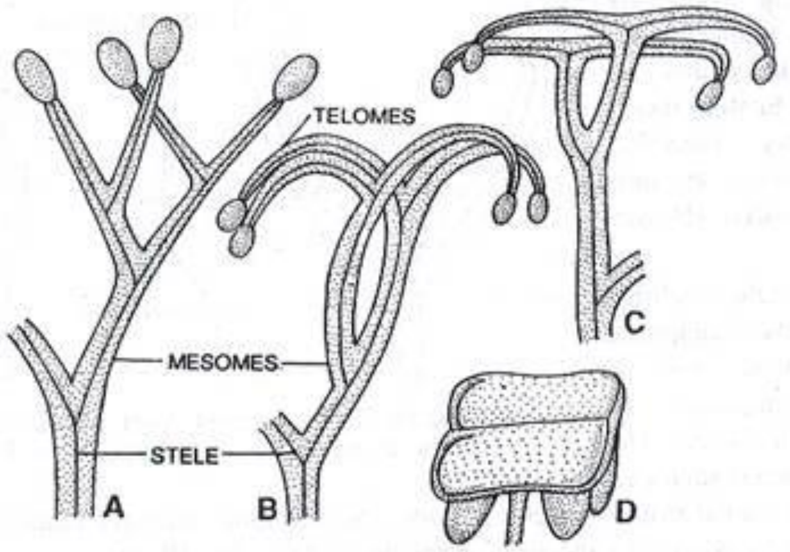


Fig. 32.13. Telome Concept. A-B, *incurvation*-downward bending of the sporangia toward a common axis; C-D, fusion and expansion of telomes and mesomes into a peltate structure (seen in Sphenopsida).

Merits

1. **This is a simple concept and explains most of the morphological problems about different organs of a plant.**
2. **According to Bierhorst (1971) this theory is too simple and too easily applicable but unfortunately its excessive use has greatly diminished its value.**

Demerits

1. **Telome has been considered as a readymade unit. This difficulty was realized by Zimmermann (1949, 52) and subsequently he recognized several other elementary processes as (a) interconnection of cells; (b) rotation of cell axis; (c) differentiation of apical cell, etc., which have led to the formation of an apical cell with three cutting faces. However, these elementary processes do not satisfy the plant morphologists (Puri, 1956).**

2. Many other plants of much greater complexity, than Rhynia fossils have been discovered in beds of the same age or even earlier, e.g., Zosterophyllum, Baragnnathia (Leclercq, 1954) Lyon Hueber (1964), Hueber and Banks (1967) and Lyon (1964) observed lateral sporangia on short vascularized stalks in Psilophyton and Asteroxylon respectively instead of usual terminal sporangia.

3. According to the supporters of the telome theory all the leaves in plants are telomic in nature. Enation theory on the contrary considers microphyllous leaves as only outgrowths of the stem (Bower, 1935).

4. **The polystelic condition in the axis of plants is supposed to have developed due to parenchymatic syngenesis of several monostelic axes. The actinostelic condition is supposed to be**

the product of radial fusion of steles in polystelic axis. Such an explanation is diametrically opposed to the widely accepted concept of stelar theory (Stewart, 1964).

5. Andrews (1963) has given a series of diagrams of Palaeozoic seeds to explain the origin of cupule. Pettitt (1970) found them to be more or less of the same age.

6. The theory has received little attention by angiosperm centred morphologists. Its application to stamens (Puri, 1947, 1951, 1955), venation pattern of leaves (Foster, 1950), morphological nature of angiosperm leaves and sporophylls, and carpels (Eames 1961) have been criticized from time to time.

To sum up it would be worth to quote the reaction of Andrews and Eames. Andrews (1961) says, "Zimmermann's scheme for the pteropsids, or atleast some pteropsids, has much supporting evidence, his concept for the articulates may be valid, but we are only in the verge of understanding the origin of this group, his concept for the lycopsids is, so far as I am aware purely hypothetical."

Eames (1961) says, "consideration of the primitive plant body as made up of basic units, telomes, is doubtless of value for the understanding of more primitive taxa, but its value in the interpretation of the higher taxa, where axis and appendages have become established as morphological units, is doubtful."