

ARCHEGONIATE

Dr/ Hoida Zaki

Order: Jungermanniales

General characters of the order

- 1- Gametophytes may be thallose or foliose, but there is little internal differentiation of tissues. Some genera are intermediate between thallose and foliose.
- 2- Archegonial neck is nearly as broad as the venter.
- 3- The Jacket layer of the capsule of the sporophyte is more than one cell in thickness: The capsule usually dehisces longitudinally into four parts.
- 4- Foot, seta, and capsule are always present.
- 5- The sporogenous tissue usually differentiates into elaters and spore-mother cells. An elaterophore may be present or lacking.

<p style="text-align: center;">Anacrogynae Jungermanniales</p>	<p style="text-align: center;">Acrogynae Jungermanniales</p>
<p>1- Gametophyte thalloid if leafy it carries only two lateral rows of leaves.</p>	<p>Gametophyte is leafy form with stems carry three rows of leaves</p>
<p>2- The apical cell of the stem does not produce archegonium</p>	<p>The apical cell of the stem or the branch terminates its growth by giving an archegonium.</p>
<p>3- Indefinite growth e.g. <i>Pellia</i>, <i>Metzgeria</i>, <i>Blasia</i></p>	<p>Definite growth e.g. <i>plagiochila</i>, <i>lejeunea</i>, <i>Frullania</i>.</p>

Suborder 1: Anacrogynae

<i>Pellia</i>	<i>Metzgeria</i>	<i>Blasia</i>	<i>Fossombronia</i>
Thalloid form	Traditional form	Little advanced transitional	Very close to the leafy forms
Gametophyte is a thin green thallus with wavy outline	Gametophyte is flattened dorsoventrally dichotomously branched	Sides have lobed wings (not detached from the rest of the thallus)	Each wing is dissected completely into separate leaf-like.
Undefined broad midrib	Narrow distinct midrib	Distinct midrib	Midrib formed the stem.

Pellia

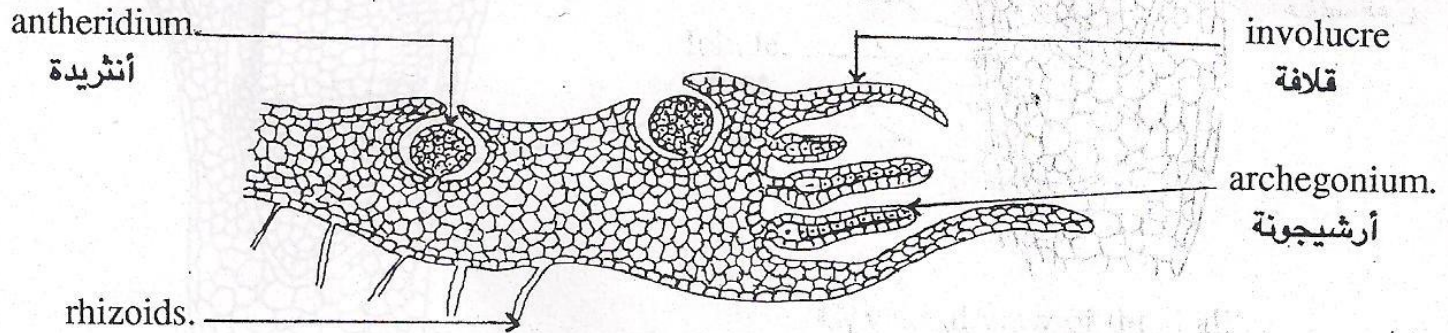
- The gametophyte of *Pellia* is a branched, thin, flat thallus bearing rhizoids on the ventral surface. There is a broad midrib.
- The archegonia originate behind the apical. The archegonia and sporophytes are always dorsal surface of the gametophyte could be seen on the dorsal surface of the gametophyte as a long seta ending in a spherical, dark-colored capsule.



-The thallus consists internally of a homogenous tissue. The only differentiation is that the cells of the midrib are somewhat longer, in the longitudinal direction, than the neighboring cells.

-Antheridia appear on the dorsal surface as small raised parts close to the midrib and they with Archegonia are borne on the same plant, i.e., *Pellia* is a monoecious plant.

-Archegonia are situated on a raised part of the thallus just behind the growing point of the stem or branch. The archegonia are covered by an involucre which is a pocket- like structure in which water is kept.



C, *Pellia epiphylla* (monoecious) V.S showing sex organs.

نوع من البليا أحادي المسكن واضح به الأعضاء الجنسية

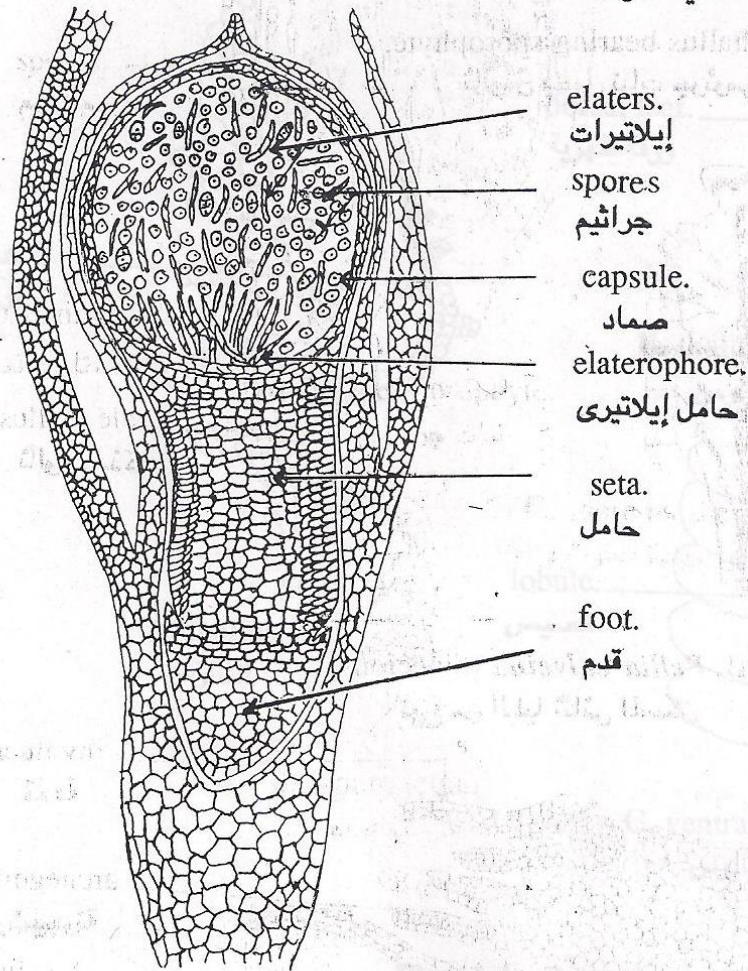
Fig. 3.1, *Pellia* sp.

شكل (١-٢) بيليا









elaters.

إيلاتيرات

spores

جراثيم

capsule.

صماد

elaterophore.

حامل إيلاتيري

seta.

حامل

foot.

قدم

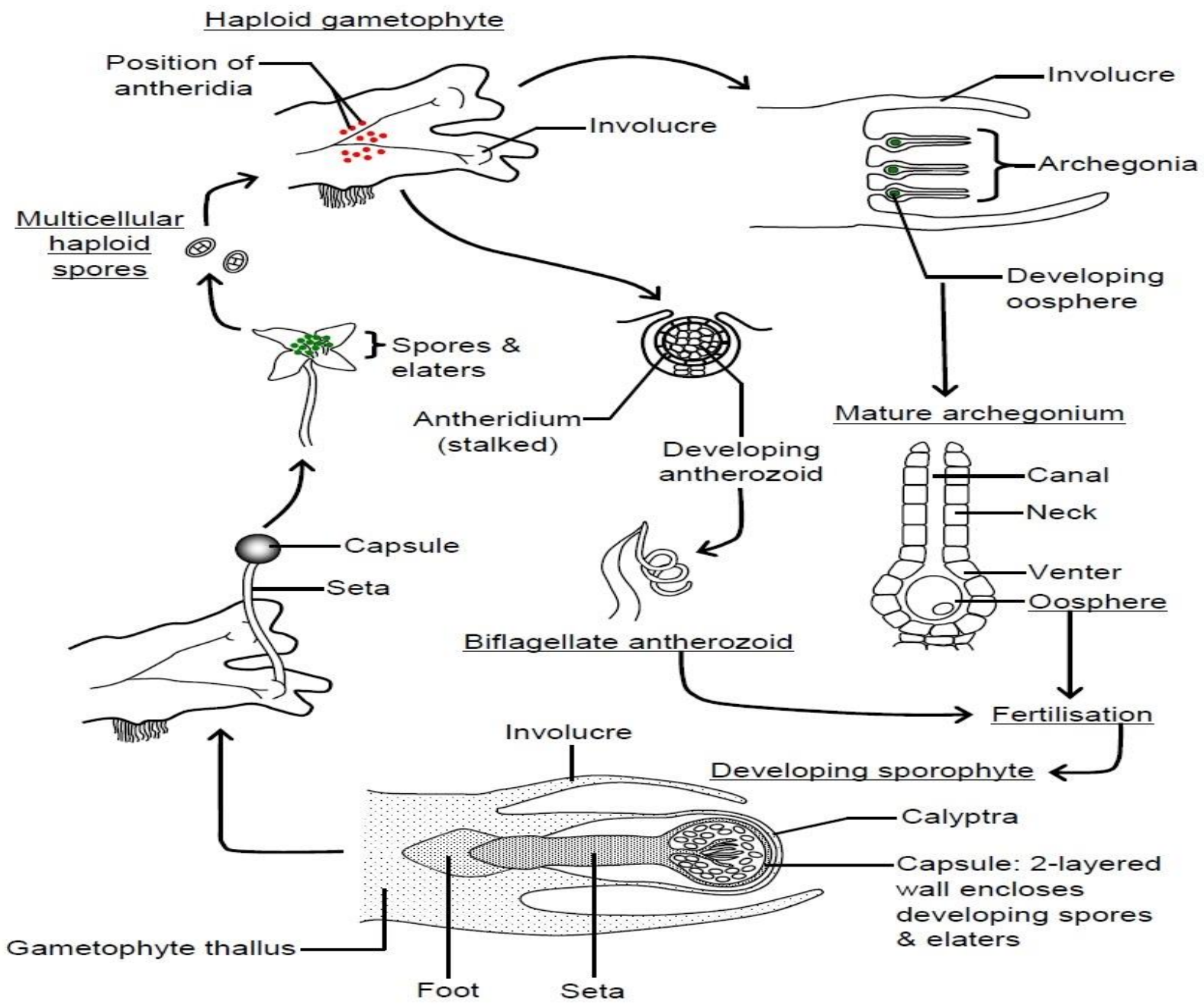
B, L.S. of mature sporophyte.

ق . ط في الطور الجرثومي الناضج

Fig. 3.2, *Pellia* sp.

شكل (٢-٣) بيليا

Life-cycle of *Pellia epiphylla*



Suborder 2: Acrogynae

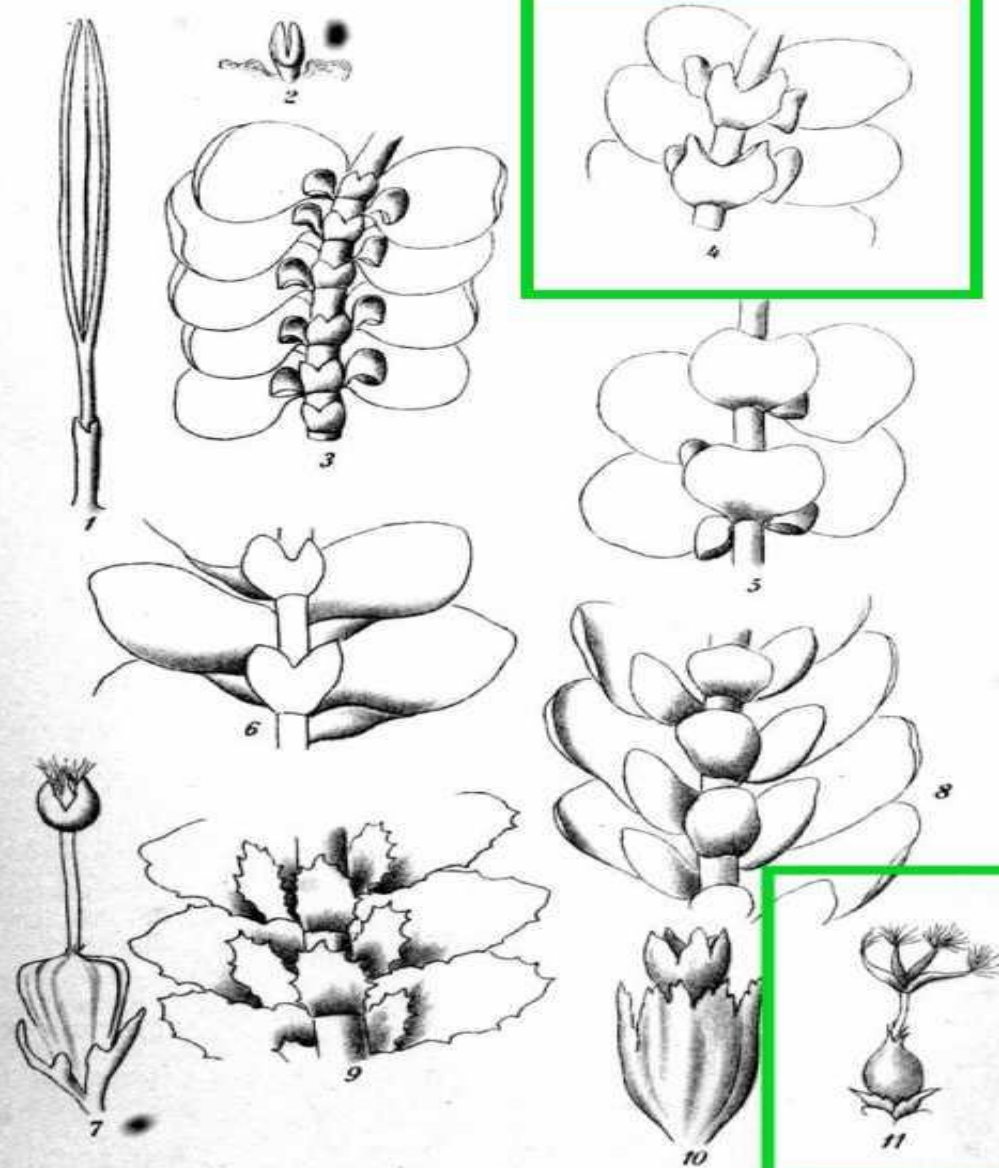
- All members of this group are foliose. The stem bears three rows of leaves; two dorsal or lateral rows and a single ventral row. The ventral leaves are usually small in size and are termed amphigastria. In some genera the ventral leaves are minute or even completely absent. In many genera the dorsal leaves consist of two lobes; a large upper lobe and smaller lower lobe (e.g. *Frullania* sp.).

Frullania



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Moose 68.

Jungermanniaceae akrogynae.
Anthocerotaceae.



200 μm

Jungemannia



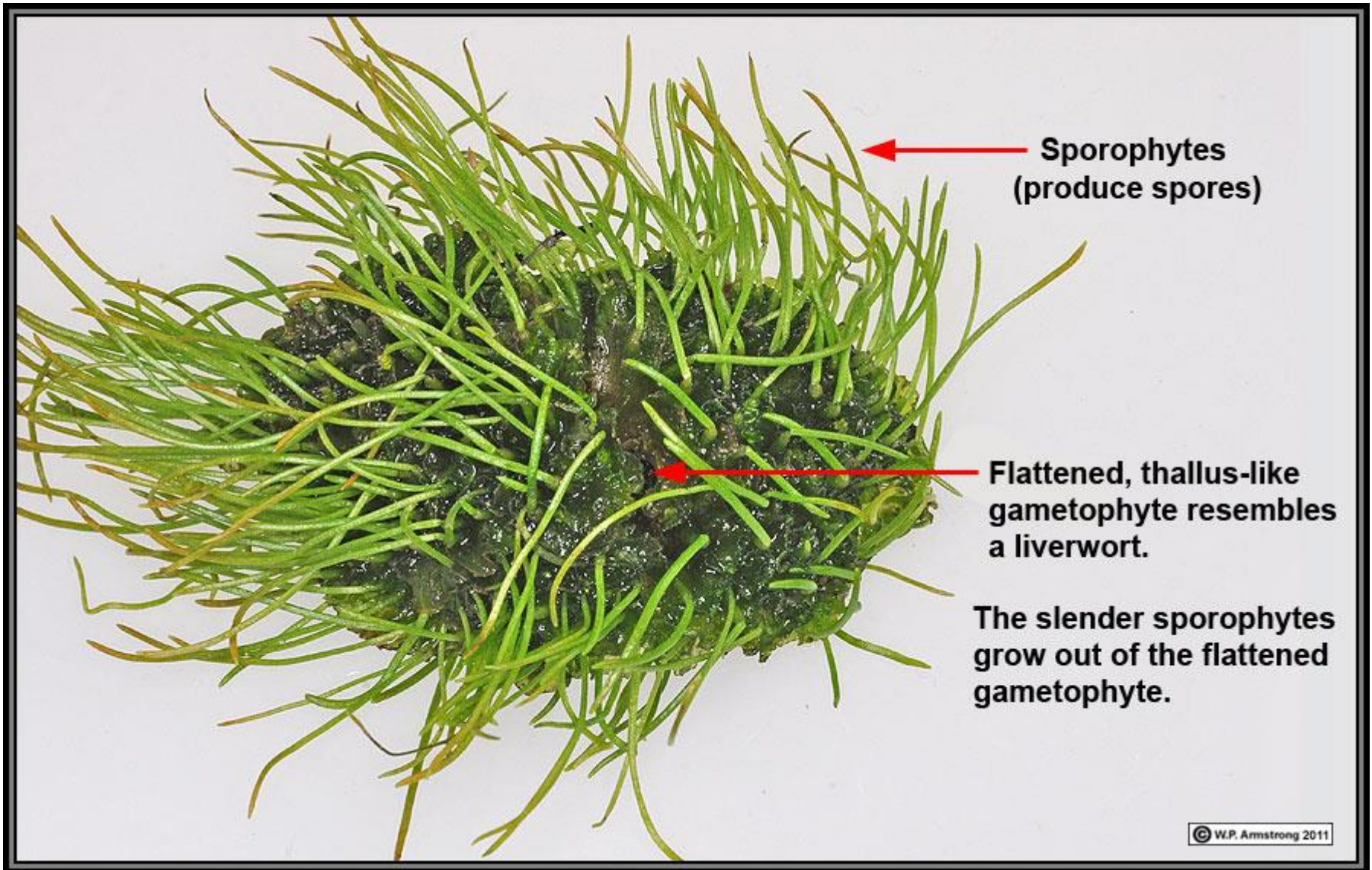


Order: Anthocerotales

- 1- The cells contain large chloroplasts, and each chloroplast has a pyrenoid.**
- 2- Antheridia develop from hypodermal cells the dorsal side of the gametophyte.**
- 3- Archegonia almost completely embedded in the gametophytic tissue.**
- 4- The growth of the sporophyte is indeterminate because of a meristematic region continually adding to the base of the capsule.**
- 5- Stomata with typical pair of guard cells (similar to higher plant).**

- **These distinguishing characters led some botanists to divide Bryophytes into 3 classes (Hepaticae, Anthocrotae, and Musci) instead of 2 (Hepaticae and Musci).**

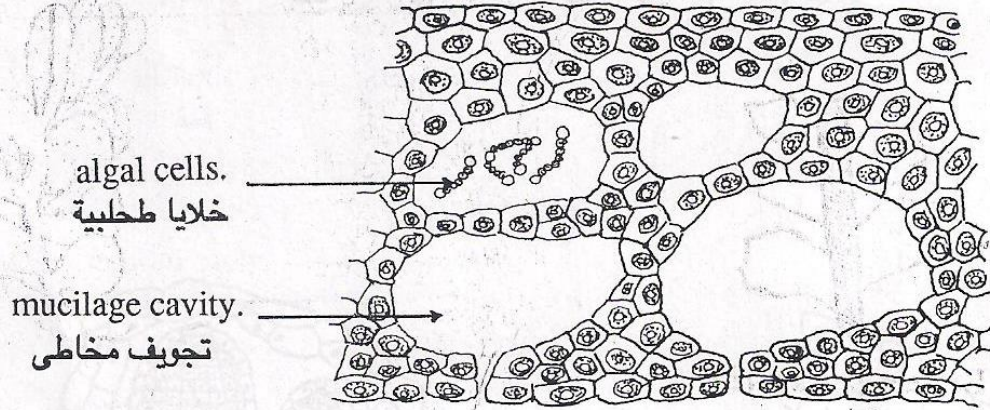
Anthoceros



- The gametophyte of *Anthoceros* is a prostrate thallus of a dark green color it is fixed to the soil by means of numerous smooth walled rhizoids arising on its ventral surface. There are no scales. There is no internal differentiation of tissues. Almost every cell contains one large chloroplast, which has a pyrenoid. Some species of *Anthoceros* have mucilage cavities in the ventral portion of the thallus. These cavities open on the ventral surface of the thallus by narrow slits. Often colonies of the blue-green alga *Nostoc* are found in these mucilage cavities.
- Vegetative reproduction takes place by the formation of “tubers” or as usual in other hepatics, i.e., by progressive death of older parts reaching a dichotomy.

A, thallus.

الثالوس



algal cells.

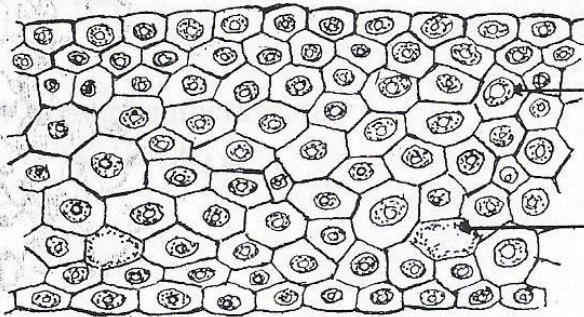
خلايا طحلبية

mucilage cavity.

تجويف مخاطي

B, T.S. thallus showing mucilage cavities.

ق . ع في الثالوس يوضح التجاويف المخاطية



chloroplast.

بلاستيدة خضراء

mucilage cell.

خلية مخاطية

C, T.S. thallus with mucilage cells.

ق . ع في الثالوس يوضح الخلايا المخاطية

Fig. 6.1, *Anthoceros* sp.

شكل (٦-١) أنثوسيروس

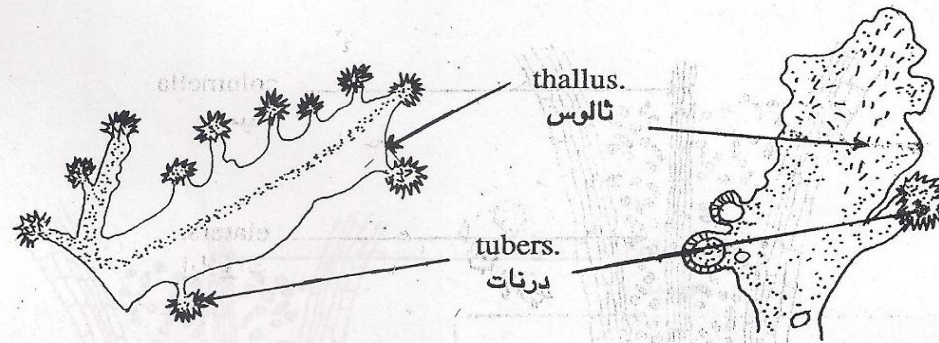
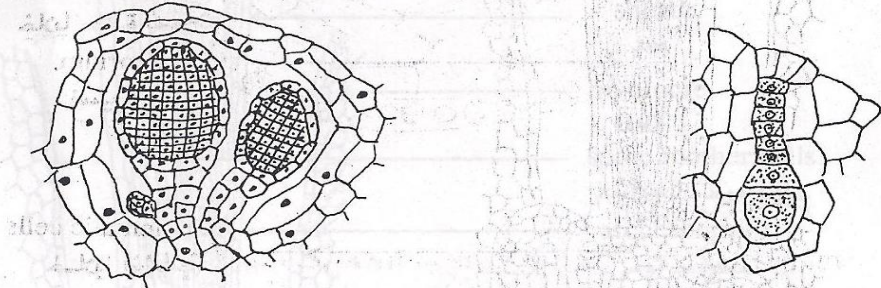


Fig. 6.2, *Anthoceros* sp. vegetative reproduction.

شكل (٦-٢) أنثوسيروس . التكاثر الخضري



A, mature antheridium.

أنثريدات ناضجة

B, archegonium.

أرشيغونية

Fig. 6.3, *Anthoceros* sp. sexual reproduction.

شكل (٦-٣) أنثوسيروس . التكاثر الجنسي



Sexual reproduction:

Most species of the genus *Anthoceros* are homothallic. However, certain species are heterothallic where sex determination is genotypic; two spores of each tetrad develop into male gametophytes and the other two into female gametophytes. A superficial cell on the dorsal surface of the thallus divides to give two cells; an outer cell and an inner or hypodermal cell. The antheridium develops from the inner or hypodermal cell. The antheridial chamber usually contains two antheridia; however, the number of antheridia in one chamber may reach 20 or even more.

The archegonia are embedded in the tissues of the gametophyte. Every archegonium is in direct contact with the vegetative cells surrounding it. Fertilization takes place in the presence of water and the resulting zygote develops into a sporophyte. The latter differentiates into a foot and a capsule, the basal portion of which remains meristematic.

The calyptra and the adjoining

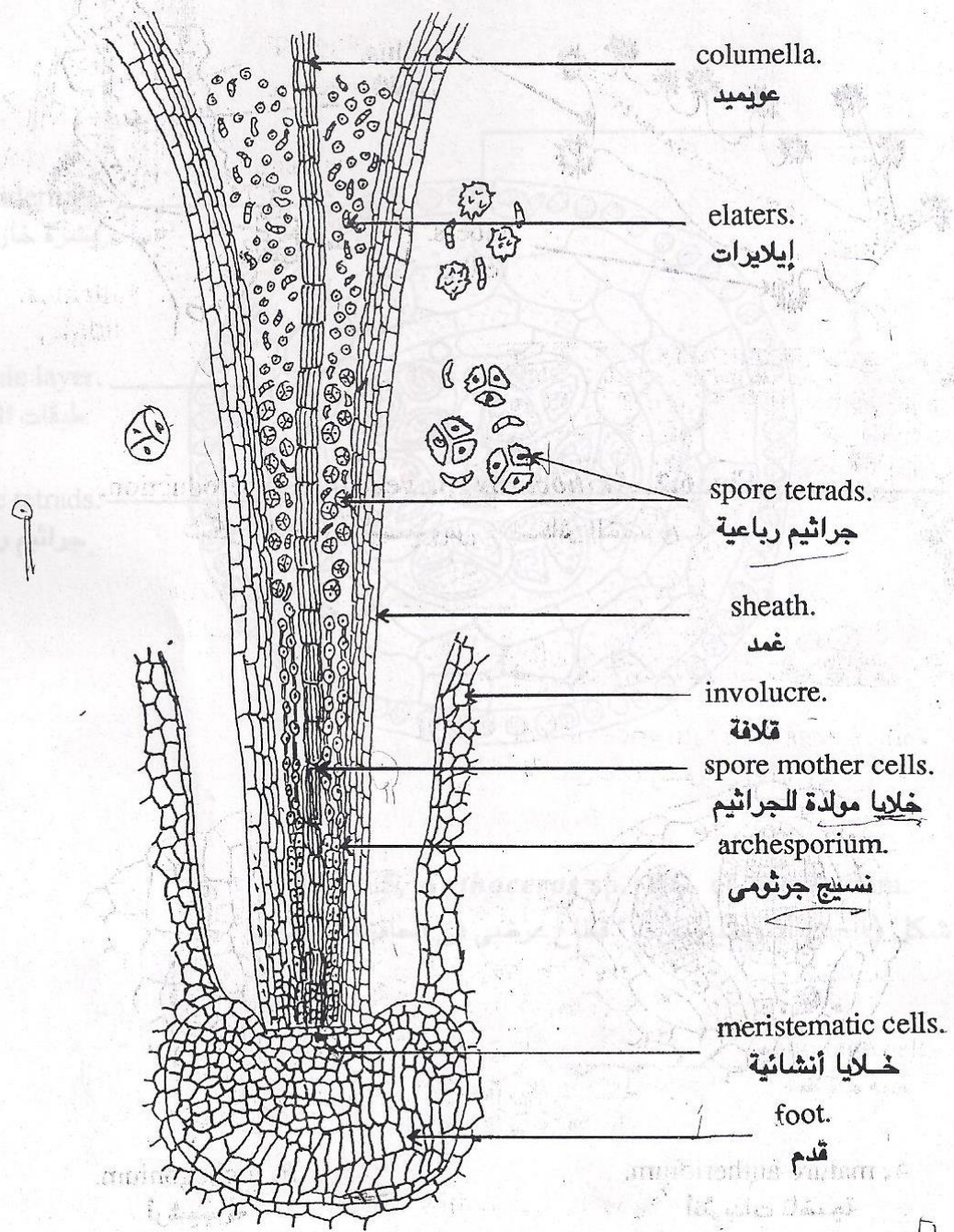
The calyptra and adjoining vegetative tissues grow upwards forming involucre which protects the young sporophyte but later it becomes ruptured by the elongating capsule. The jacket of the capsule is 4-6 cells in thickness. The outermost layer is the epidermal cells are strongly cutinized.

Stomata with a typical pair of guard cells (similar to higher plants) are present in the epidermis of the capsule. Cells beneath the epidermis are parenchymatous with intercellular spaces. There are a number of chloroplasts in the cells of the sporophyte. The center of the capsule is occupied by a sterile columella which consists of 16 vertical rows of cells forming a solid square.

The sporogenous tissue covers the columella and may extend to its base. Sporogenous cells give spore mother cells and sterile cells. The sterile cells become joined at the ends to give filaments, called pseudoelaters.

Mature pseudoelaters may have smooth walls. Spore mother cells give spore tetrads. Spores at the upper region of the capsule mature first. The meristematic region adds, continuously, new tissues to the foot and to the capsule, but mainly to the latter. The capsule splits vertically into two or more portions or valves. Pseudoelaters help in spore discharge. Mature spores at the top of the capsule become the discharge when the capsule splits open whereas young immature and newly formed spores just above the meristematic zone remain inside the capsule until they become mature and pushed upwards by new ones formed by the meristematic zone.

In other words, the tip of the capsule is mature while its base is still in an embryonic condition and thus the growth of the sporophyte is indefinite. Spores on germination give new gametophytes, and the life-cycle is repeated.



columella.

عوميد

elaters.

إيليرات

spore tetrads.

جراثيم رباعية

sheath.

غمد

involucre.

قلافة

spore mother cells.

خلايا مولدة للجراثيم

archesporium.

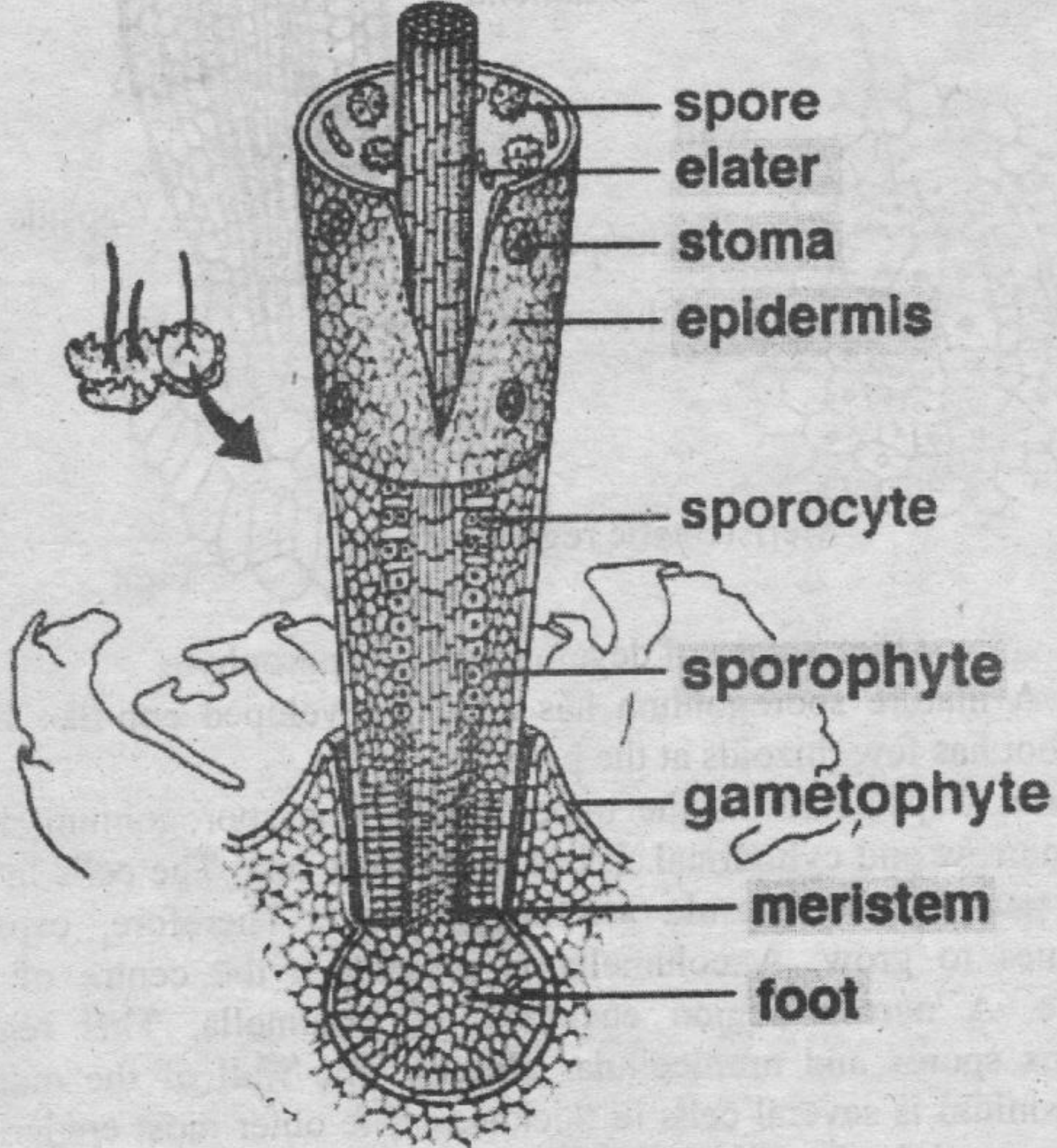
نسيج جرثومي

meristematic cells.

خلايا أنشائية

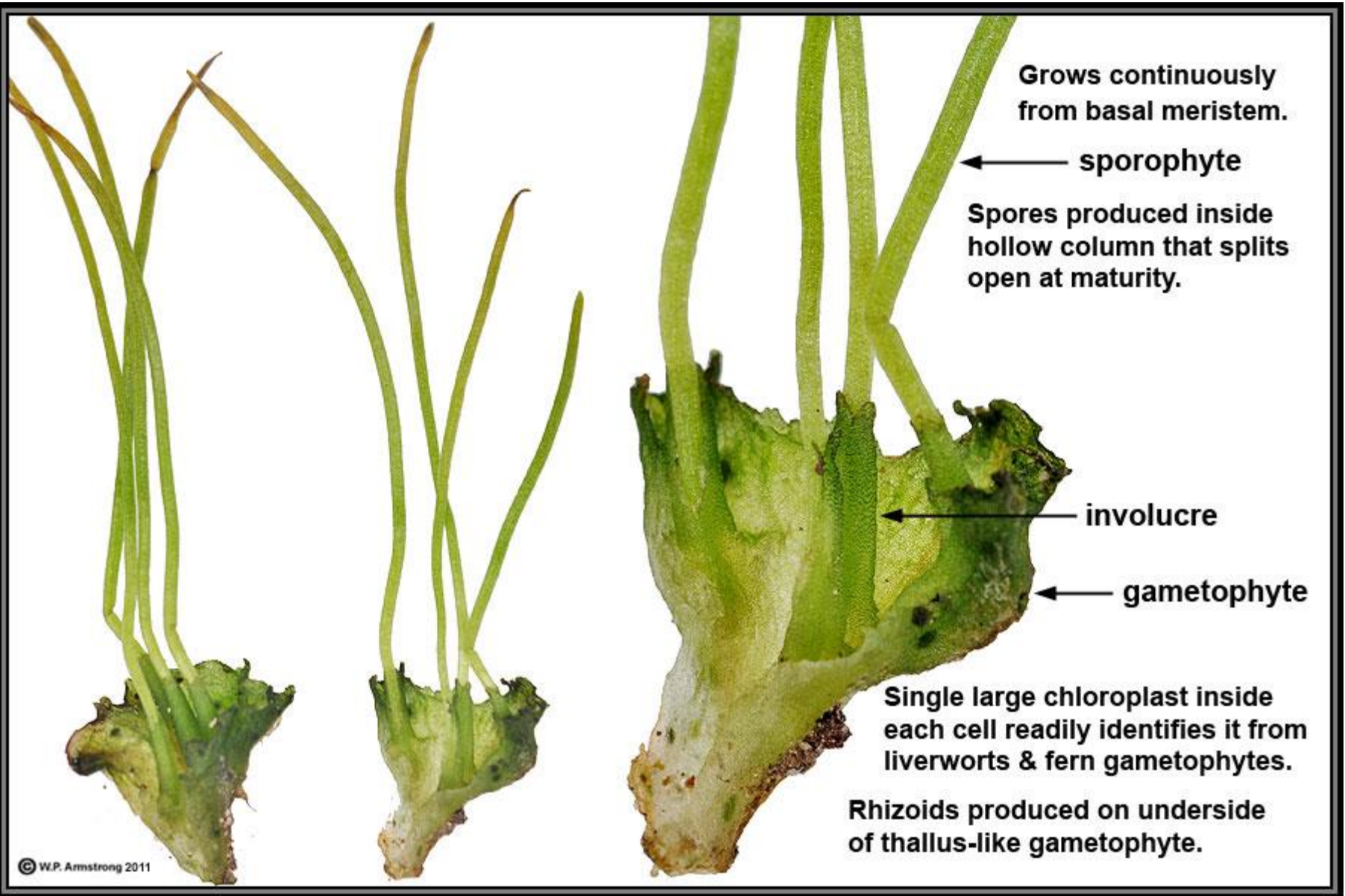
foot.

قدم









Grows continuously from basal meristem.

← sporophyte

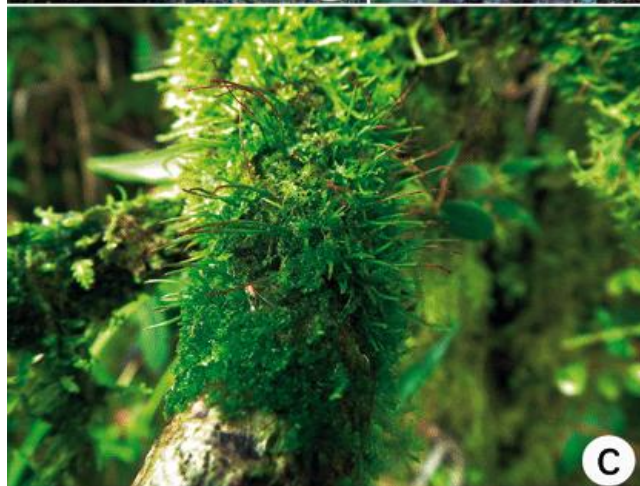
Spores produced inside hollow column that splits open at maturity.

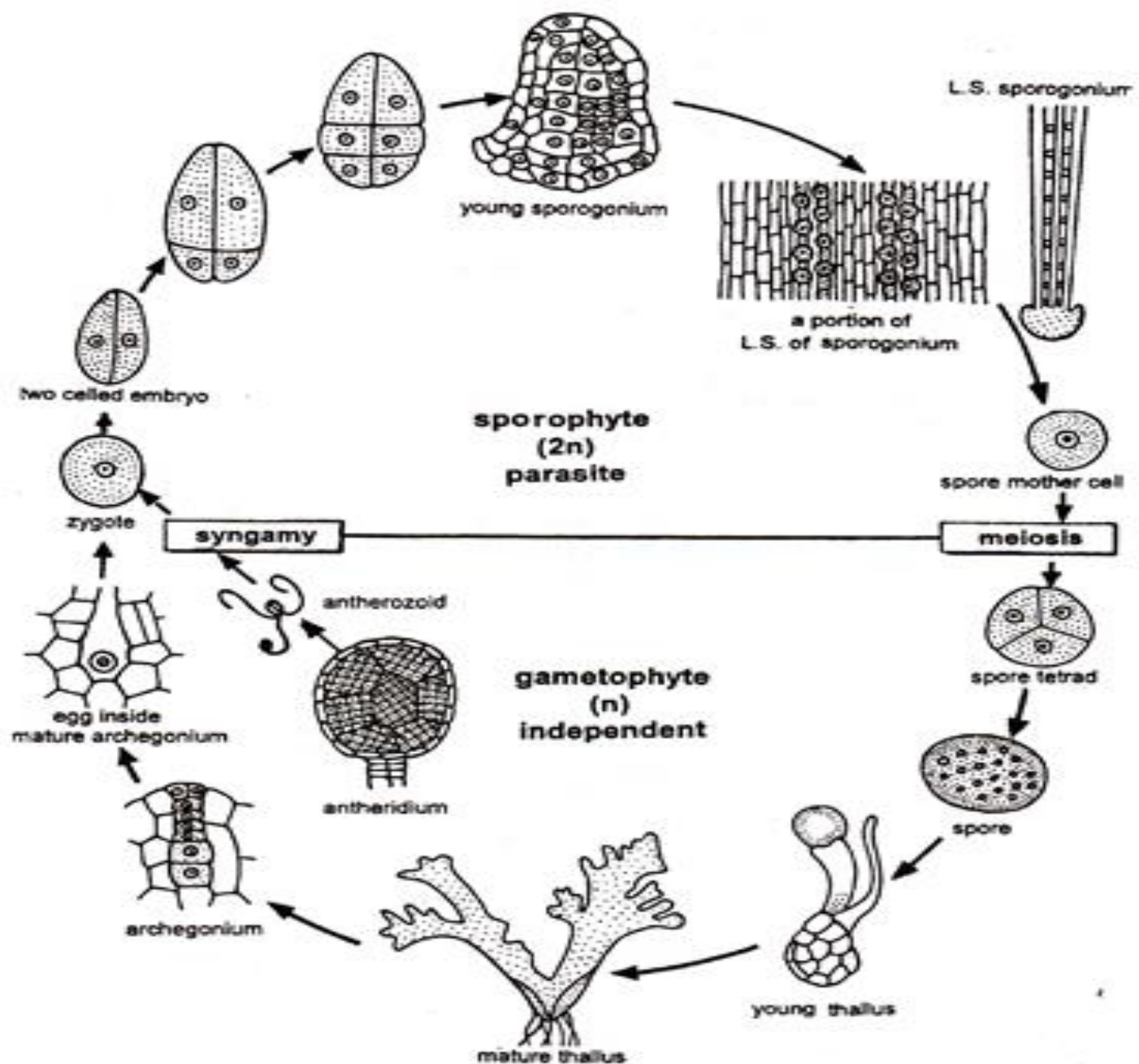
← involucre

← gametophyte

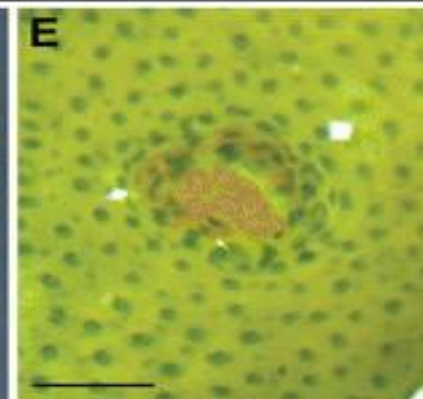
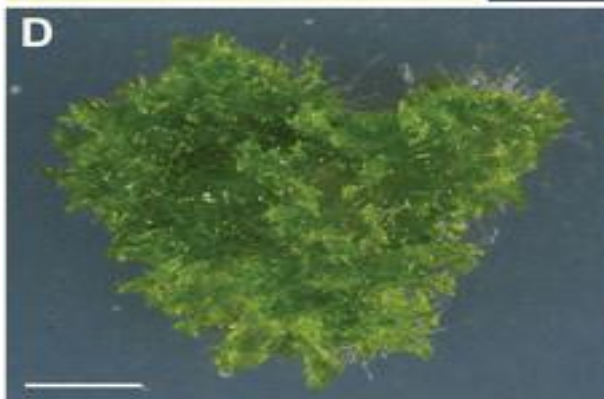
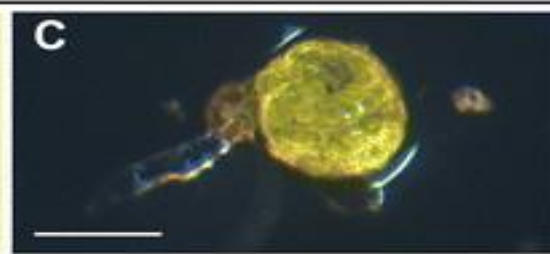
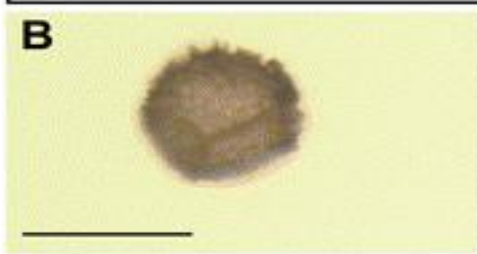
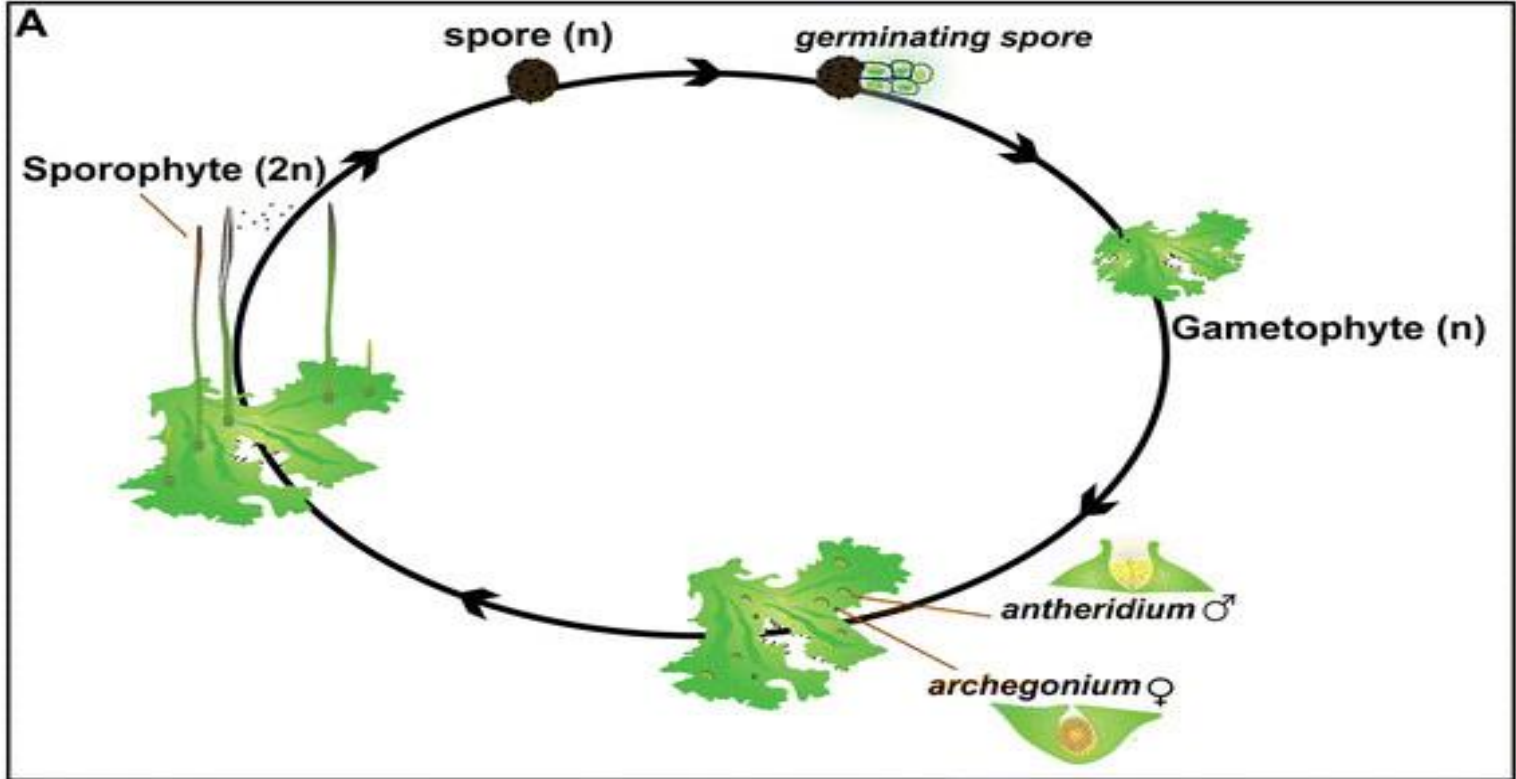
Single large chloroplast inside each cell readily identifies it from liverworts & fern gametophytes.

Rhizoids produced on underside of thallus-like gametophyte.





***Anthoceros*. Diagrammatic life cycle.**



- **It is important to state that sporophyte of *Anthoceros* may be considered more advanced than the sporophytes of other hepatics. It has a thick jacket, stomata, large numerous chloroplasts, a sterile columella, and grows continuously as a result of the activity of the meristematic zone. Although the sporophyte has all these tissues together with the absorbing foot yet it cannot grow away from the gametophyte.**

- **In an experiment the sporophyte was supplied with food materials, it (the sporophyte lived days and days but it almost did not grow). This shows that in Bryophytes the sporophyte generation is always dependophytes that the sporophyte depends upon the gametophyte only for a short period of time after which it become an independent free-living plant whereas the gametophyte withers and away.**

THE END

