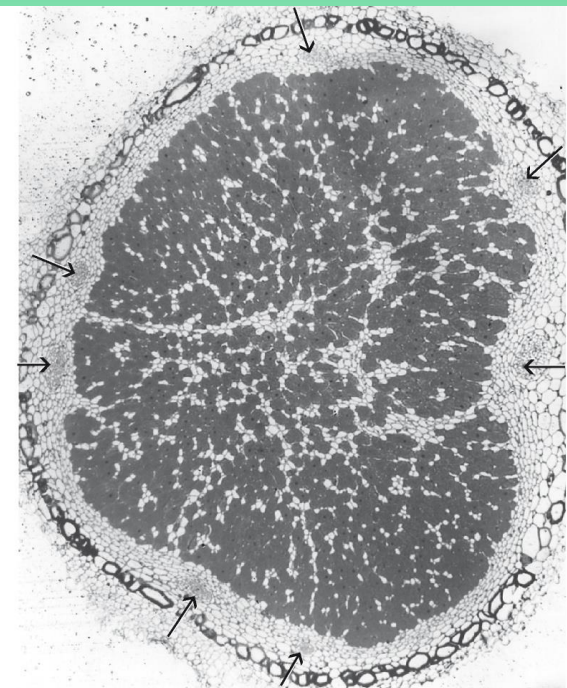
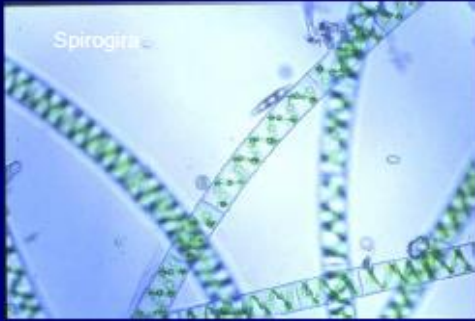


(a)

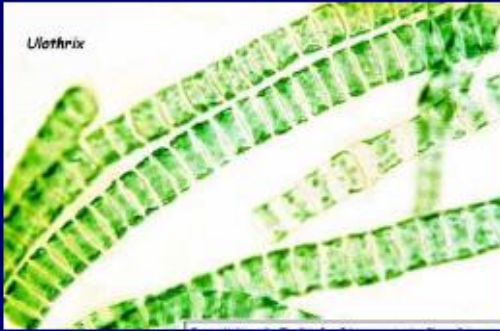


(b)

0,5 μm



Spirogyra



Ulothrix

## Chlorophyta

### Tallo filamentoso sifonato



reticulated chloroplasts

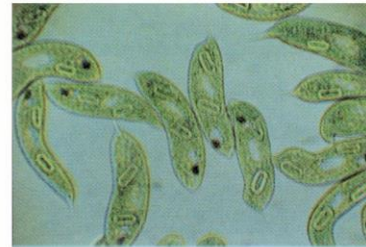
## Cladophora (Chlorophyta)



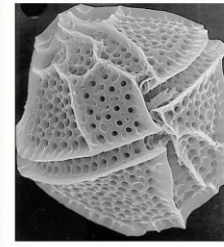
Ulva (Chlorophyta)



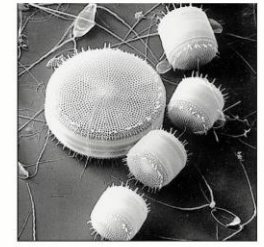
Laminaria (Phaeophyta)



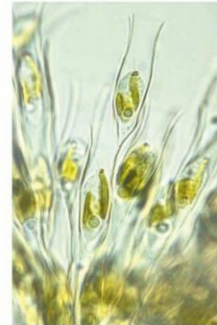
(a)



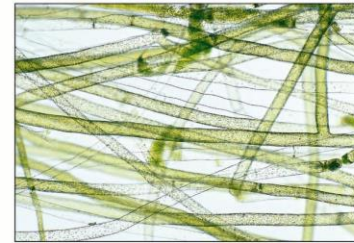
(b)



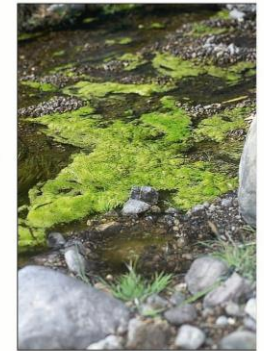
(c)



(d)



(e)



(f)



(g)

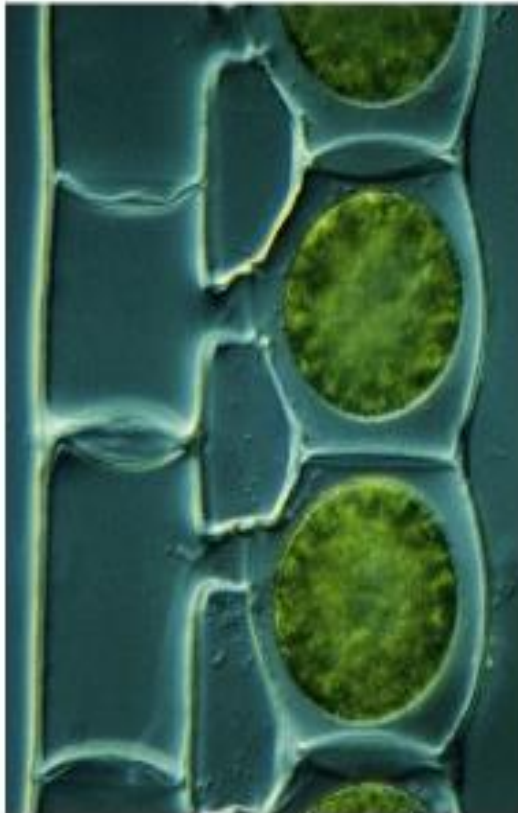


(h)



(c)

25  $\mu\text{m}$



(d)

25  $\mu\text{m}$

La lattuga di mare ha un'alternanza di generazione isomorfa, ciclo aplodiplonte

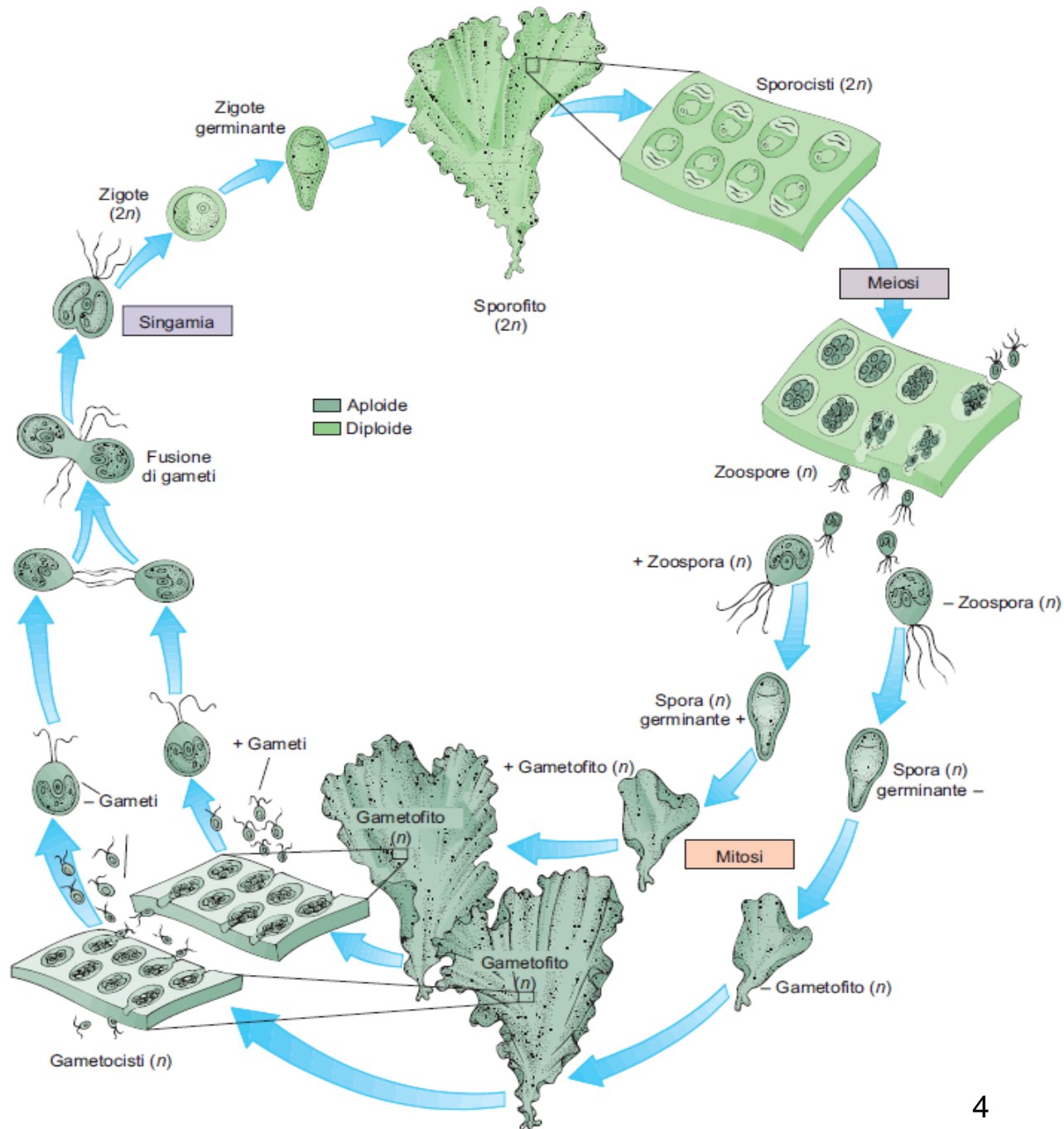
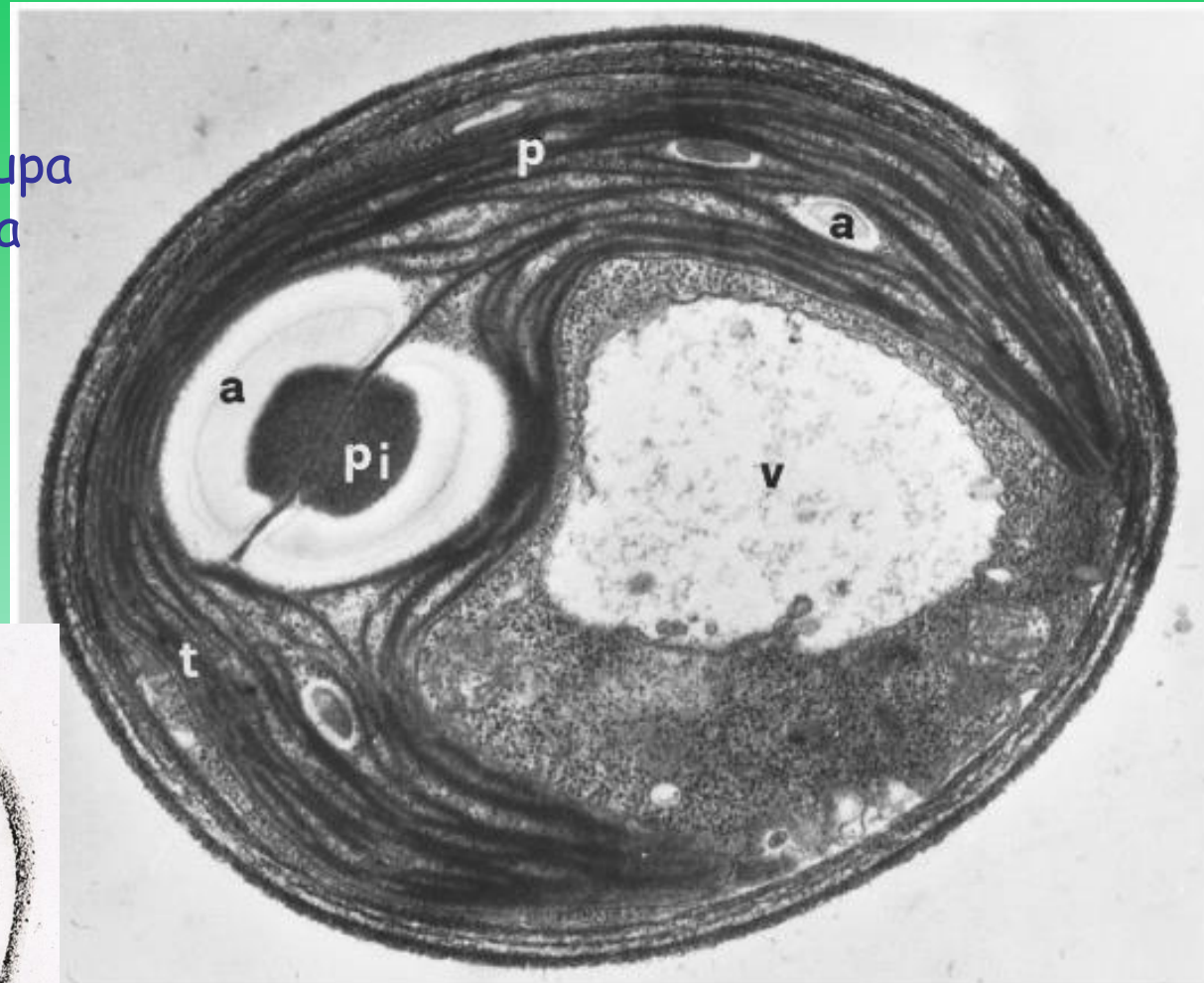


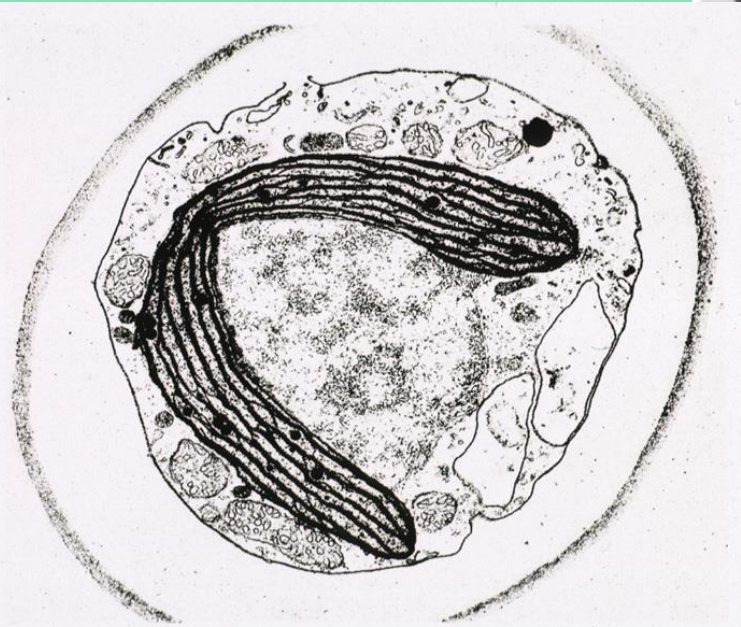
Figura 19.17 Il ciclo di *Ulva* è digenetico aplo-diploide isomorfo. Vedi dettagli nel testo.

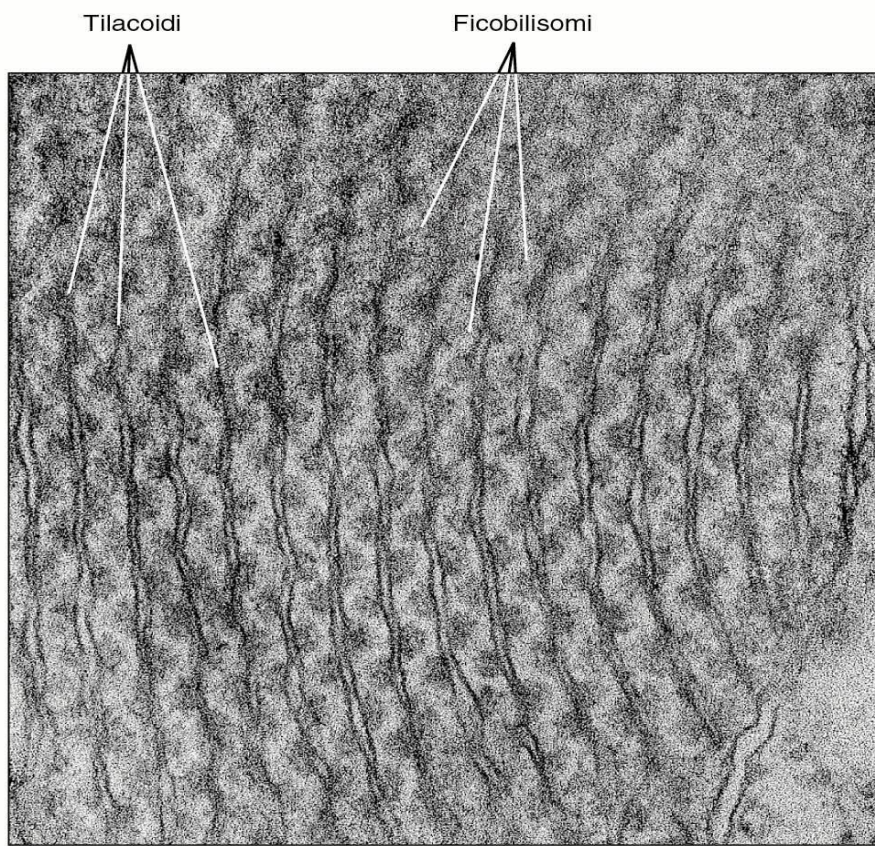
# Plastidi algali (*Chlorella*, alga verde unicellulare)

Un solo cloroplasto che occupa buona parte del volume della cellula

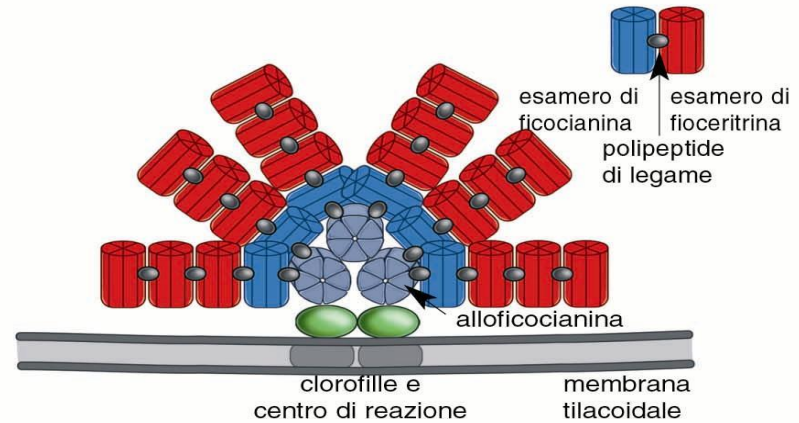


0.5  $\mu$ m





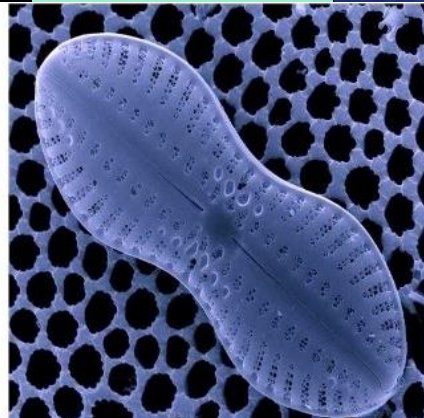
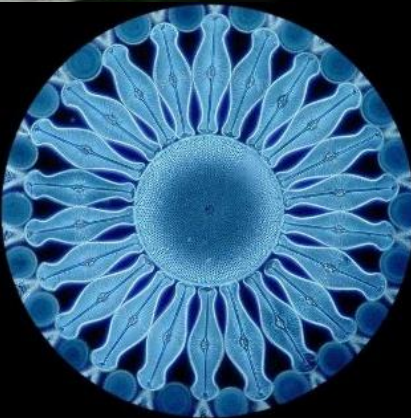
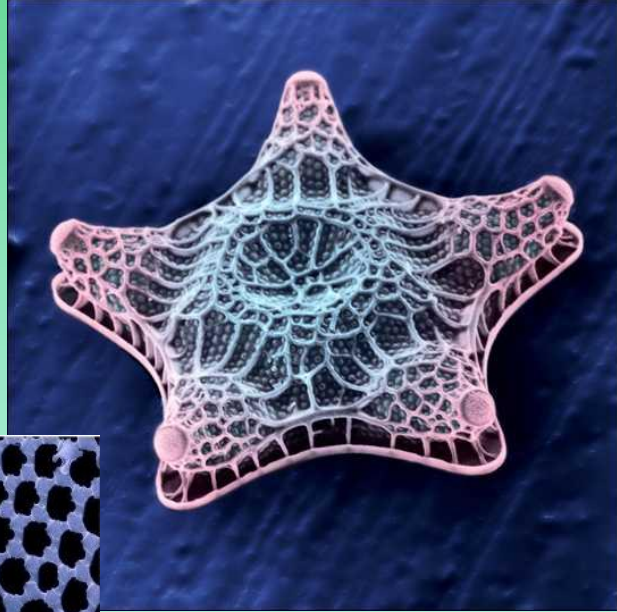
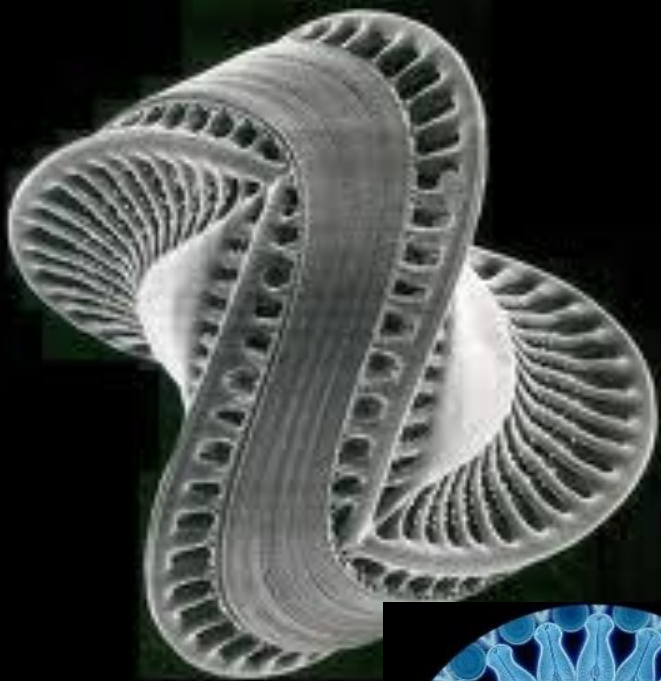
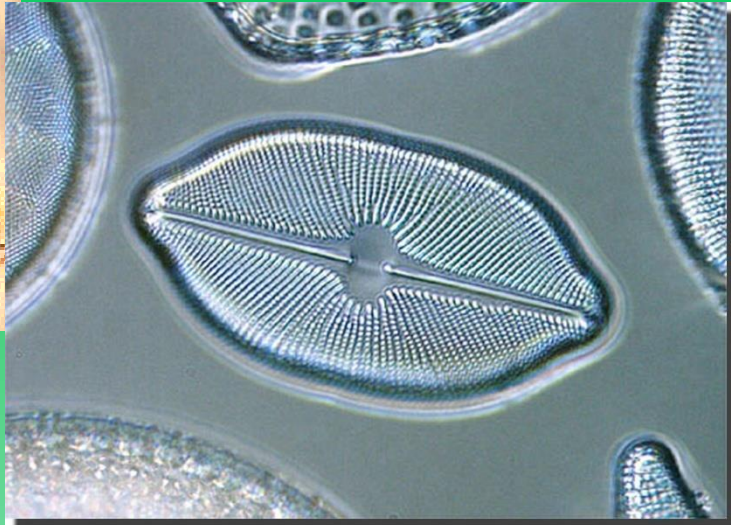
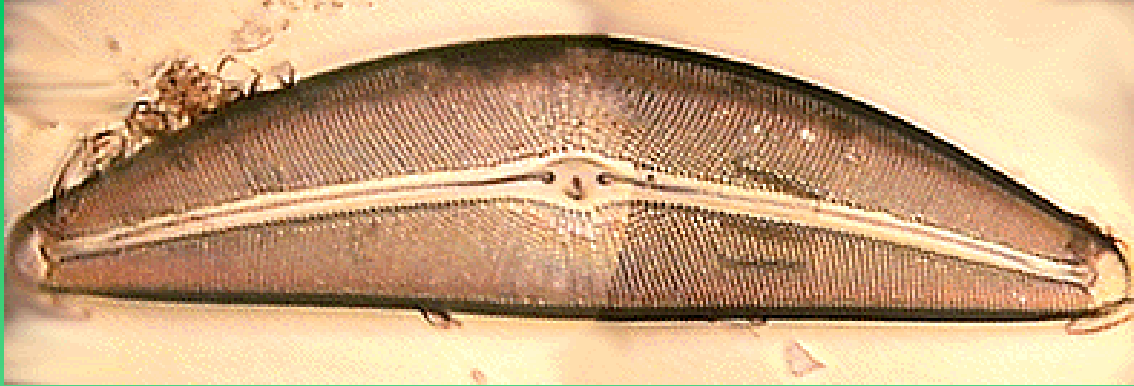
(a)

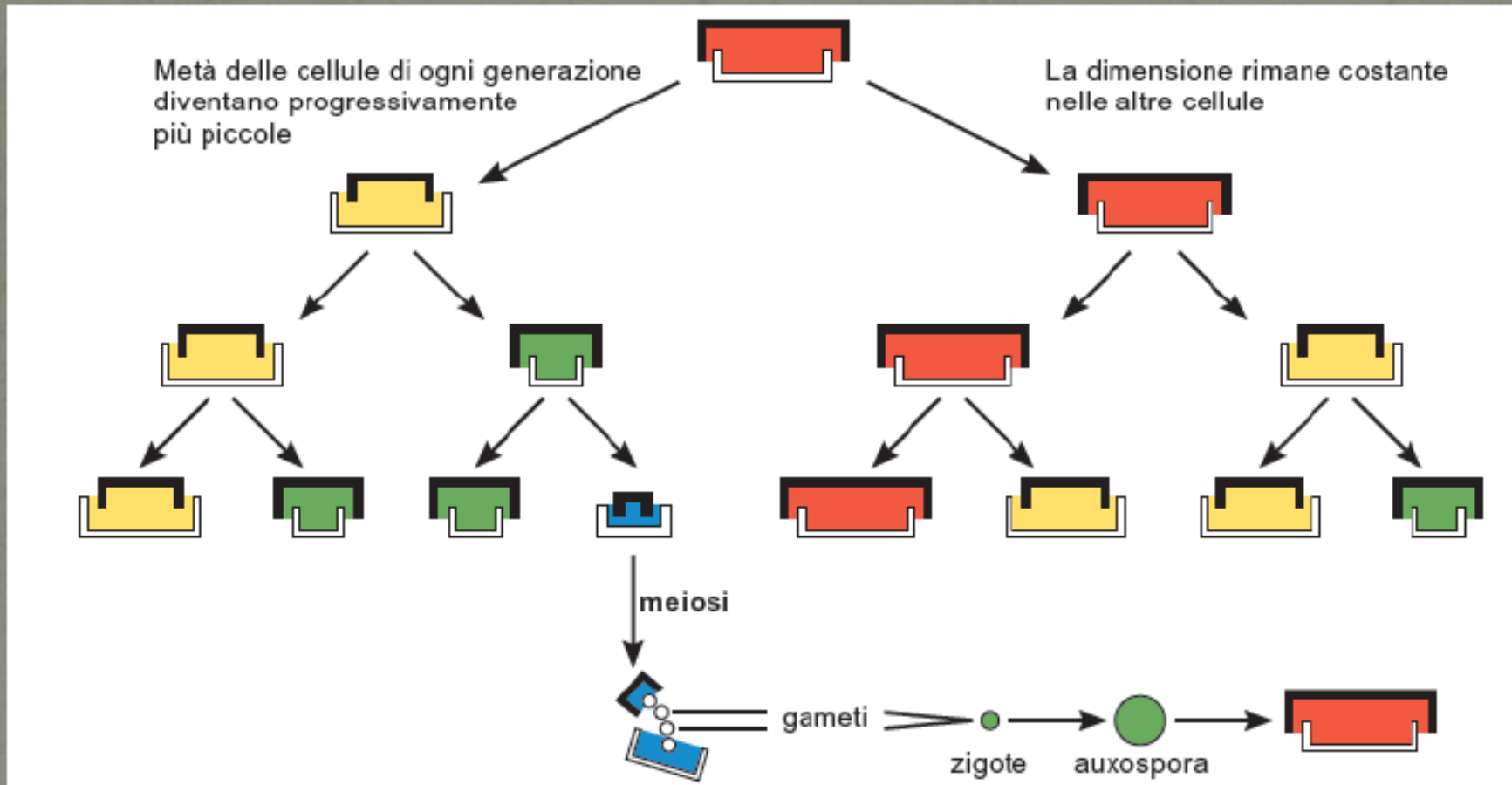


(b)

Complesso del ficobilisoma, esamero di ficobiliproteine, con funzione antenna per convogliare l'energia luminosa al centro di reazione.

La ficocianina è di colore azzurro con picco di assorbimento della luce intorno a 620 nm, e la ficoeritrina di colore rosso con un picco a 545 nm<sup>6</sup>.

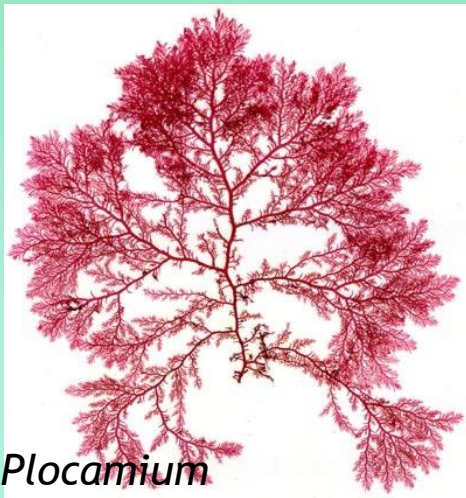
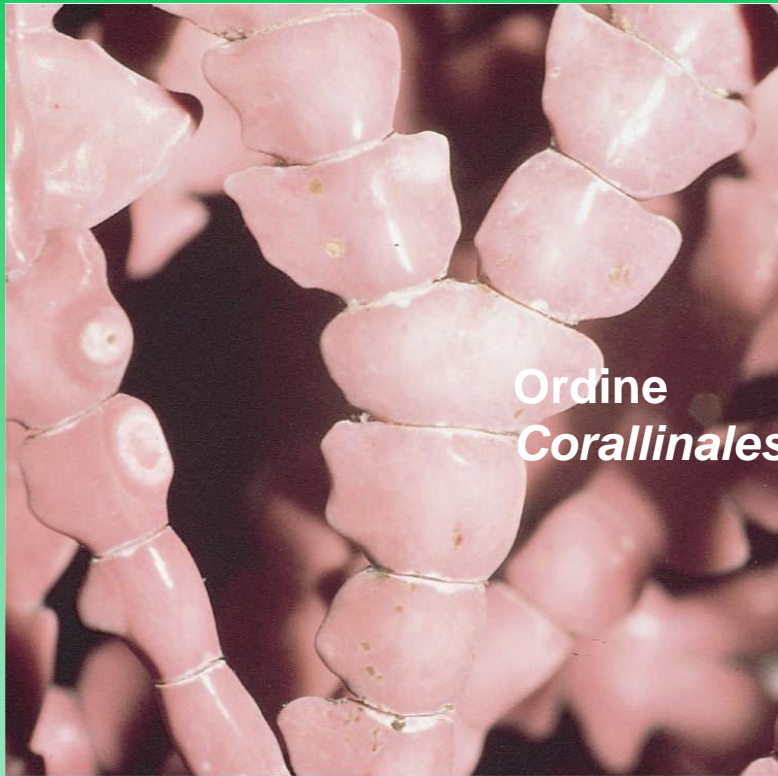




Auxospora: cellula  $2n$  di grandi dimensioni



# RHODOPHYTA o Alghe rosse



# Phaeophyceae o Alghe brune

*Durvillea antarctica*



(a)



(a)



(b)

*Sargassum vulgare*

*Laminaria*

Visibili le ventose basali per l'ancoraggio al substrato



(b)



*Fucus vesiculosus*

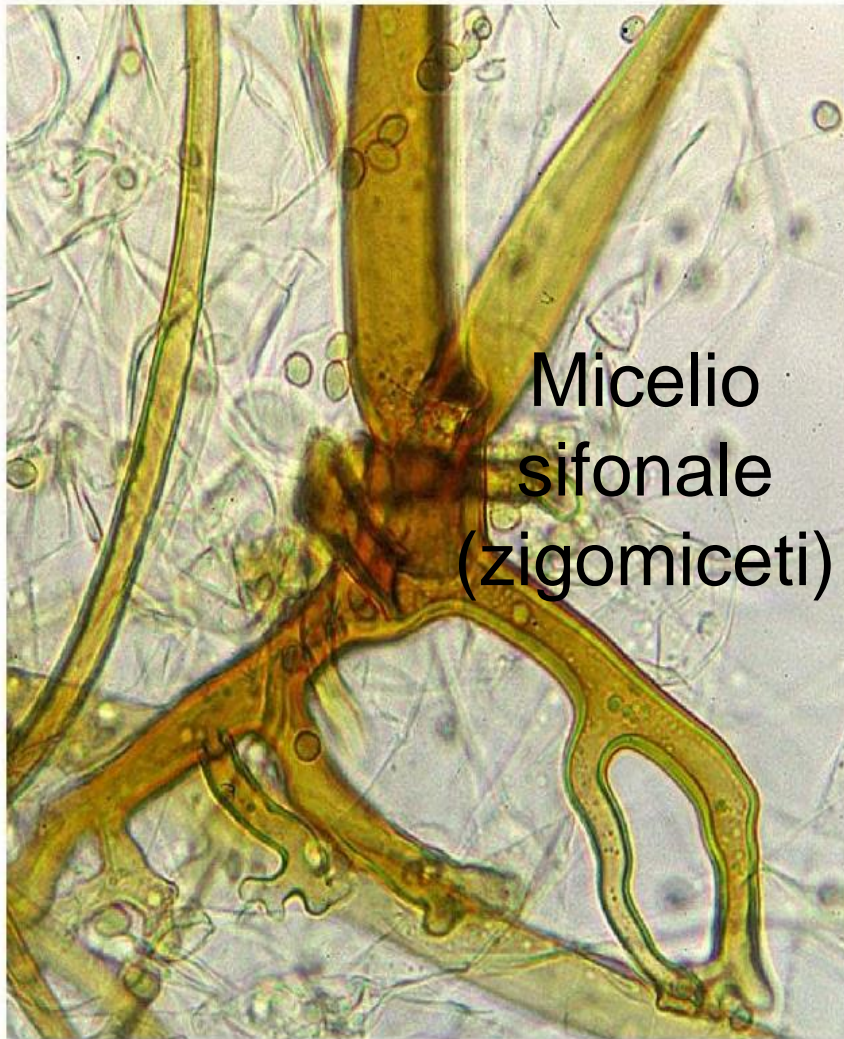
Le cisti sono piene d'aria e servono per spostare le fronde verso l'alto per permettere di captare meglio la luce.



*Sargassum vulgare.*

# Crescita della muffa *Rhizopus* sul

Zigomiceti



**Figura 23.10**  
Rizoidi di *Rhizopus* (osservazione di O. Maggi).

# Ascomyceti

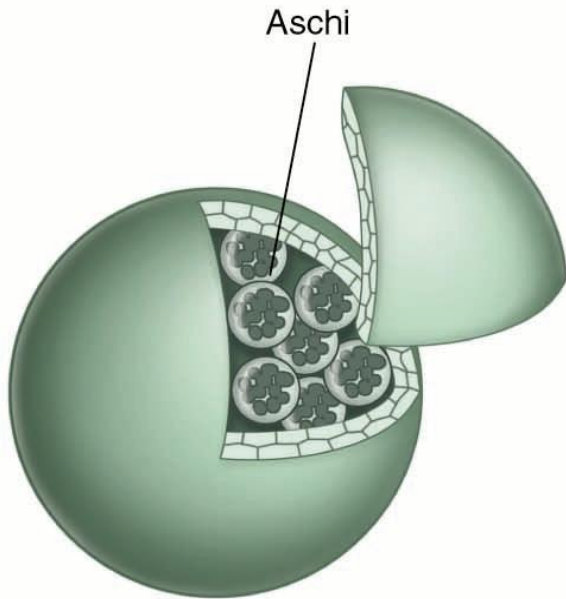
Conidiofori  
ramificati



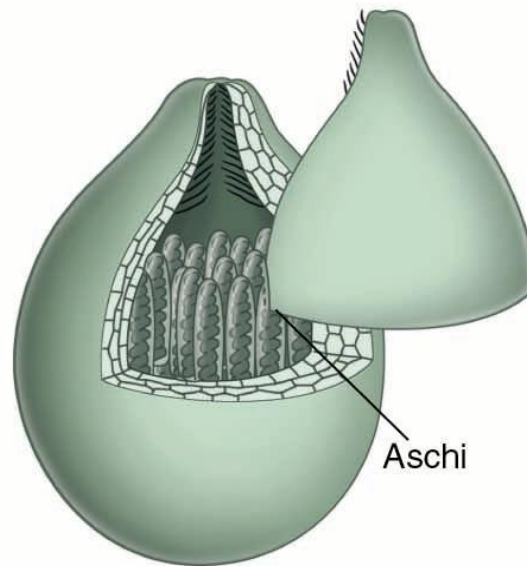
Il Pennicillium



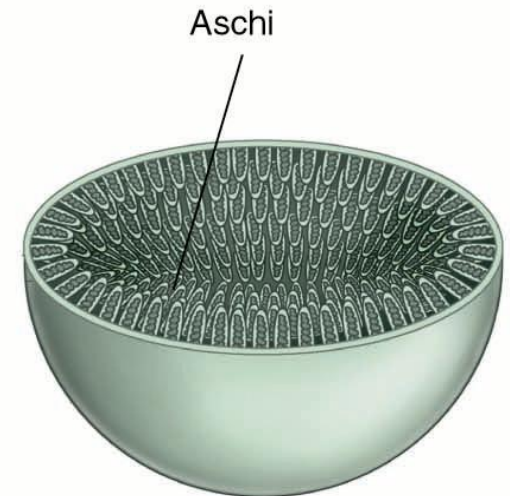
# Esempi di corpo fruttifero degli ascomiceti



Cleistotecio



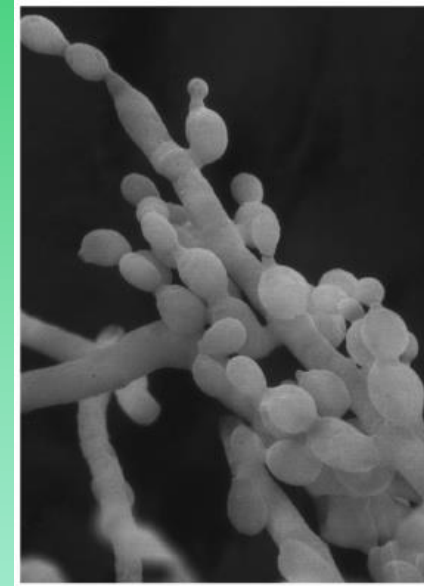
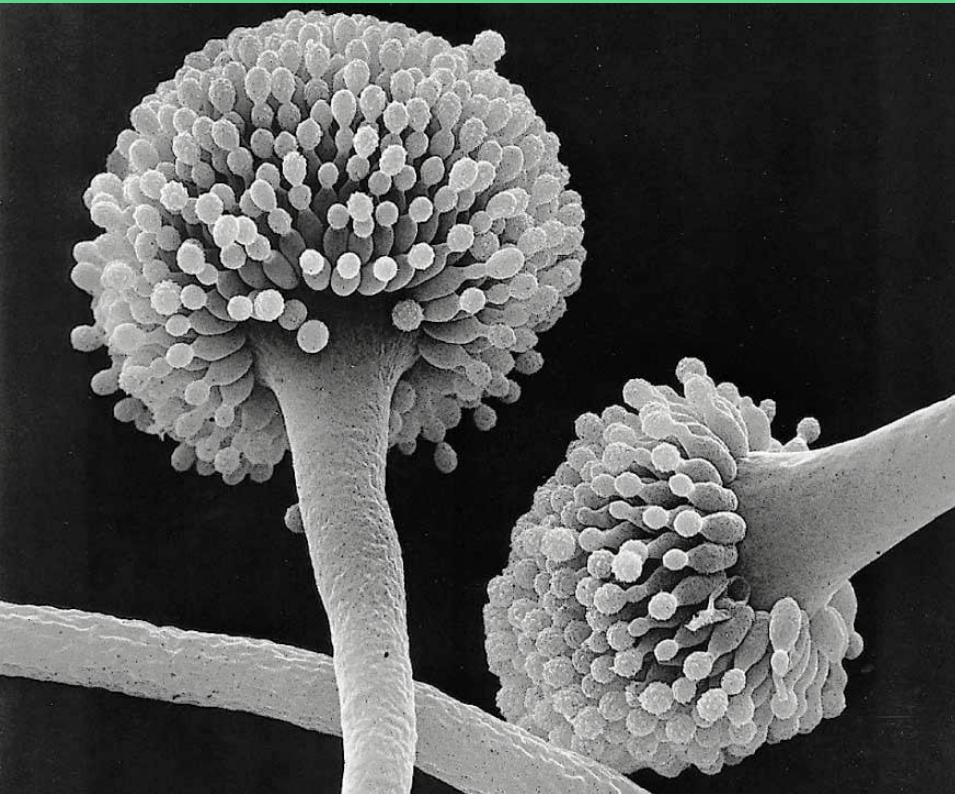
Peritecio



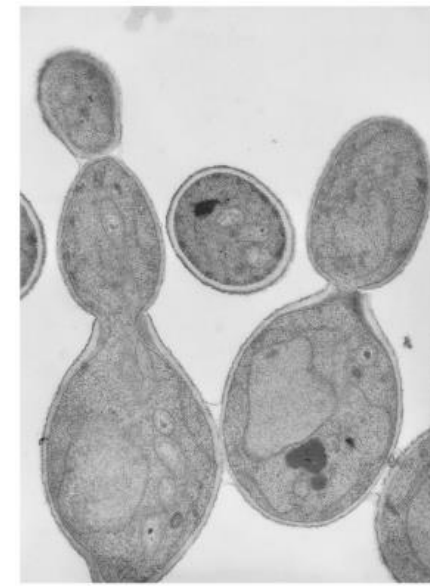
Apotecio

# Le mitospore

I conidifori con  
all'estremità file di spore  
(spore asexuate).



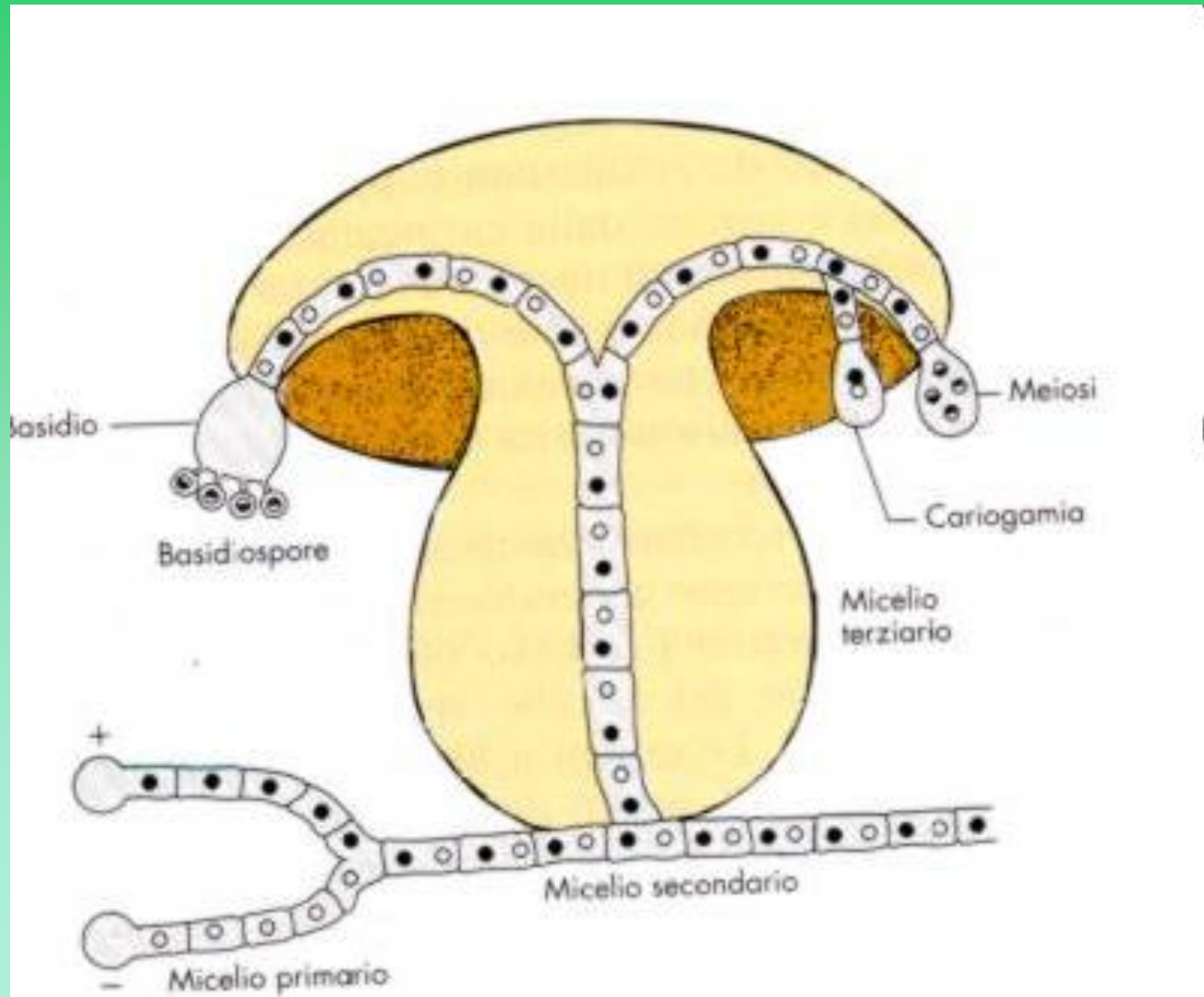
(a)



(b)

Conidi di ascomiceti a vari stadi di  
sviluppo

# Basidiomiceti



# Esempi di basidiomiceti: Amanita, poliporo, fungo a mensola, fungo corallo



(a)



(b)



(c)



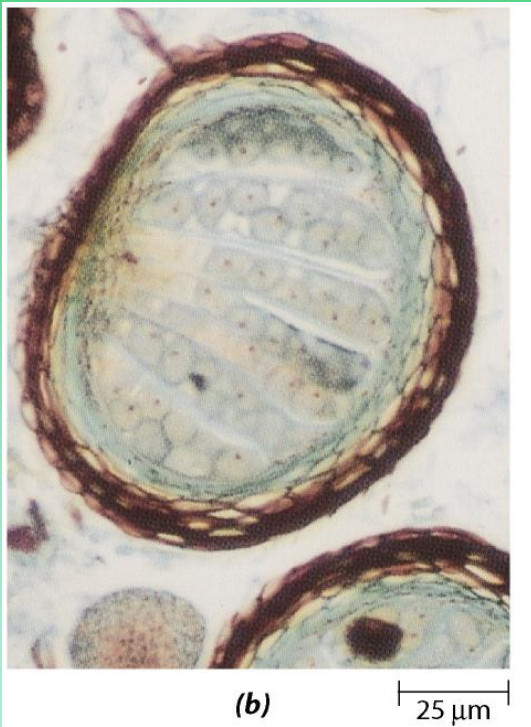
(d)



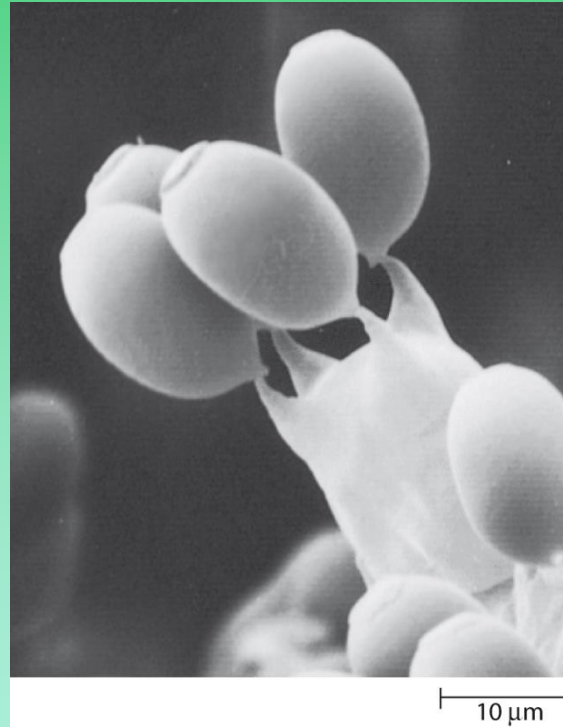
(b)



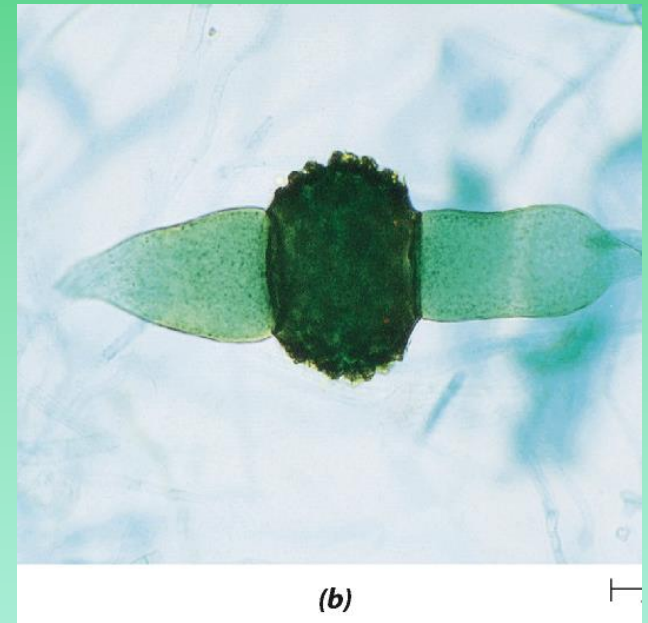
# Le spore del ciclo sessuale (meiospore:ascospore, basidiospore e zigospore)



asco



basidio

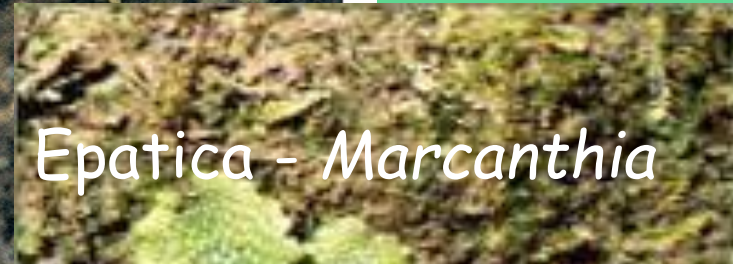


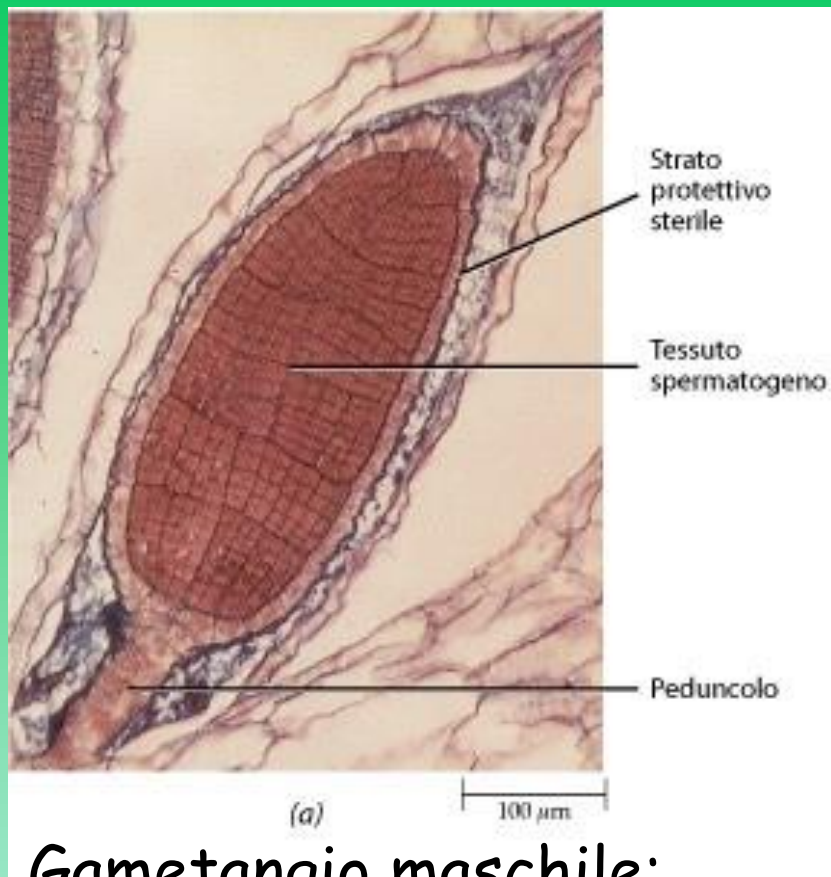
zigosporangio

# Le briofite, gli anfibi del regno vegetale

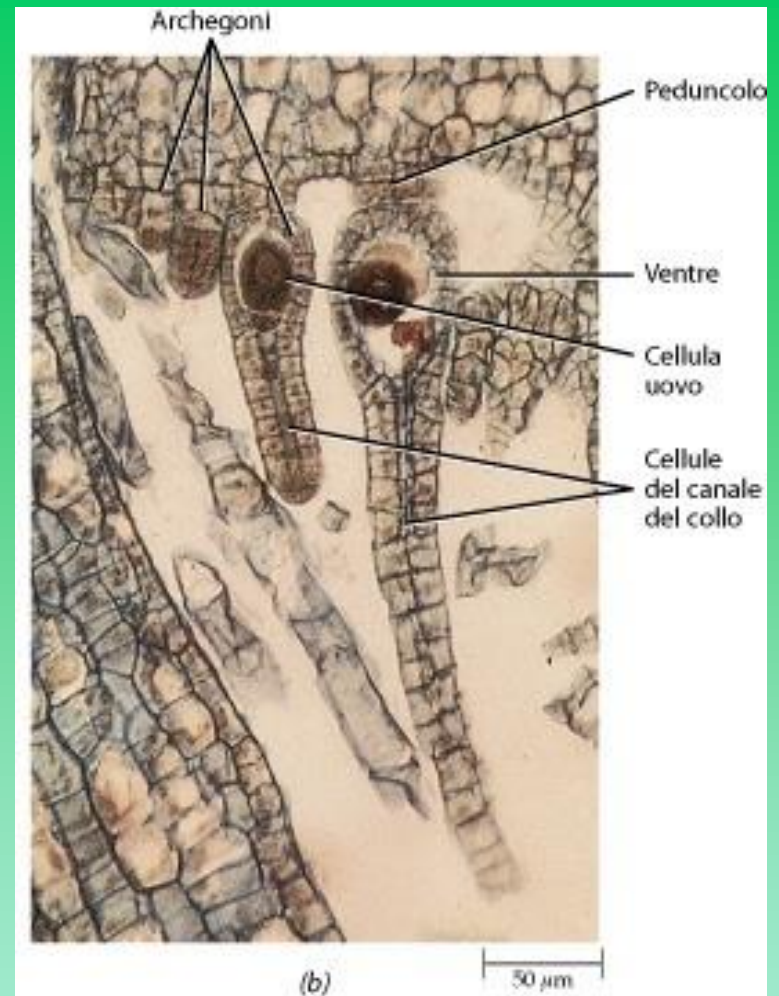


*Epatica - Marcanthia*





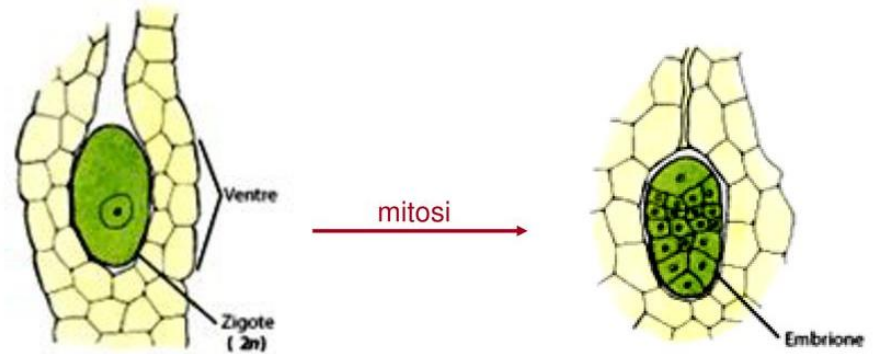
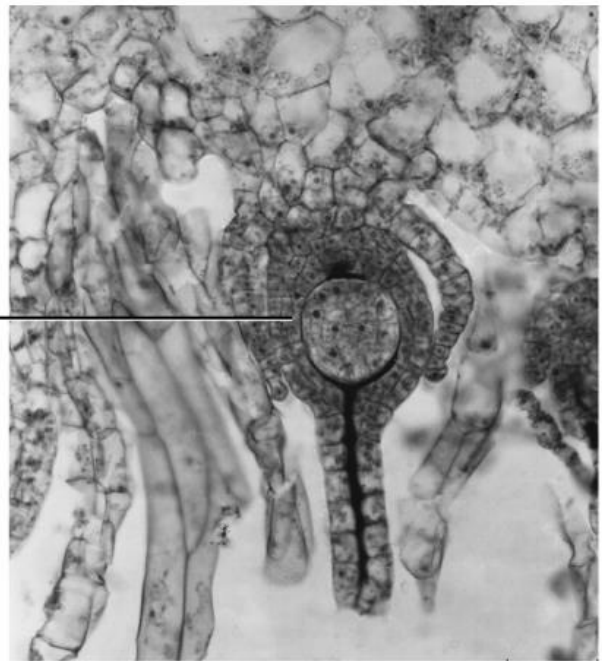
Gametangio maschile:  
Anteridio di epatica.



Gametangio femminile:  
Archegonio di epatica.

# Embrione a Nutrizione matrotrofica

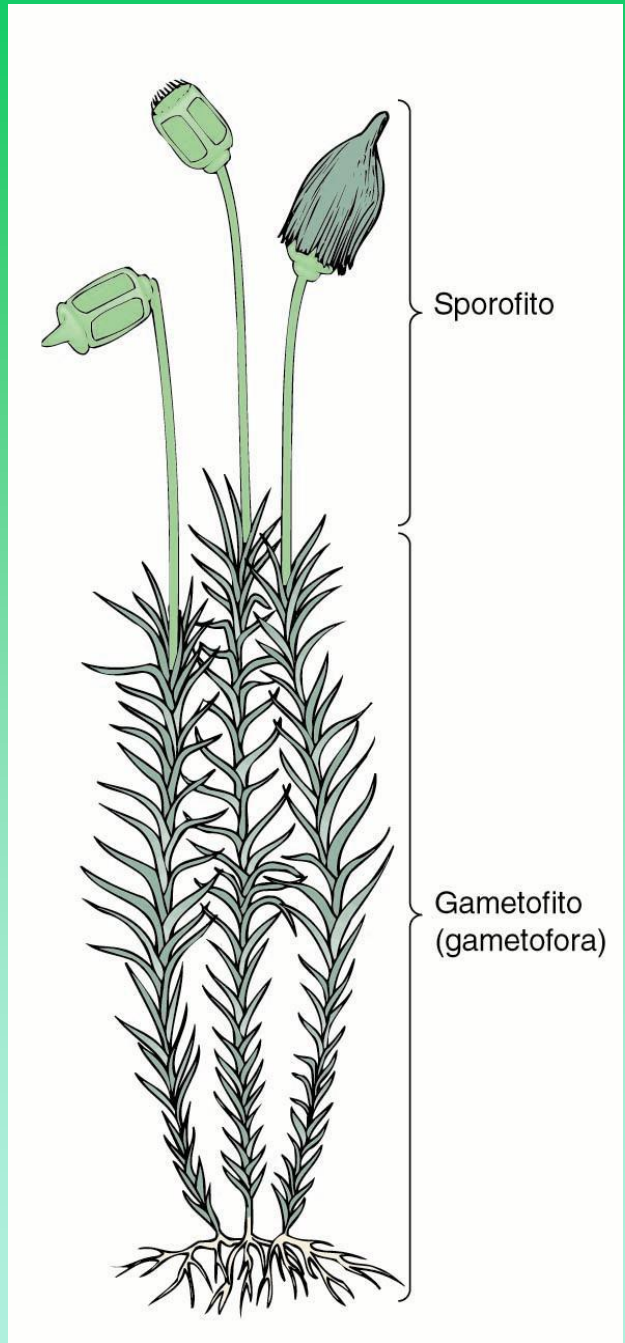
L'embrione è il giovane sporofito



- Lo zigote formerà un embrione, anch'esso contenuto all'interno dell'archegonio



lini



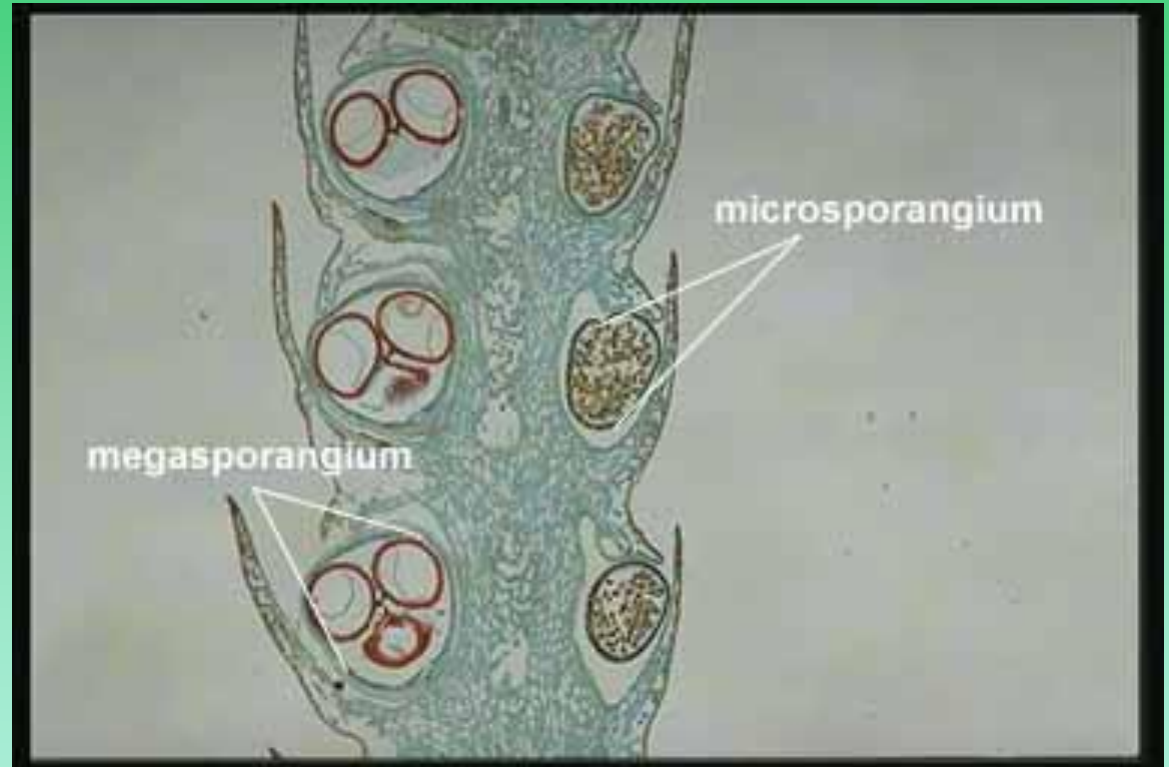
# Selaginelle e l'eterosporia

I macrosporangii e i microsporangii sono protetti da macrosporofilli e microsporofilli.

I micro- e macrosporangii sono presenti sullo stesso strobilo

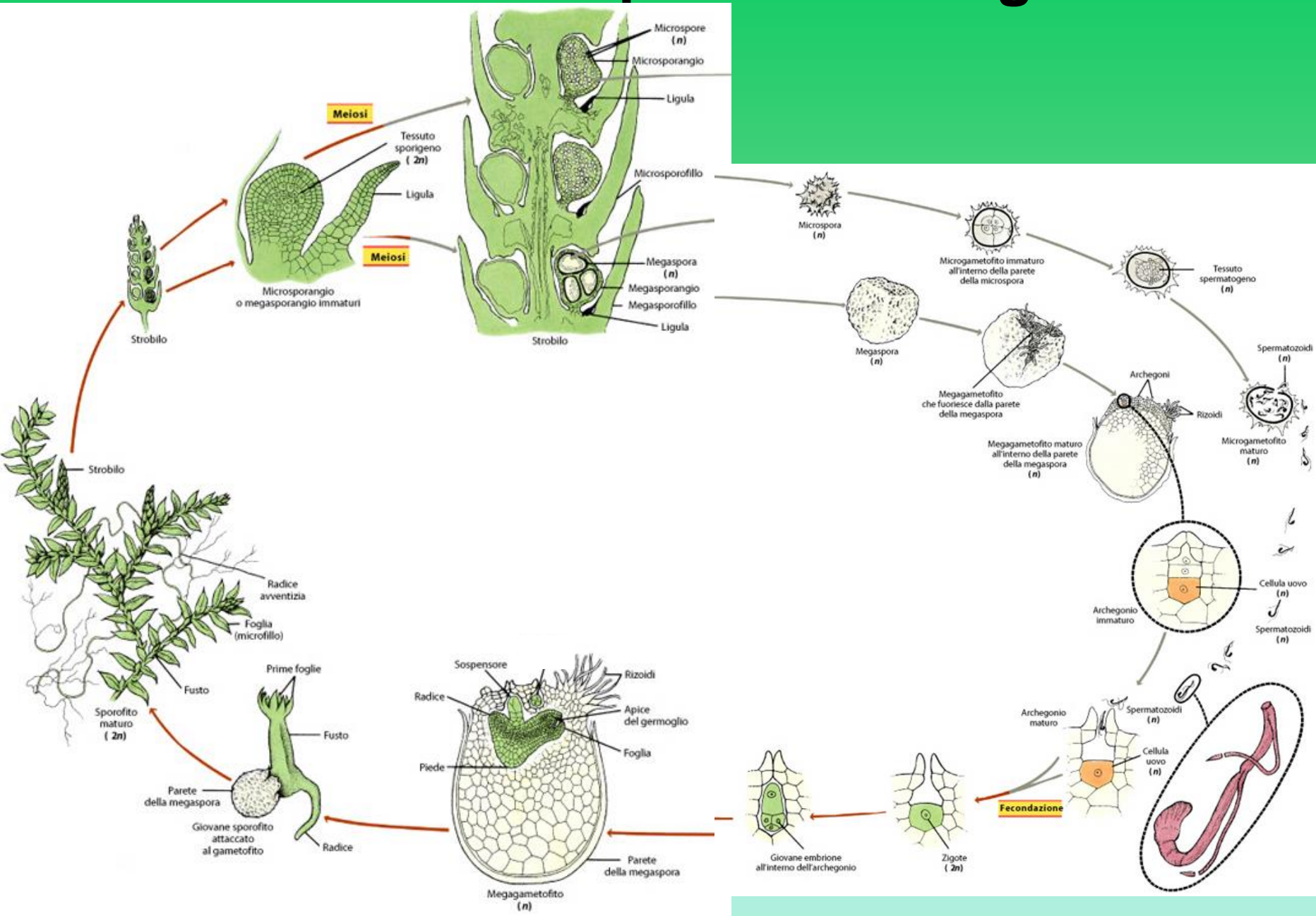


**Strobilo**



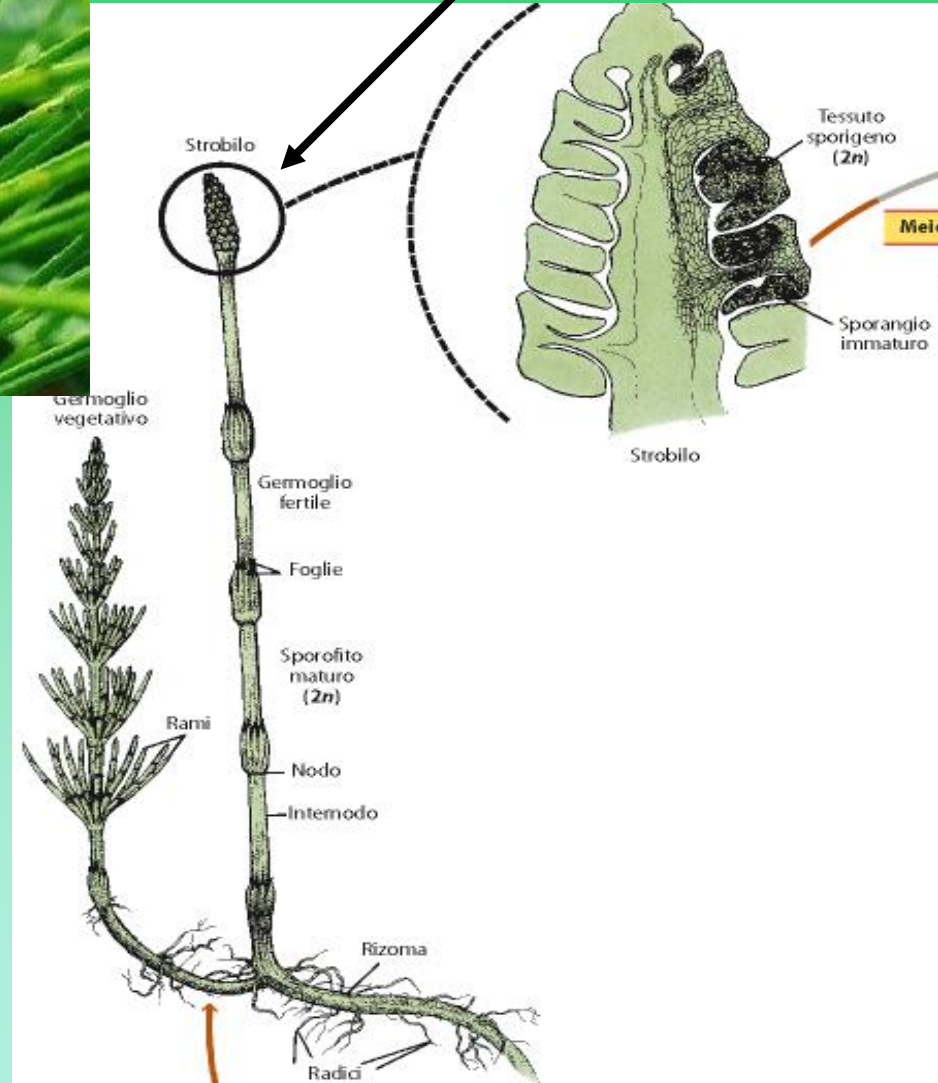
**Microsporangii e macrosporangii in *Selaginella***

# Il ciclo eterosporeo di Selaginella



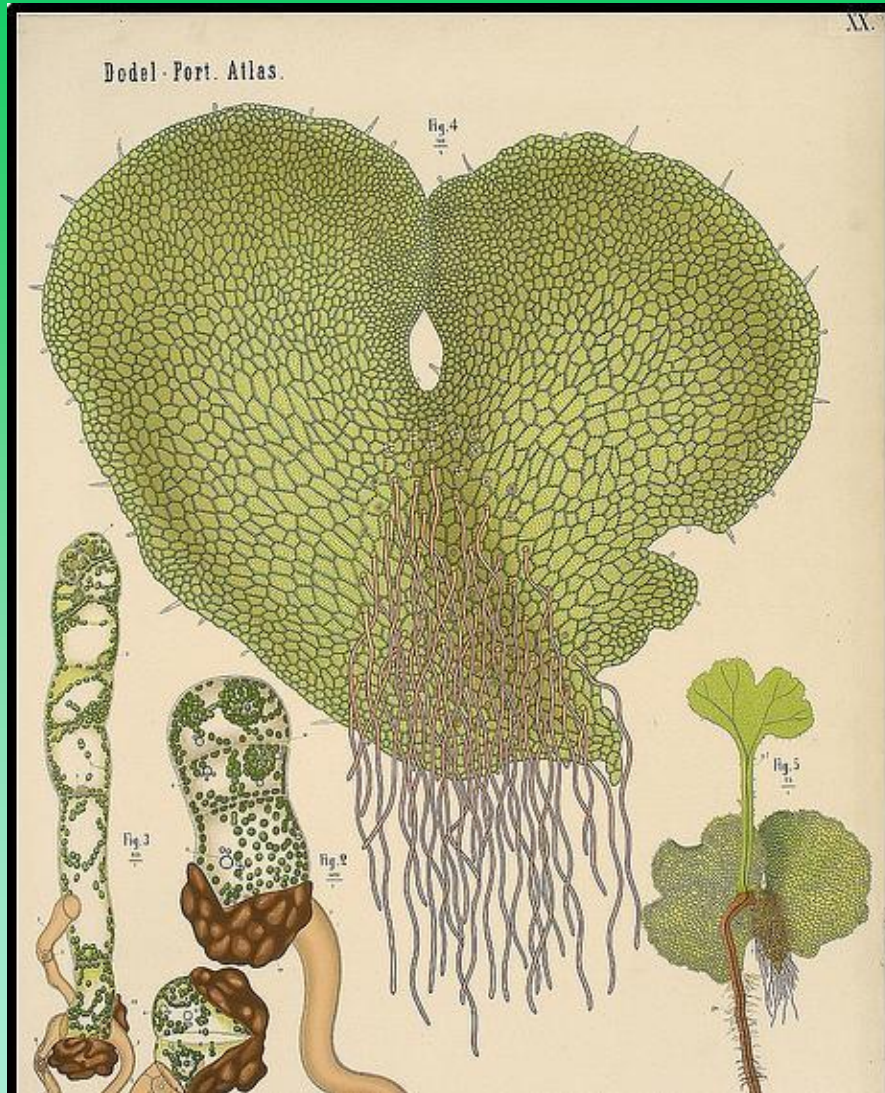


Insieme di sporangi

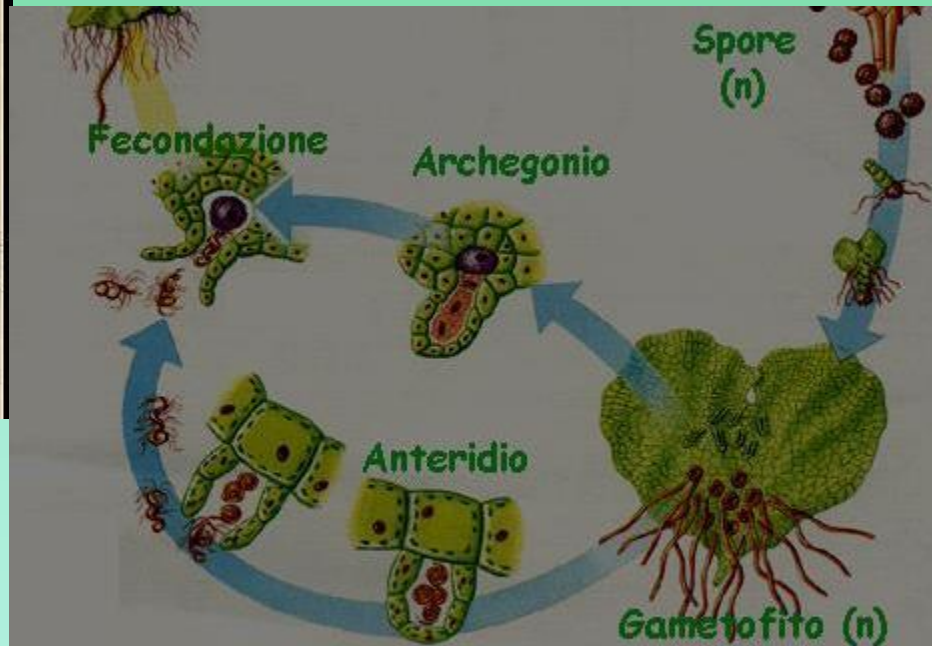




# GAMETOFITO delle PTEROPHYTA

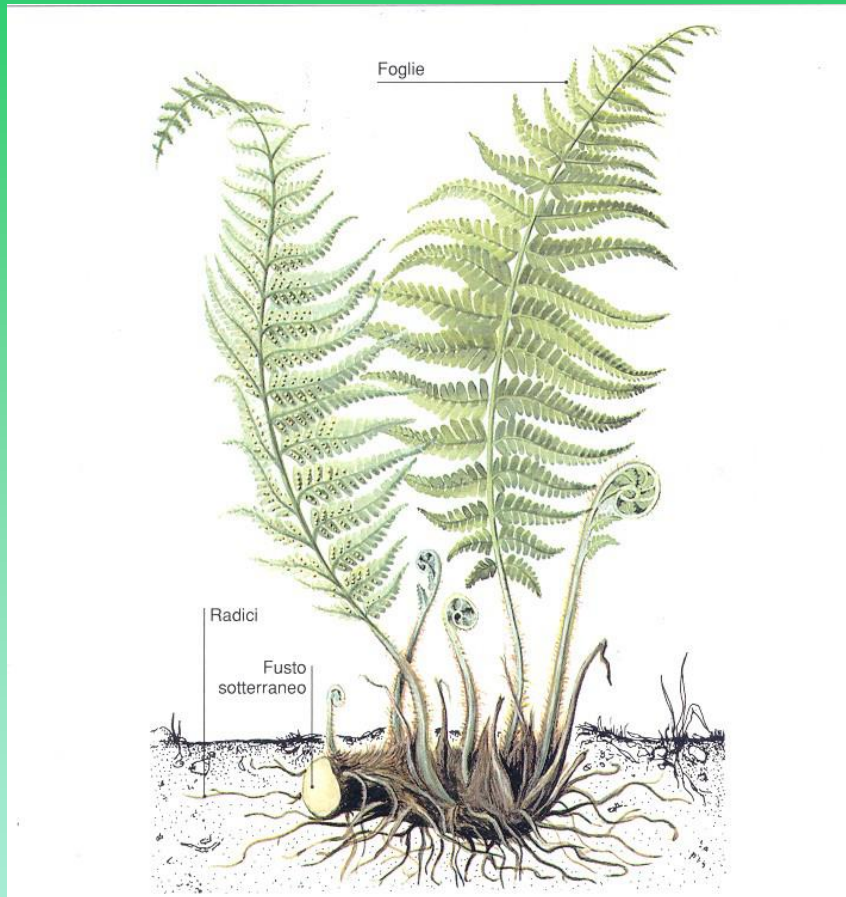


In molte felci, i gametofiti producono sia anteridi che archegoni, ma i gameti maschili e femminili maturano in tempi diversi.



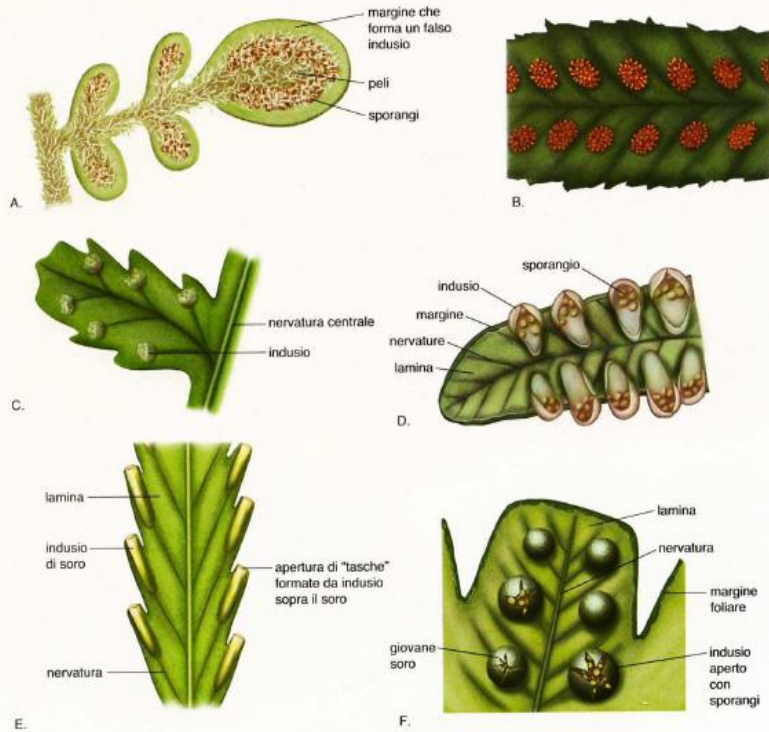
Protallo

## SPOROFITO delle PTERIDOFITE



**Figura 20.17**

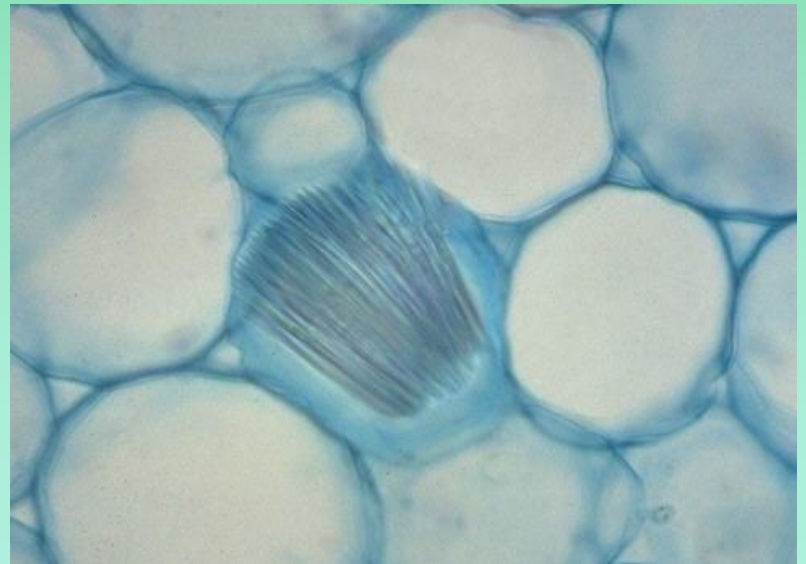
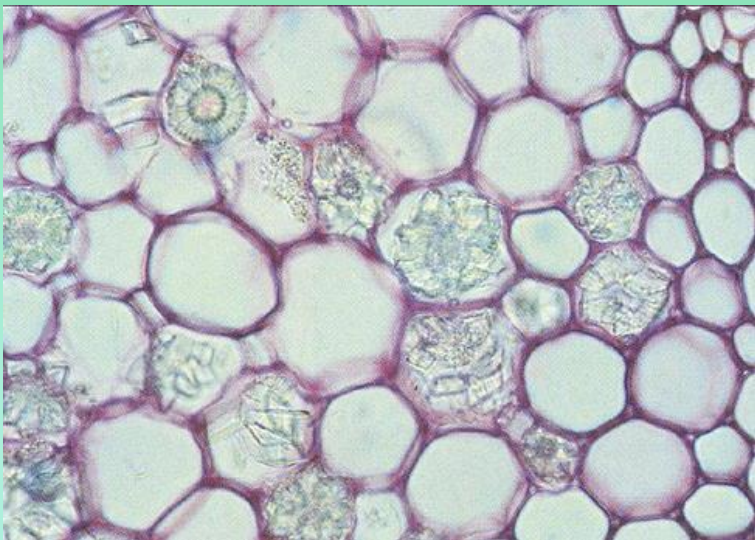
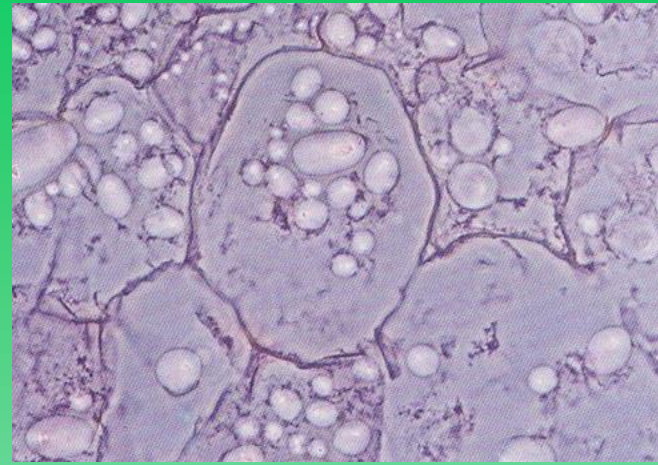
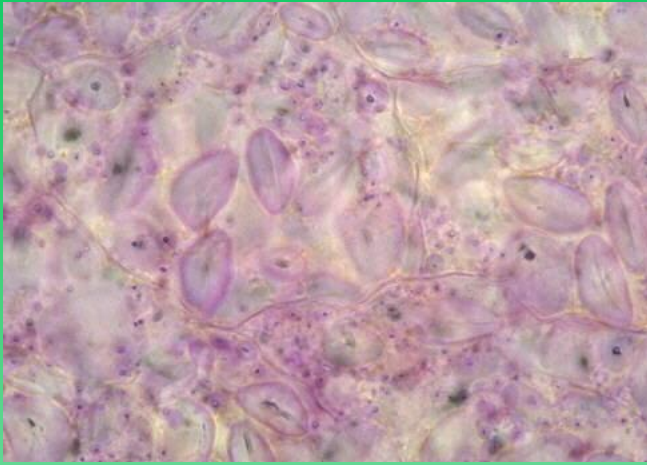
Fronda di felce in fase giovanile, arrotolata nella caratteristica forma a pastorale (foto di E. Giovi).

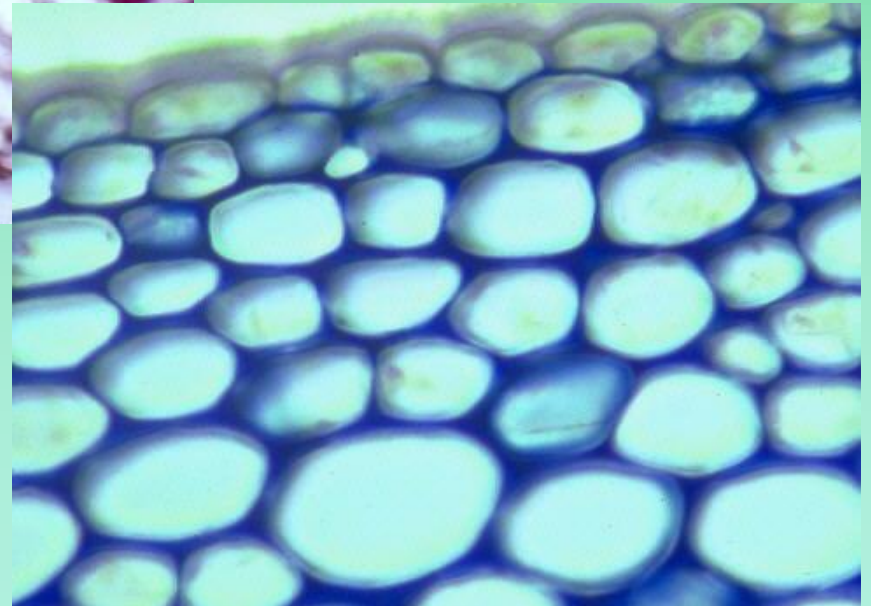
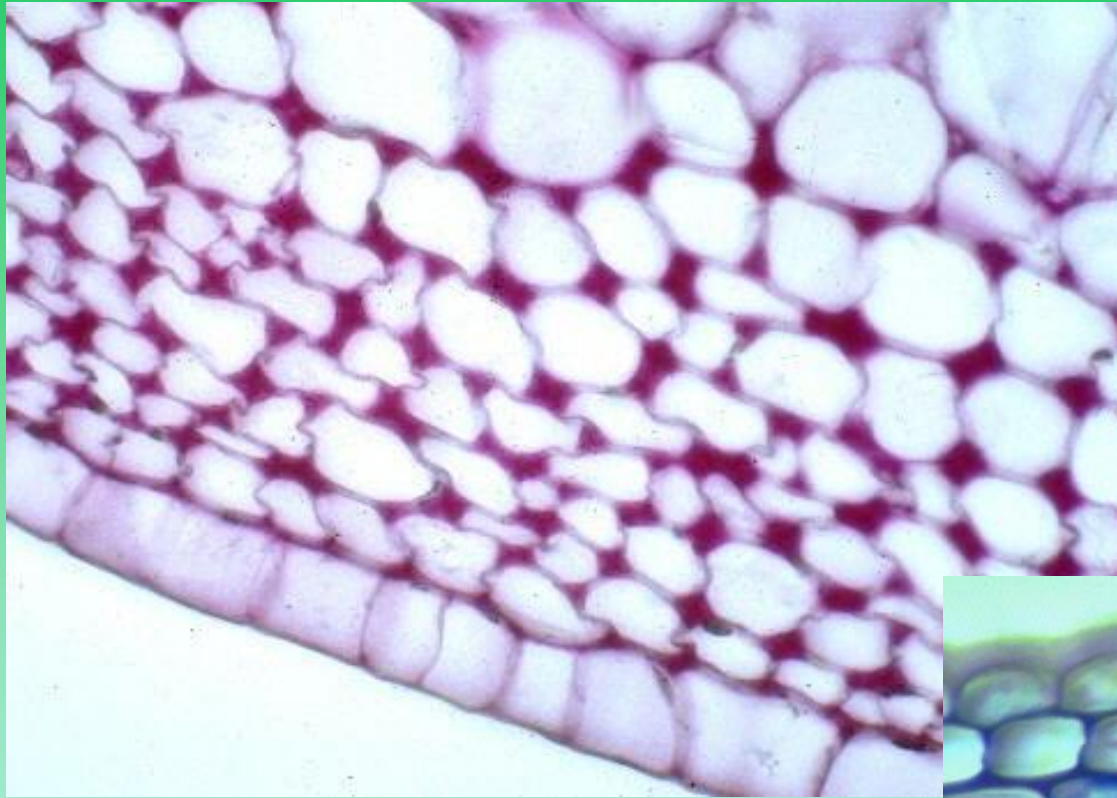


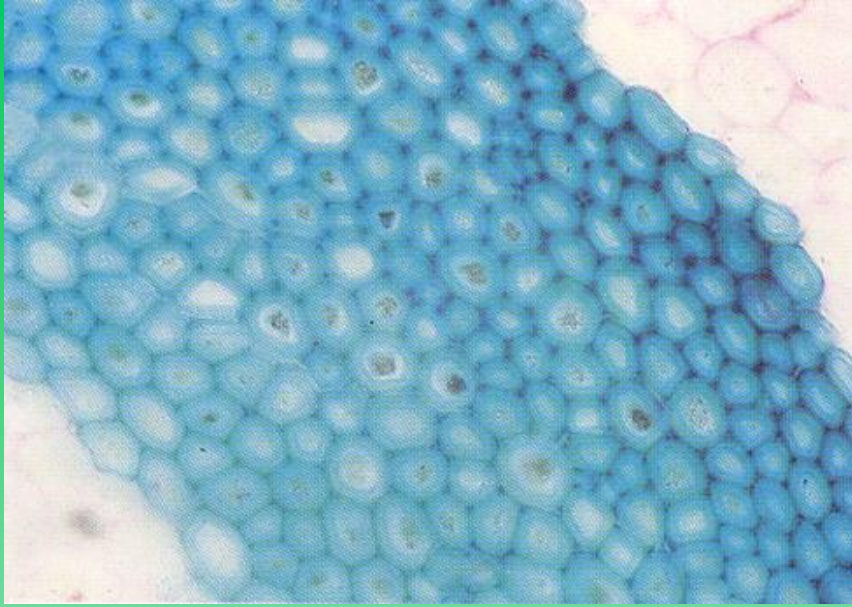
Pinne di fronde di felci con la disposizione di sporangi sulla superficie ventrale delle foglie.

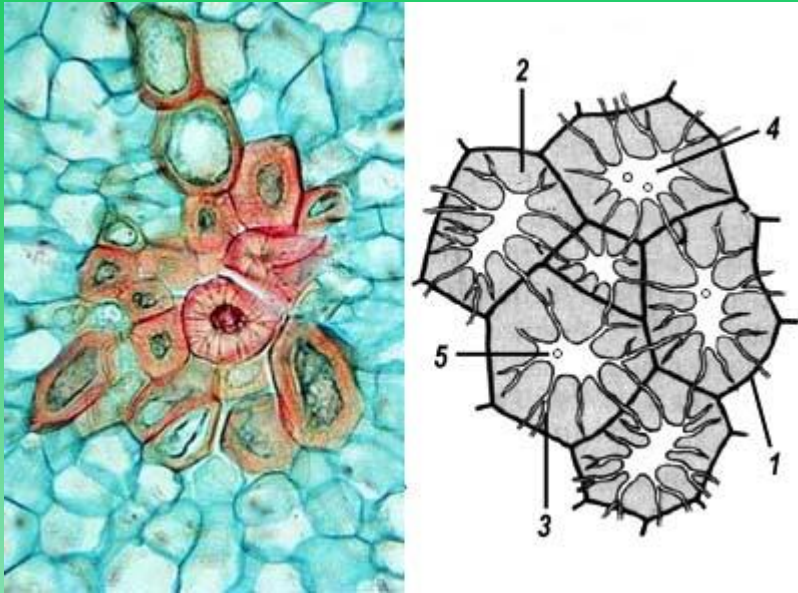


**Esempi di fronde di felci (Pterophyta) con gruppi di sporangi (sori) di diversa morfologia**

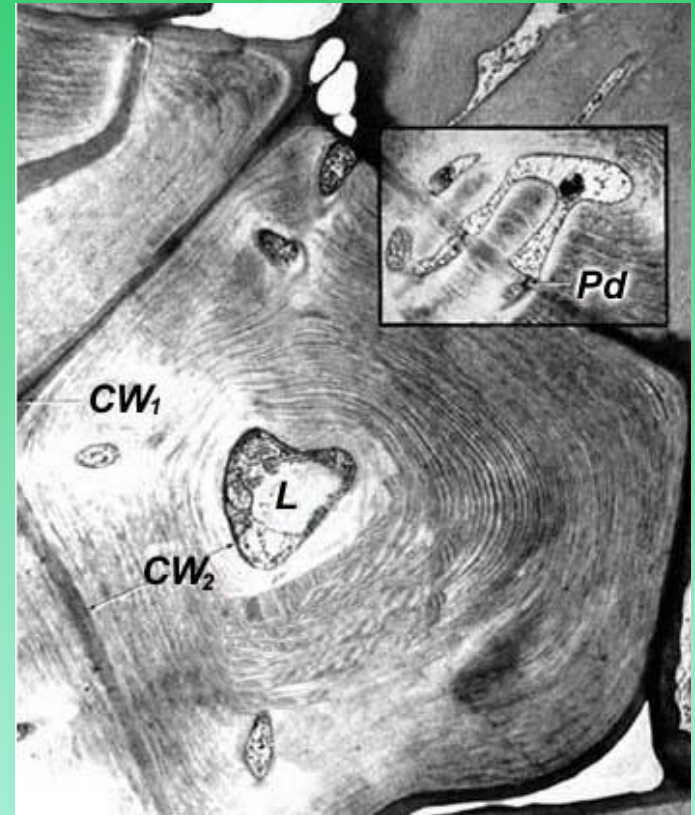


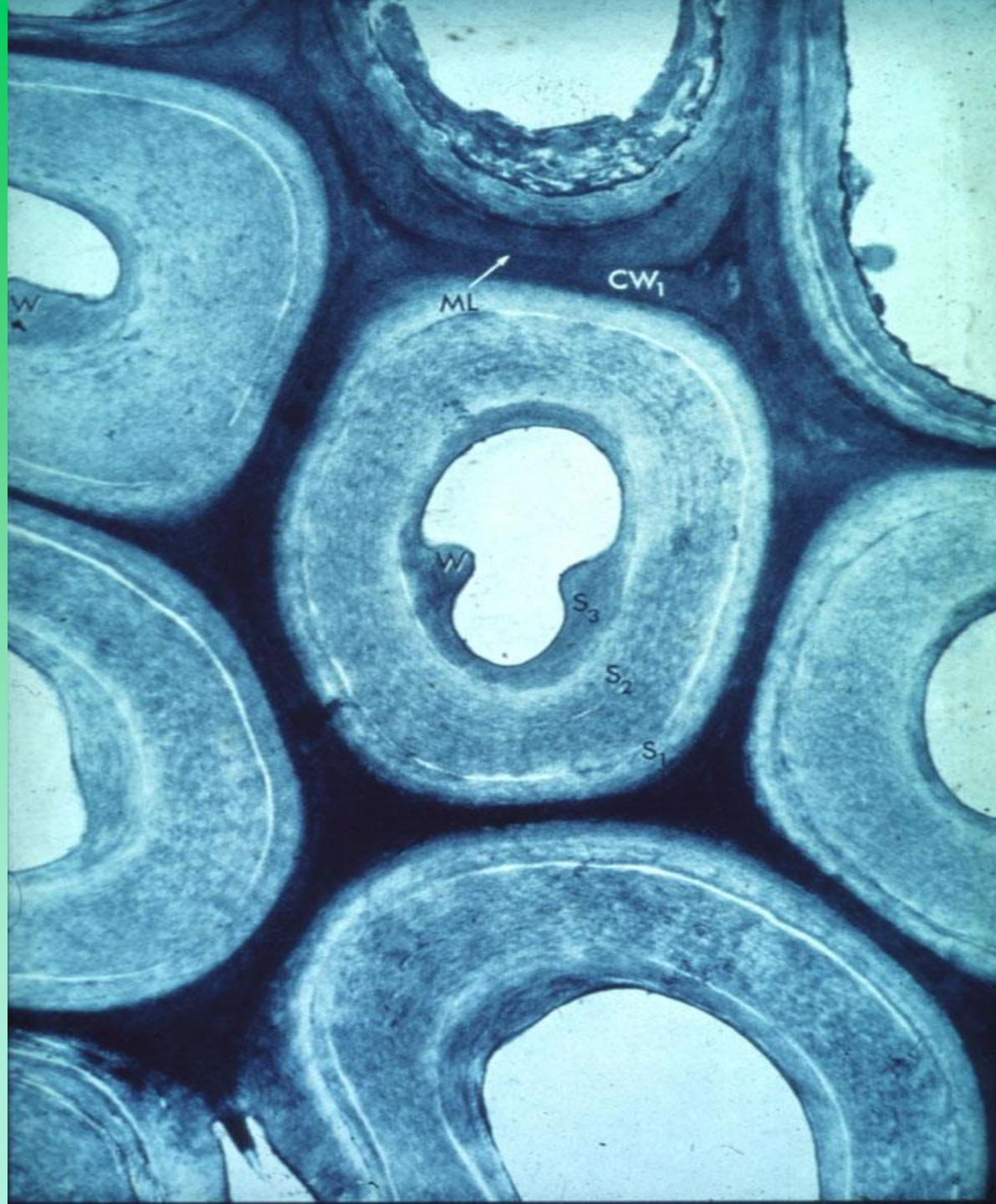




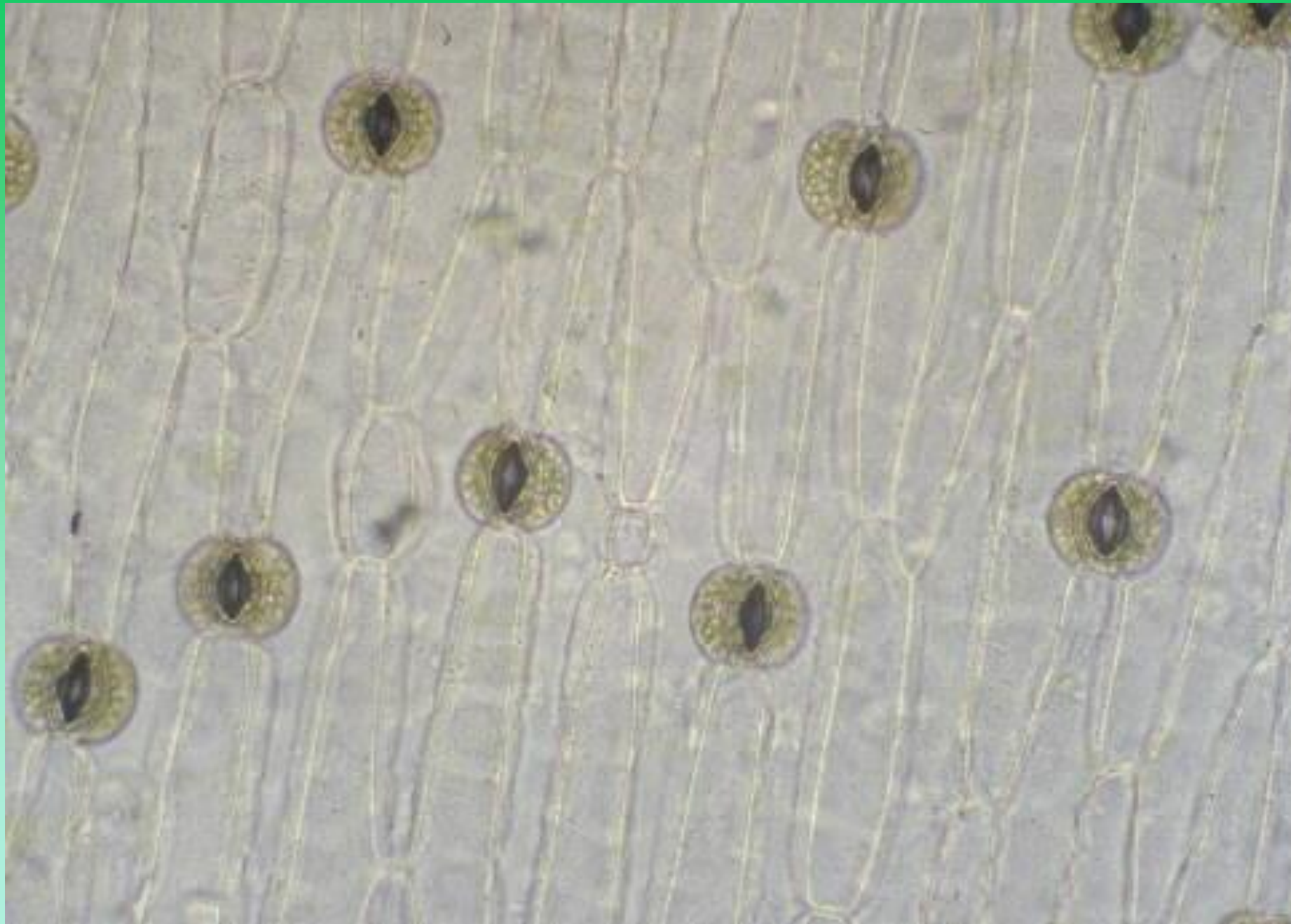


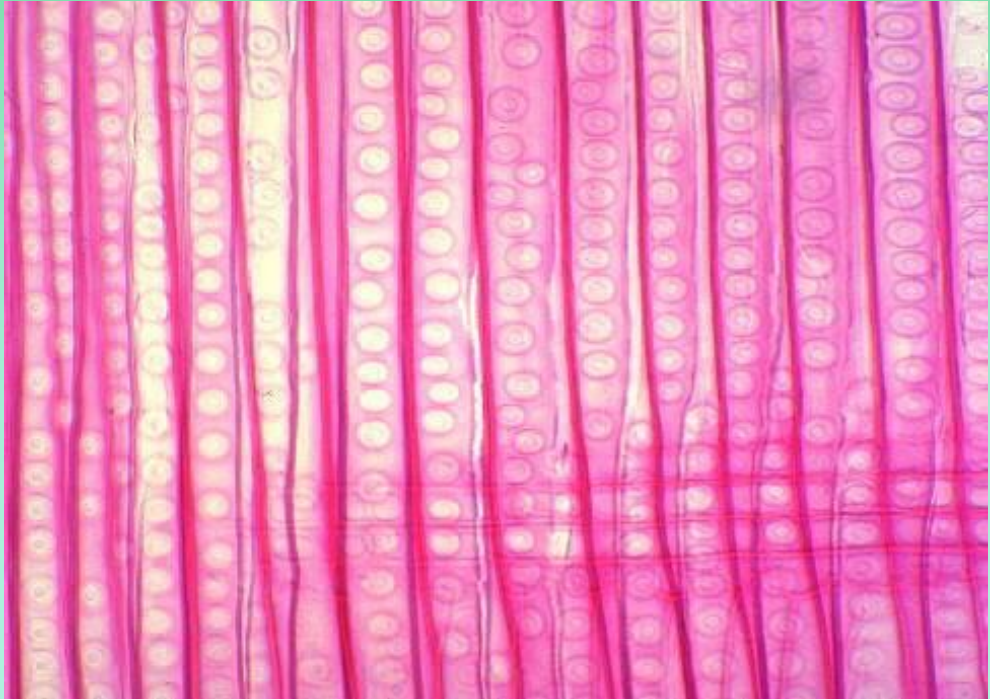
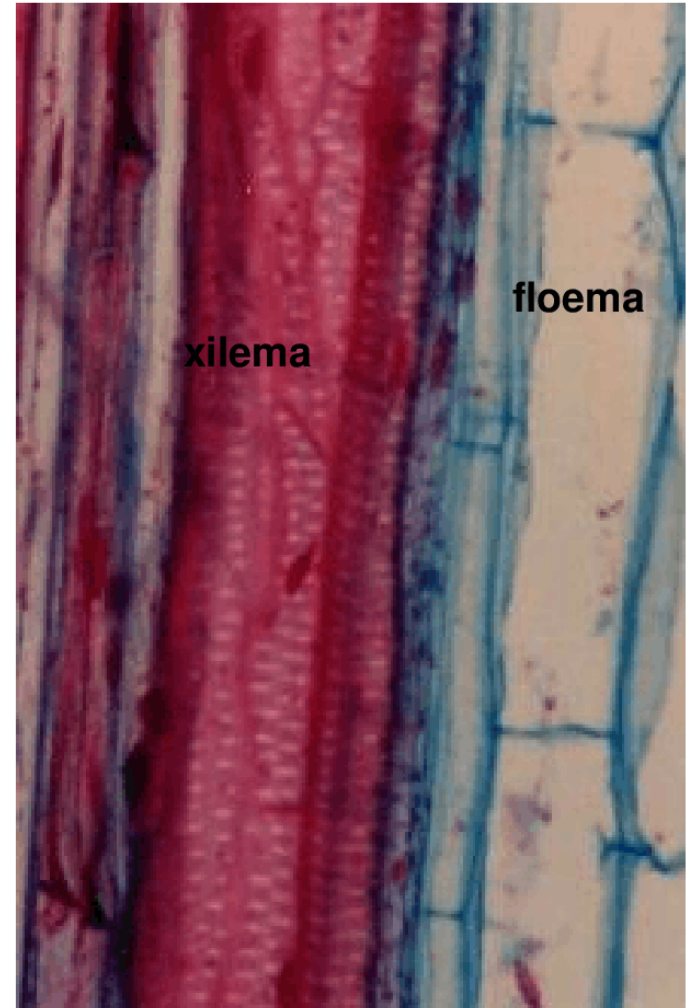
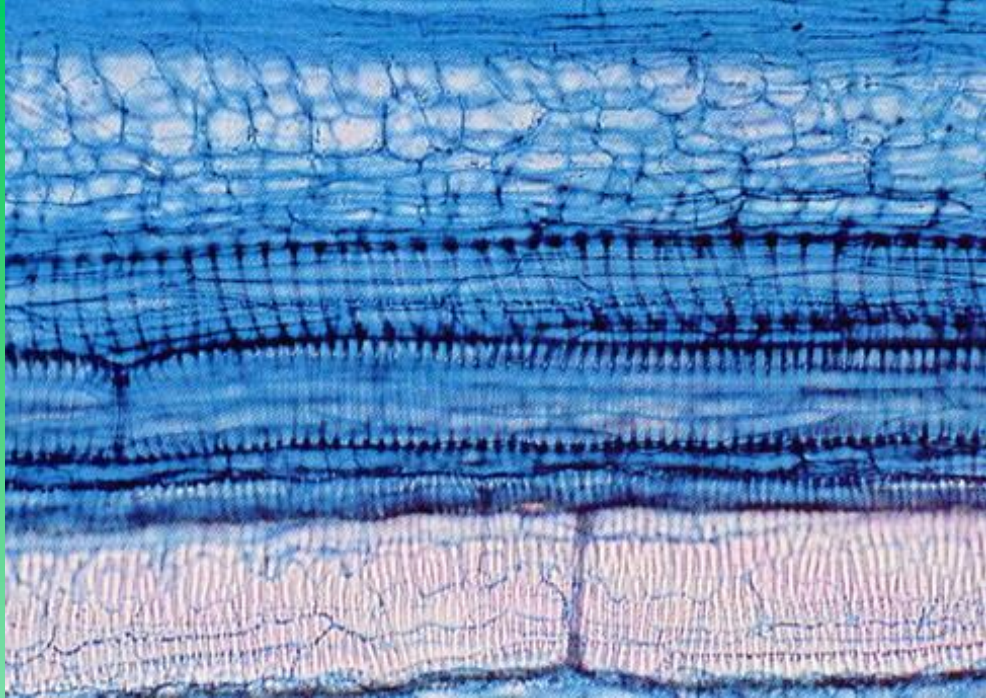
**1** = primary wall, **2** = secondary wall, **3** = ramified pit, **4** = cell lumen, **5** = cross-sectioned pit



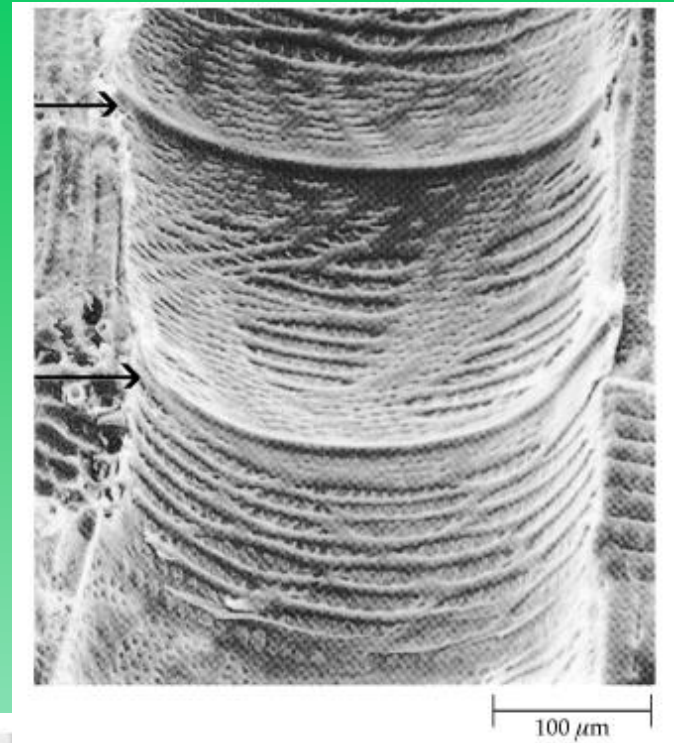
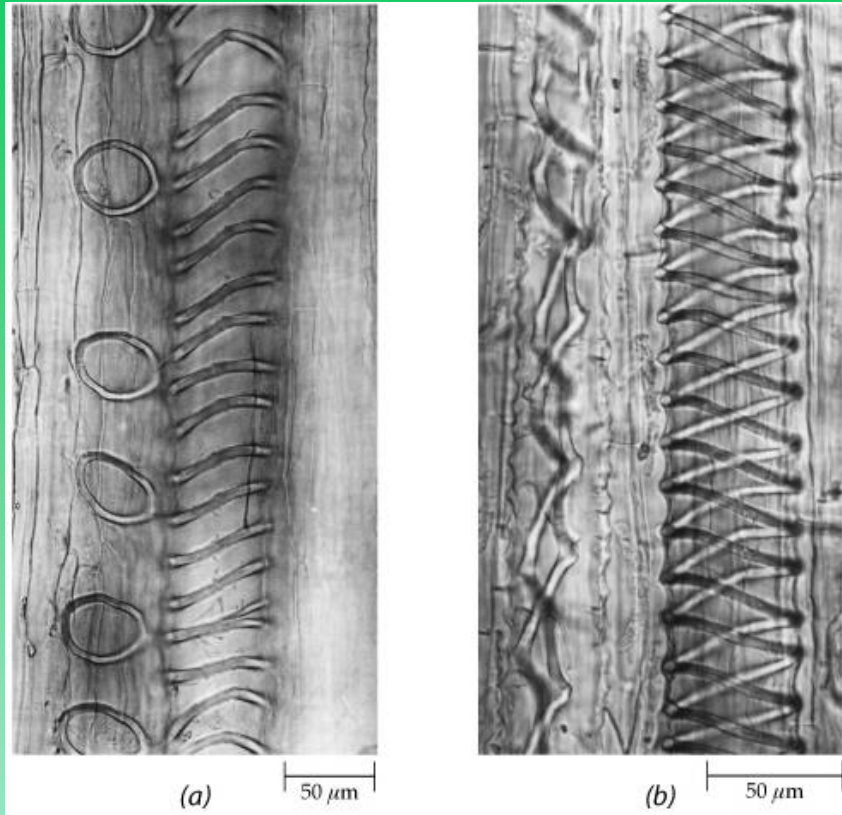




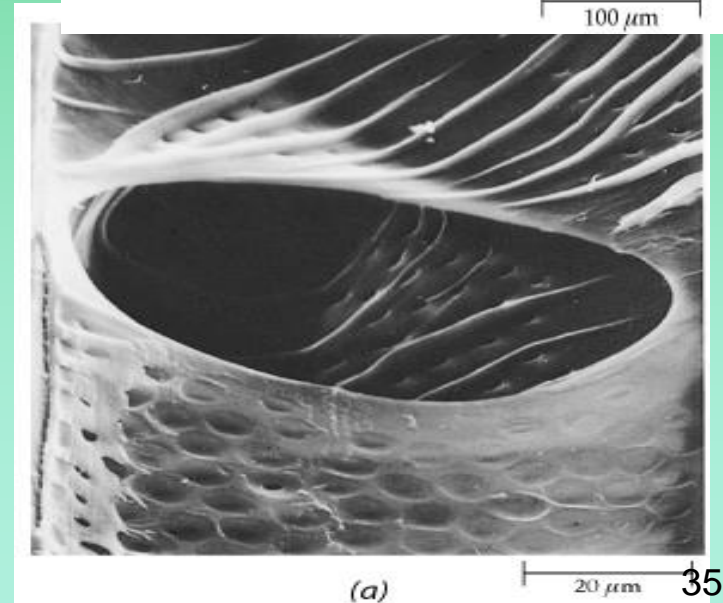
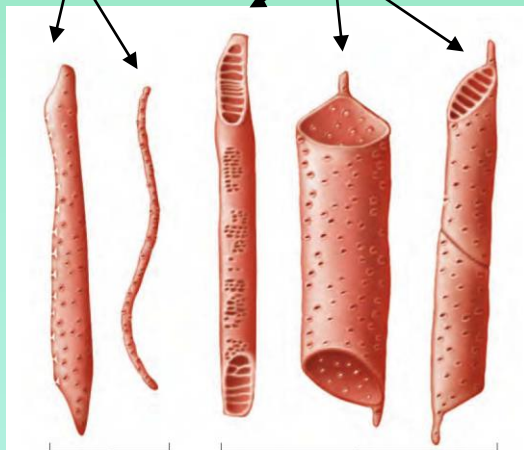




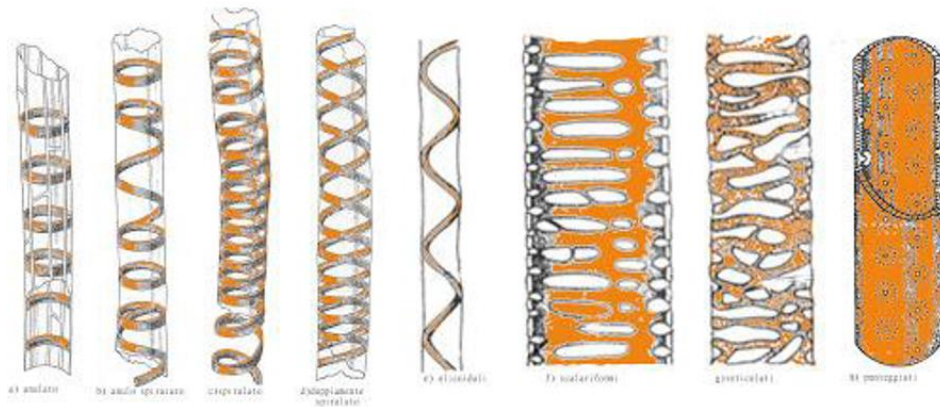
# Xilema



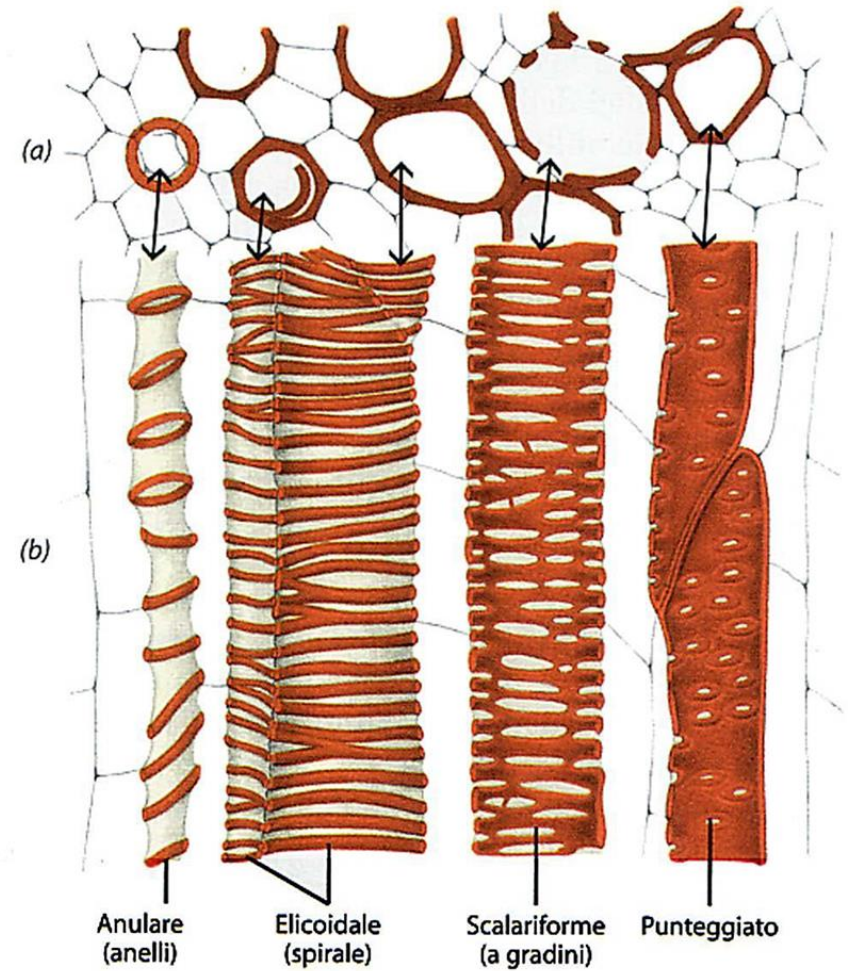
fibrotracheidi      trachee

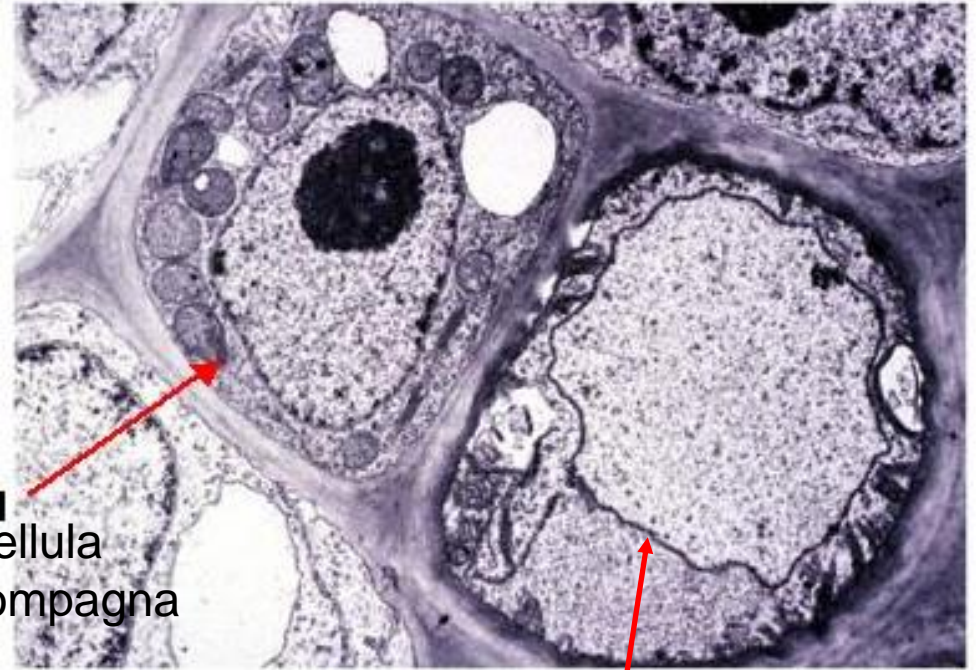
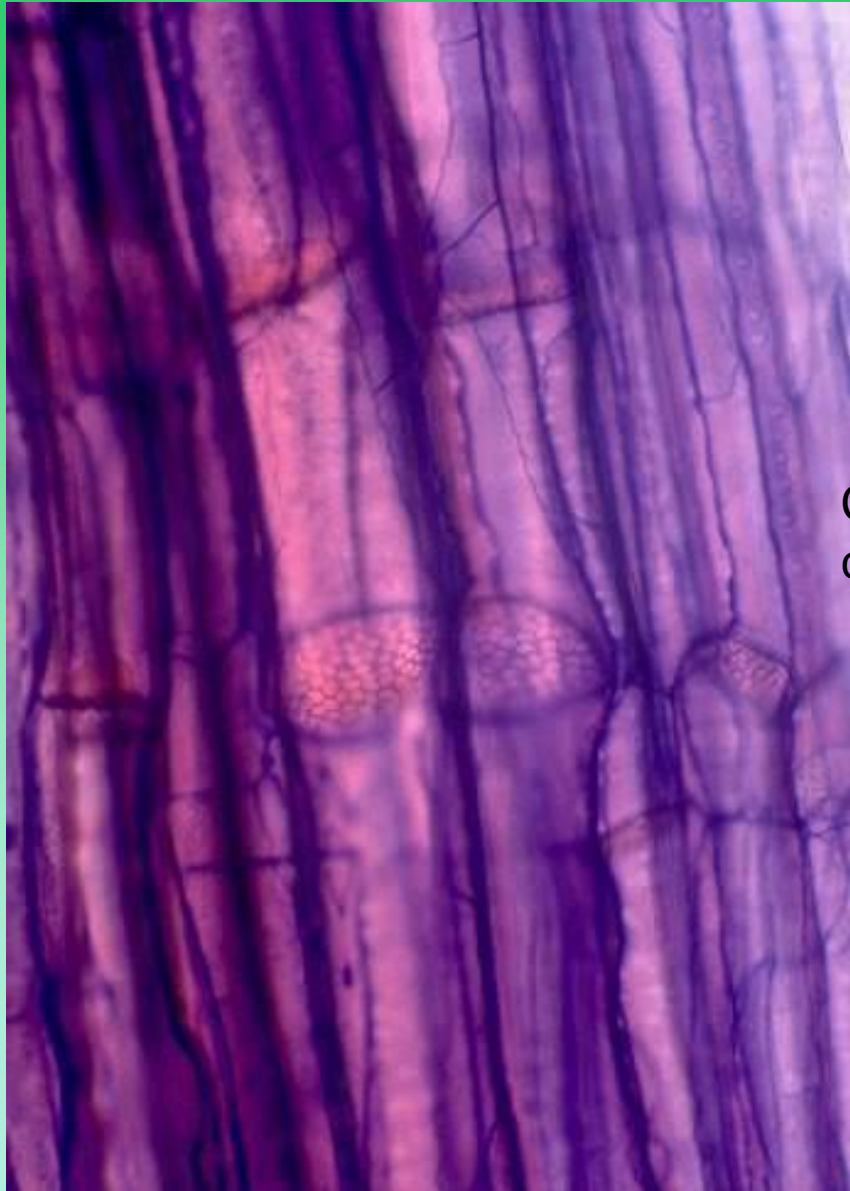


# Diversa deposizione di parete secondaria nelle cellule xilematiche



1) anulare  
2) anulare (sp. raro)  
3) crispato  
4) zigzagante spirale  
5) elicoidale  
6) scalariforme  
7) punticiolate  
8) puntigliato



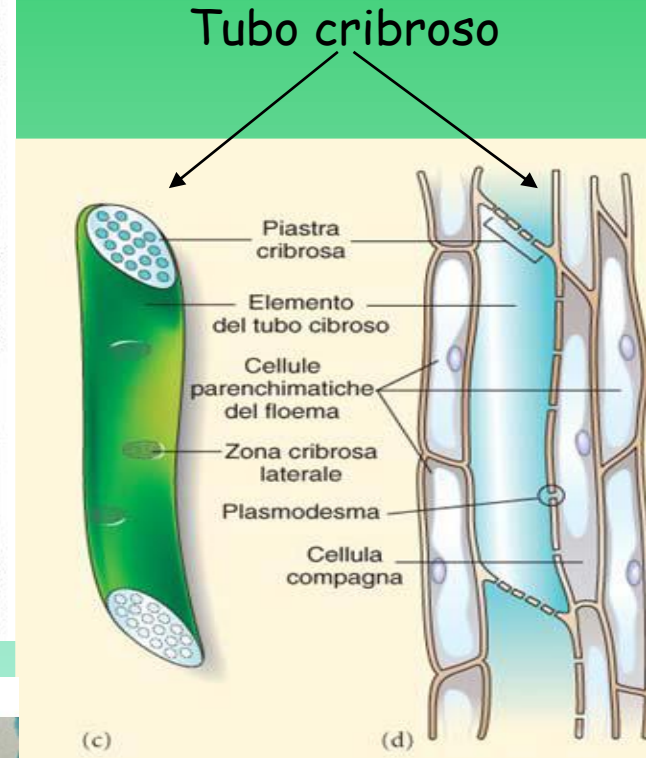
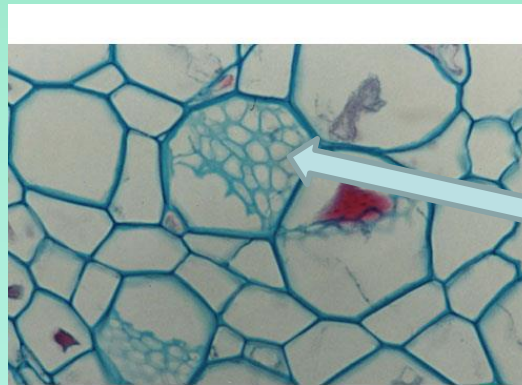
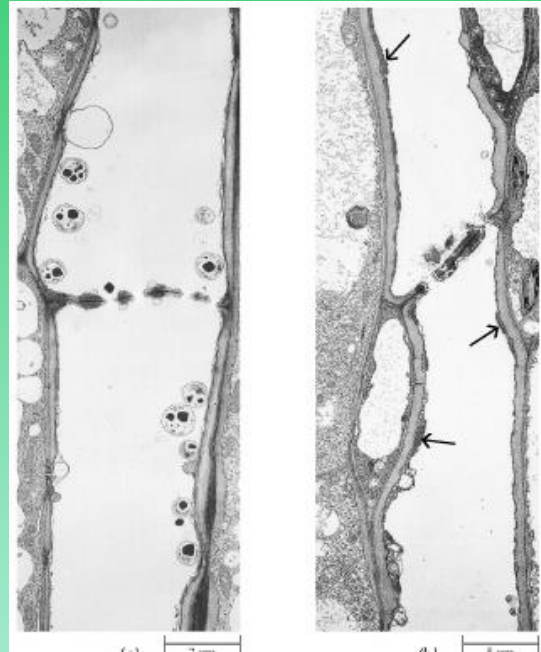
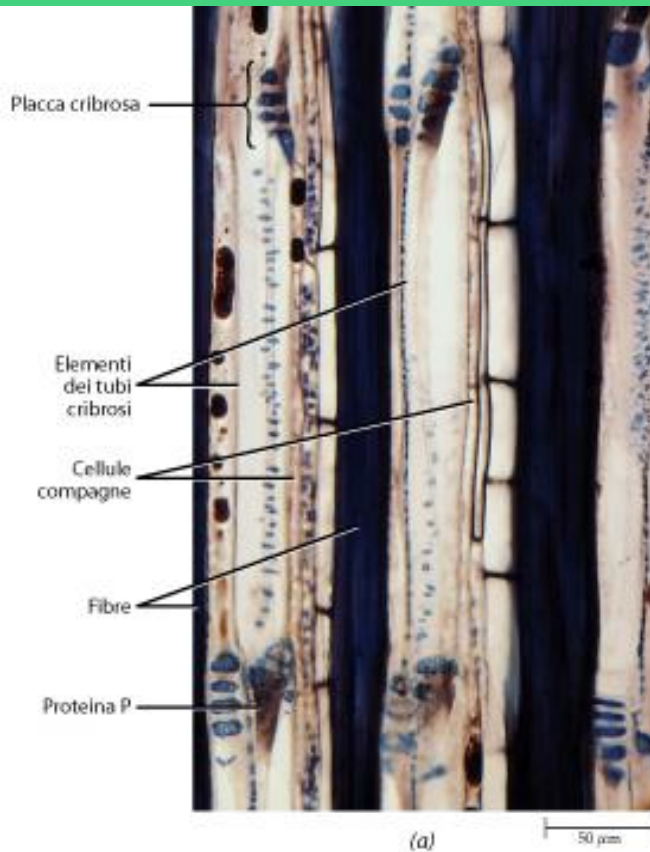


Cellula compagna

Cellula floematica

# Floema

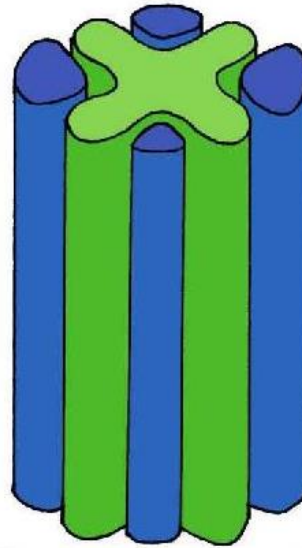
Si distinguono **cellule cribrose** (isodiametriche, più primitive, presenti nelle Pteridofite e Gimnosperme, flusso più lento) accompagnate da **cellule albuminose** e **tubi cribrosi** (allungati, più evoluti) affiancati da **cellule compagne**



Placca cribrosa

# Fascio radiale

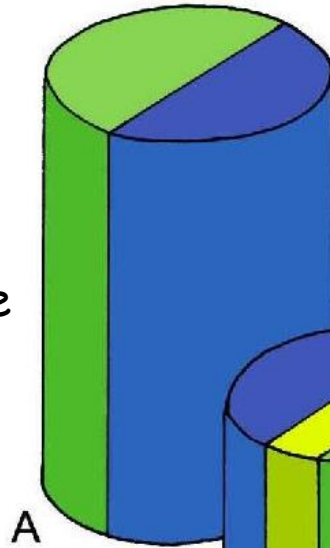
- Xilema
- Floema
- cambio



E

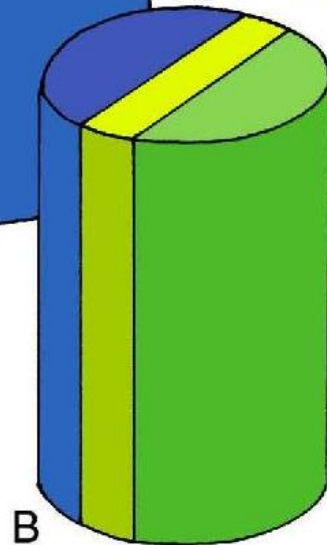
Fascio  
concentrico

Fascio collaterale  
chiuso

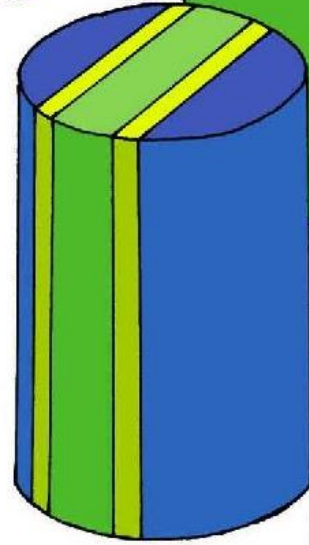


A

Fascio collaterale  
aperto

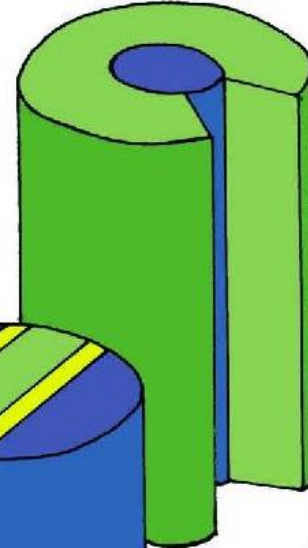


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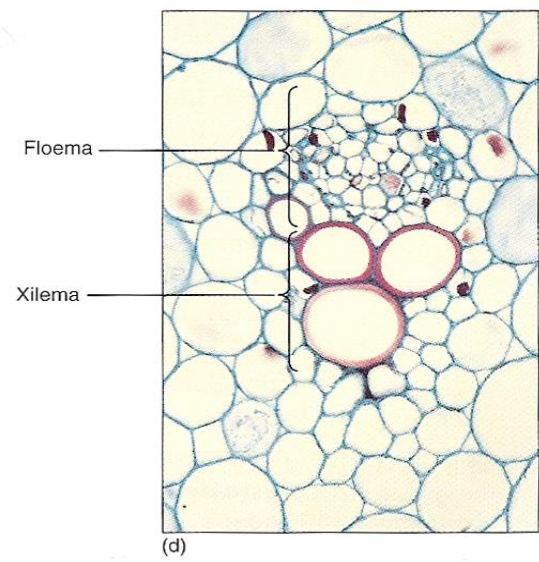
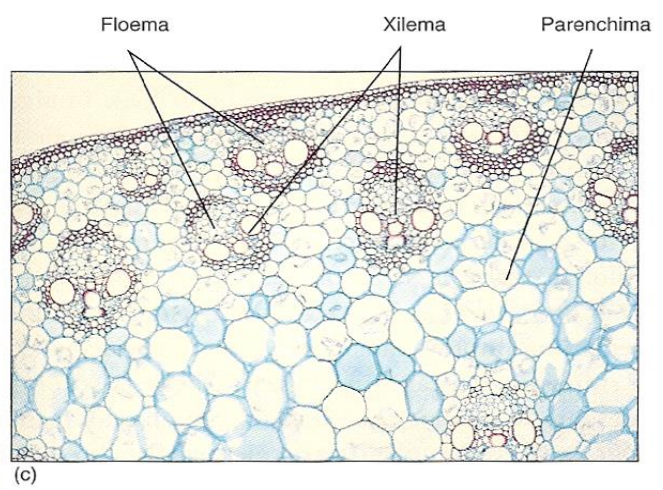
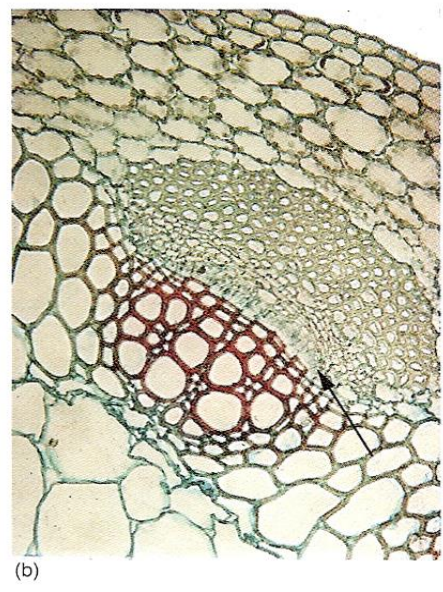
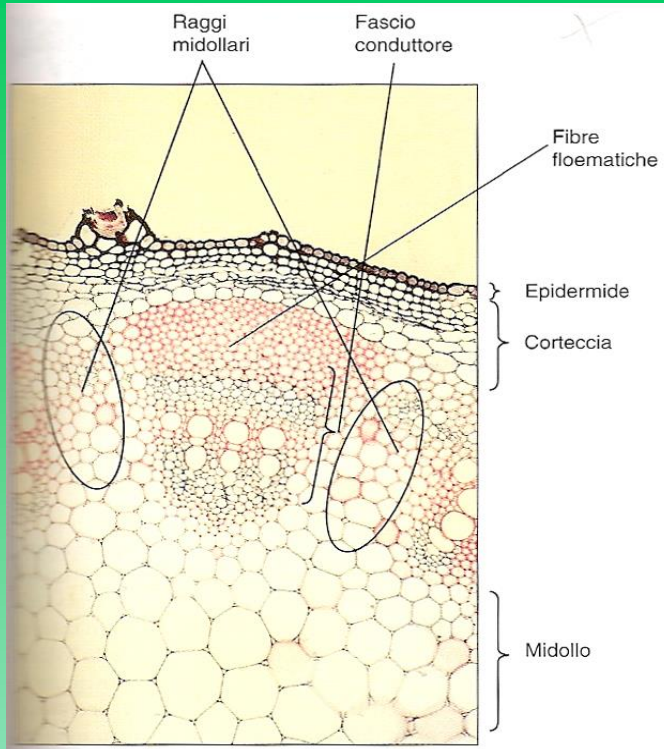


C

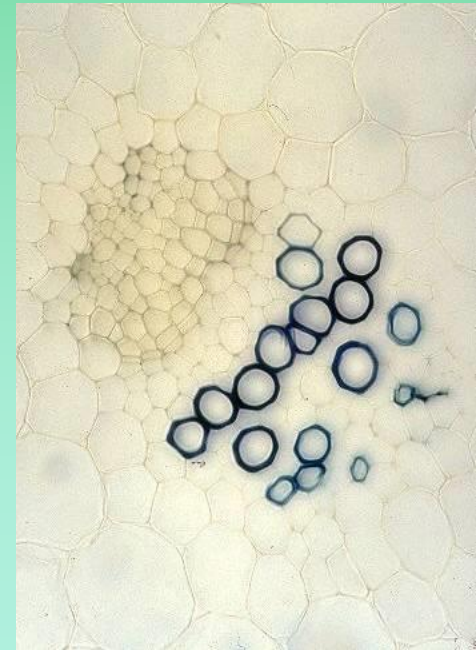
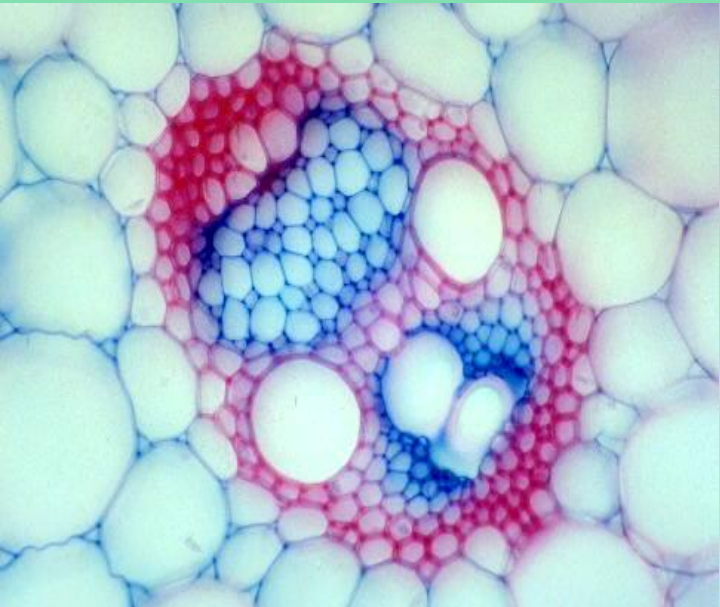
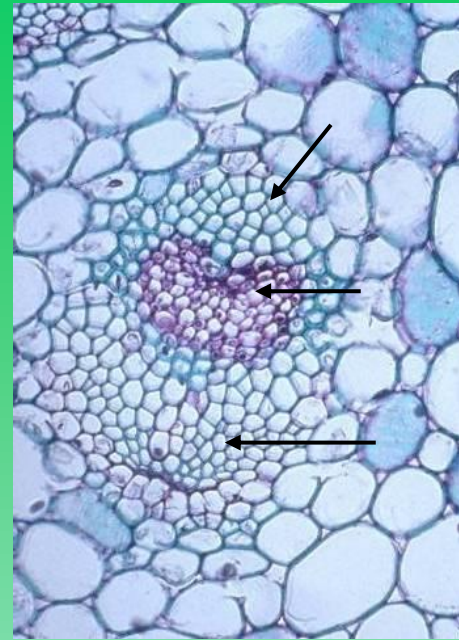
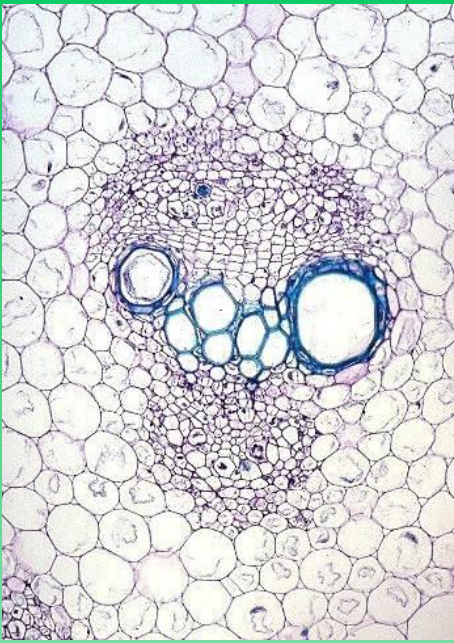
Fascio bicollaterale

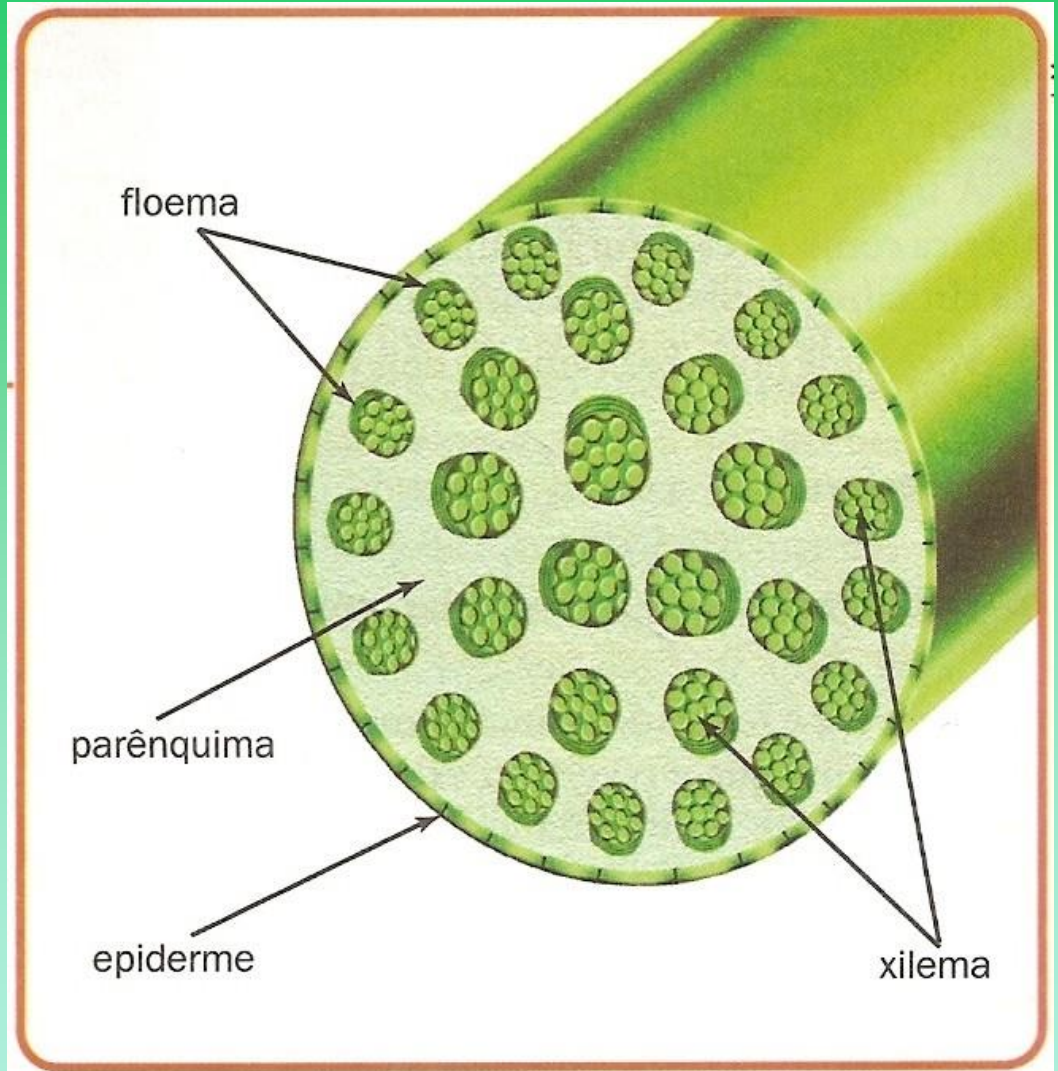
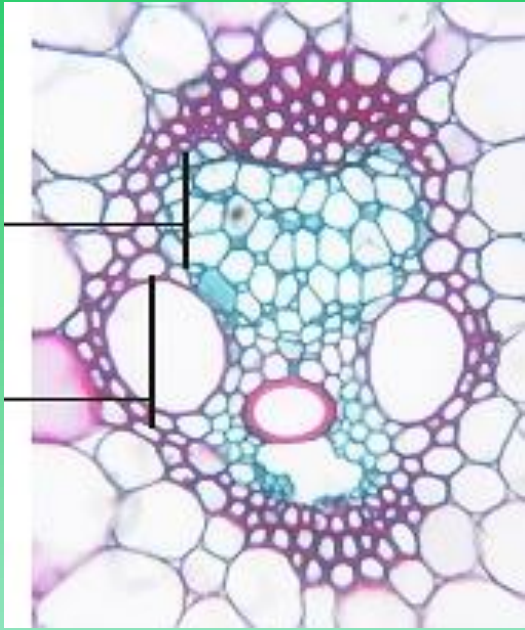


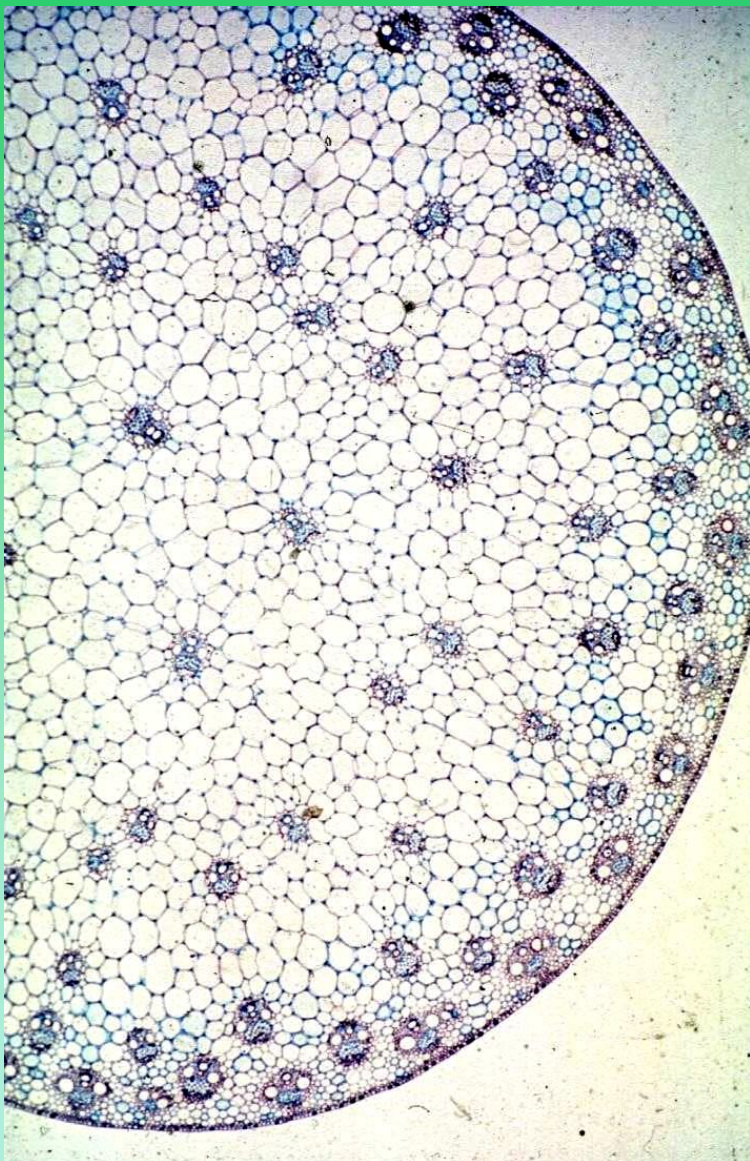
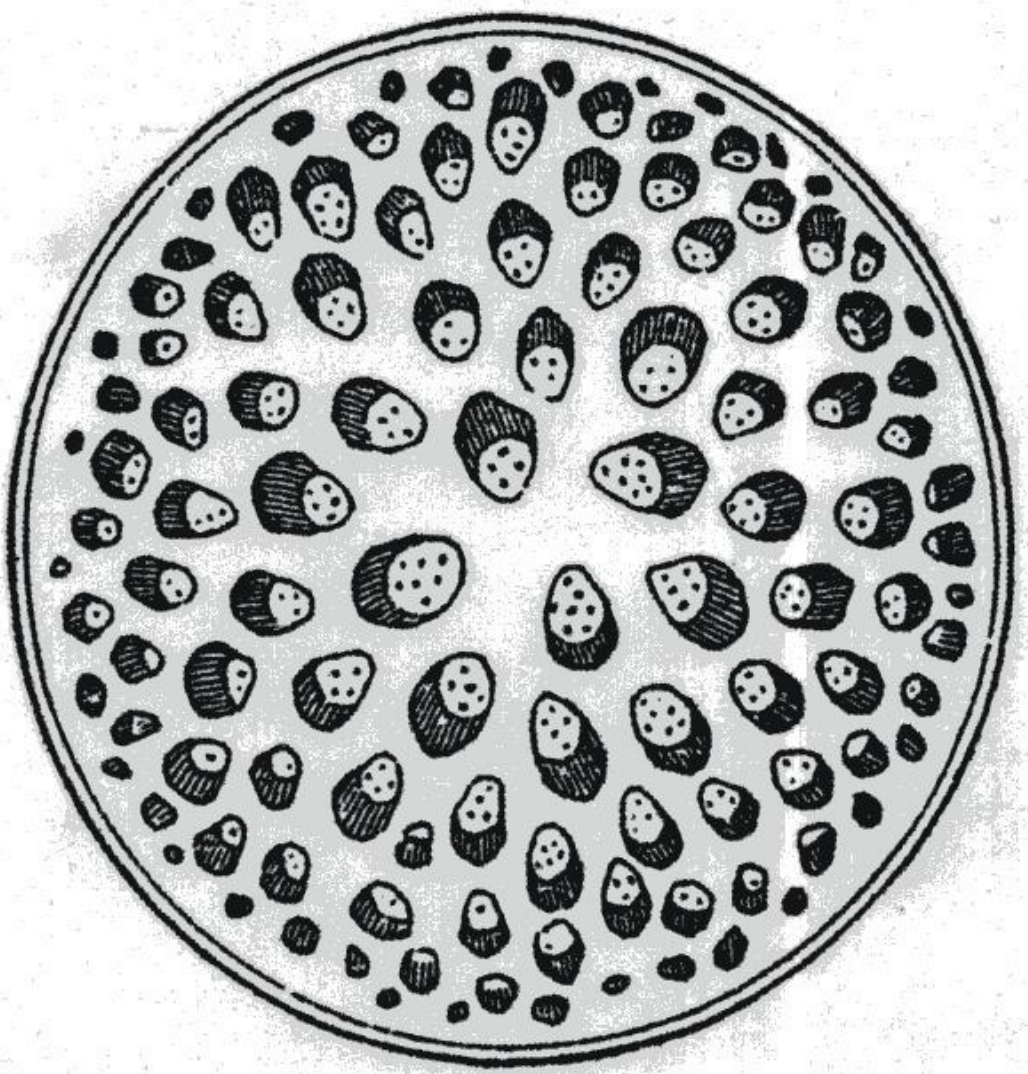
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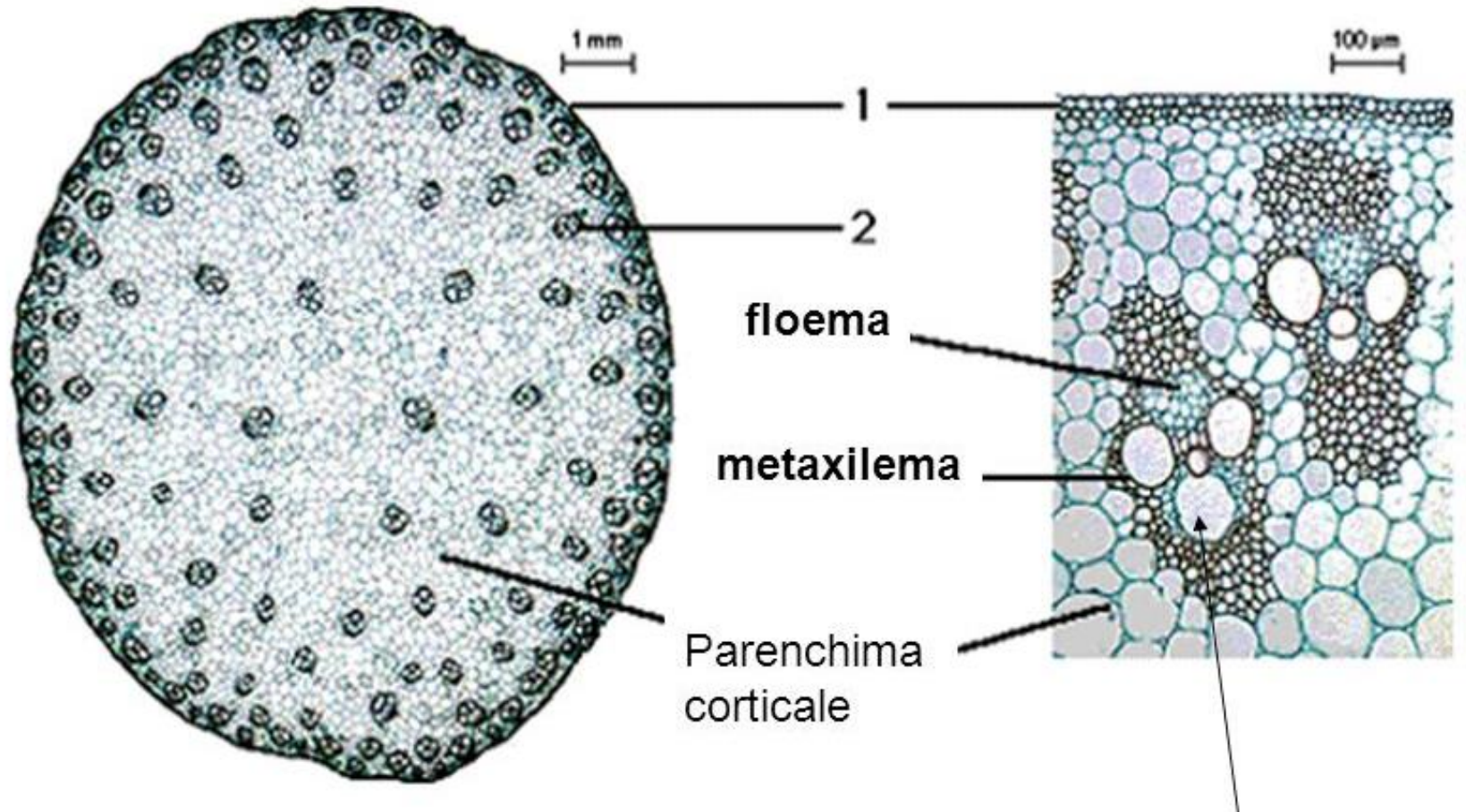


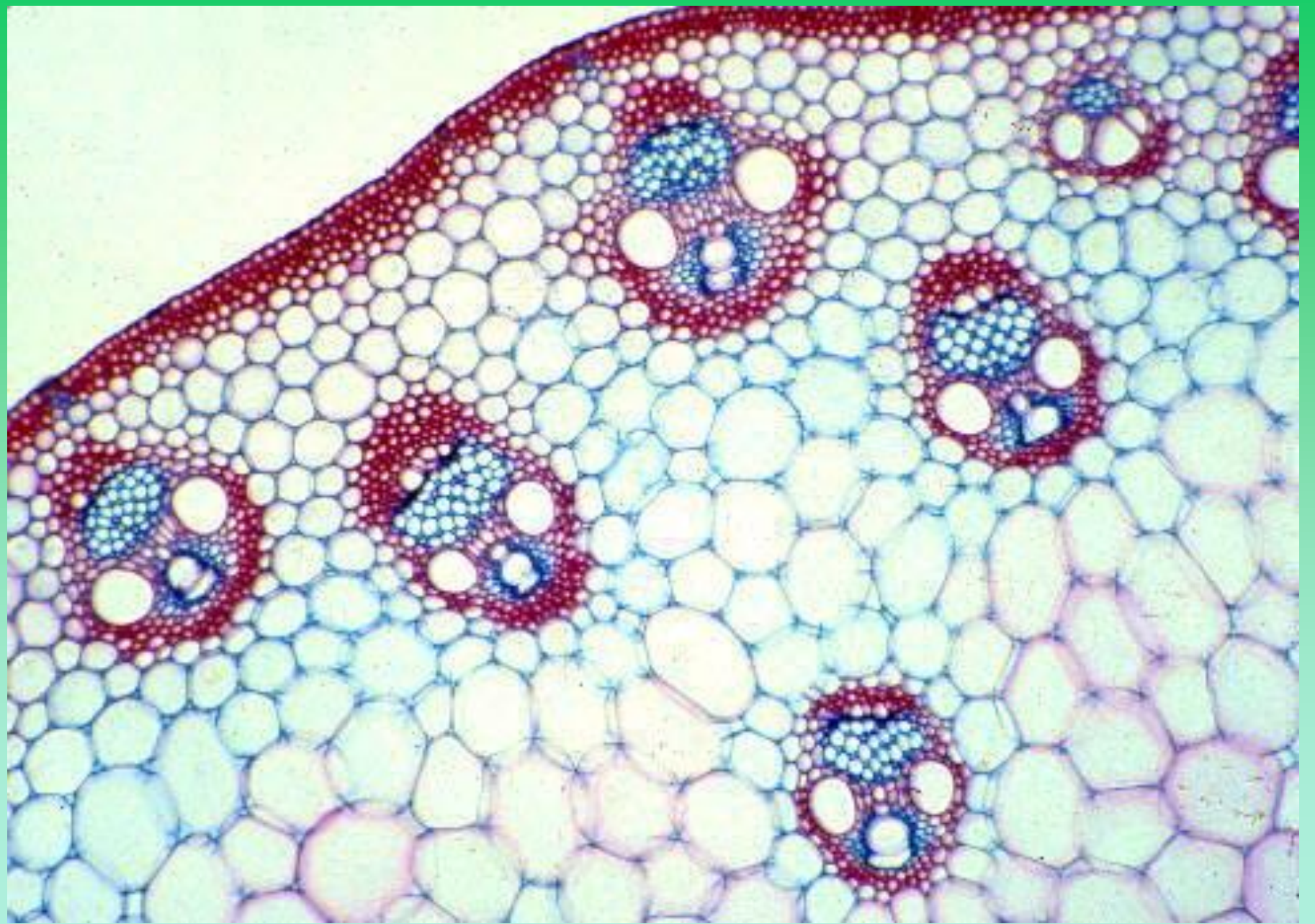


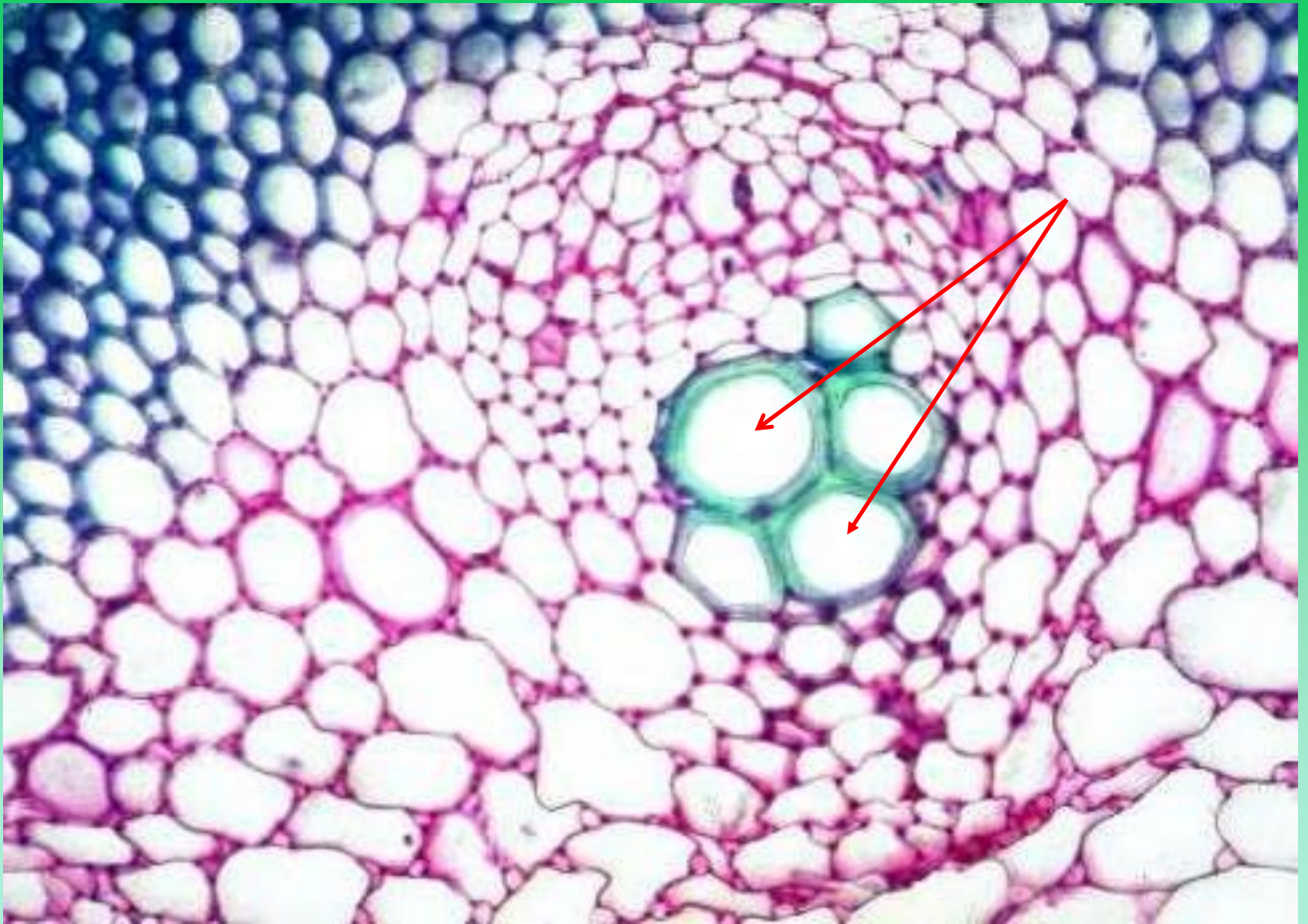


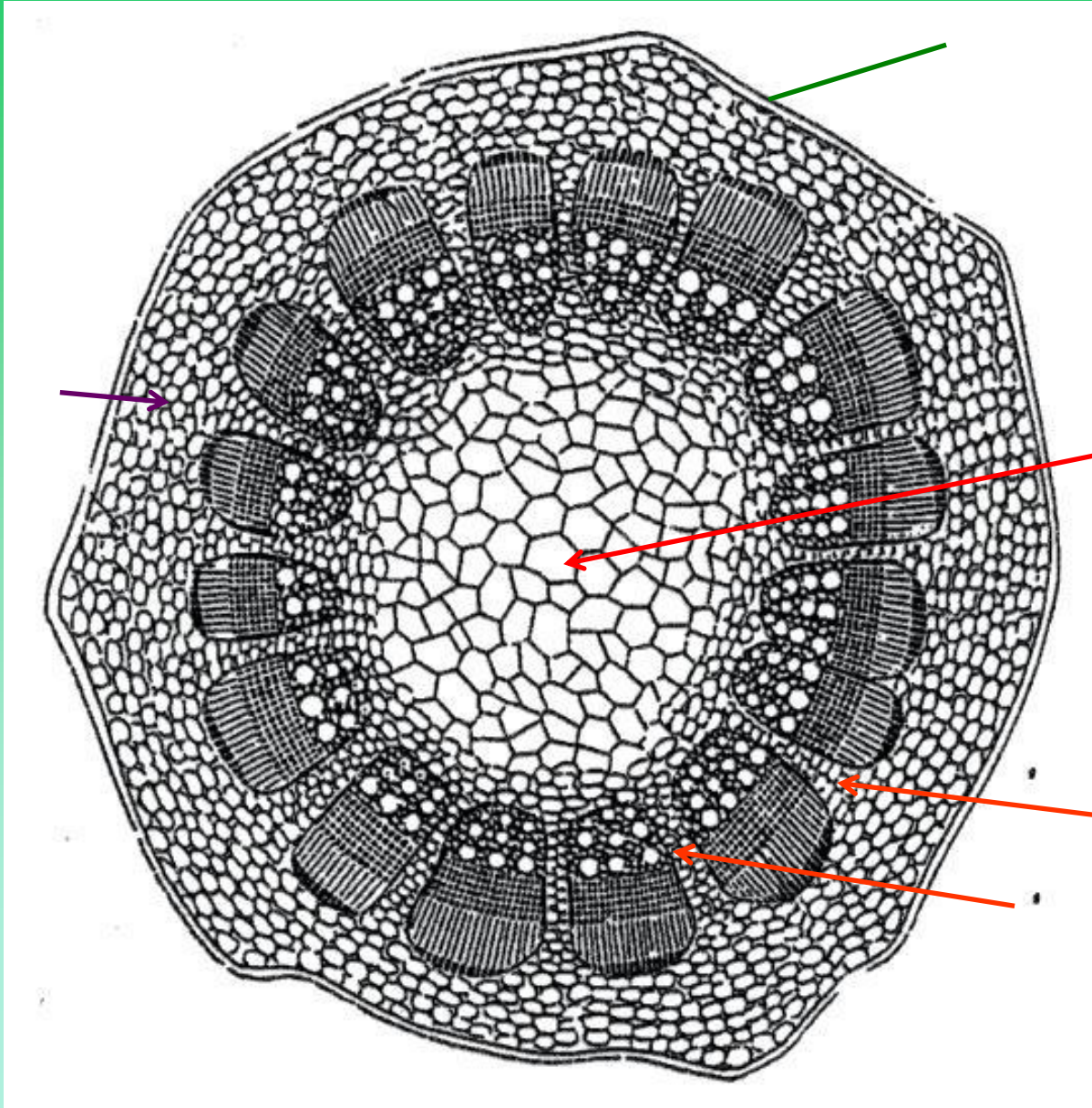








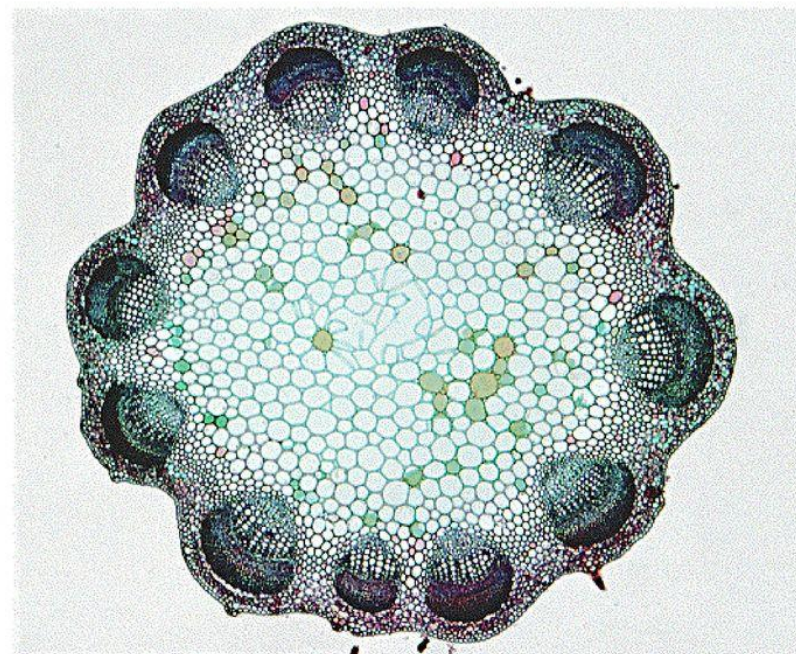




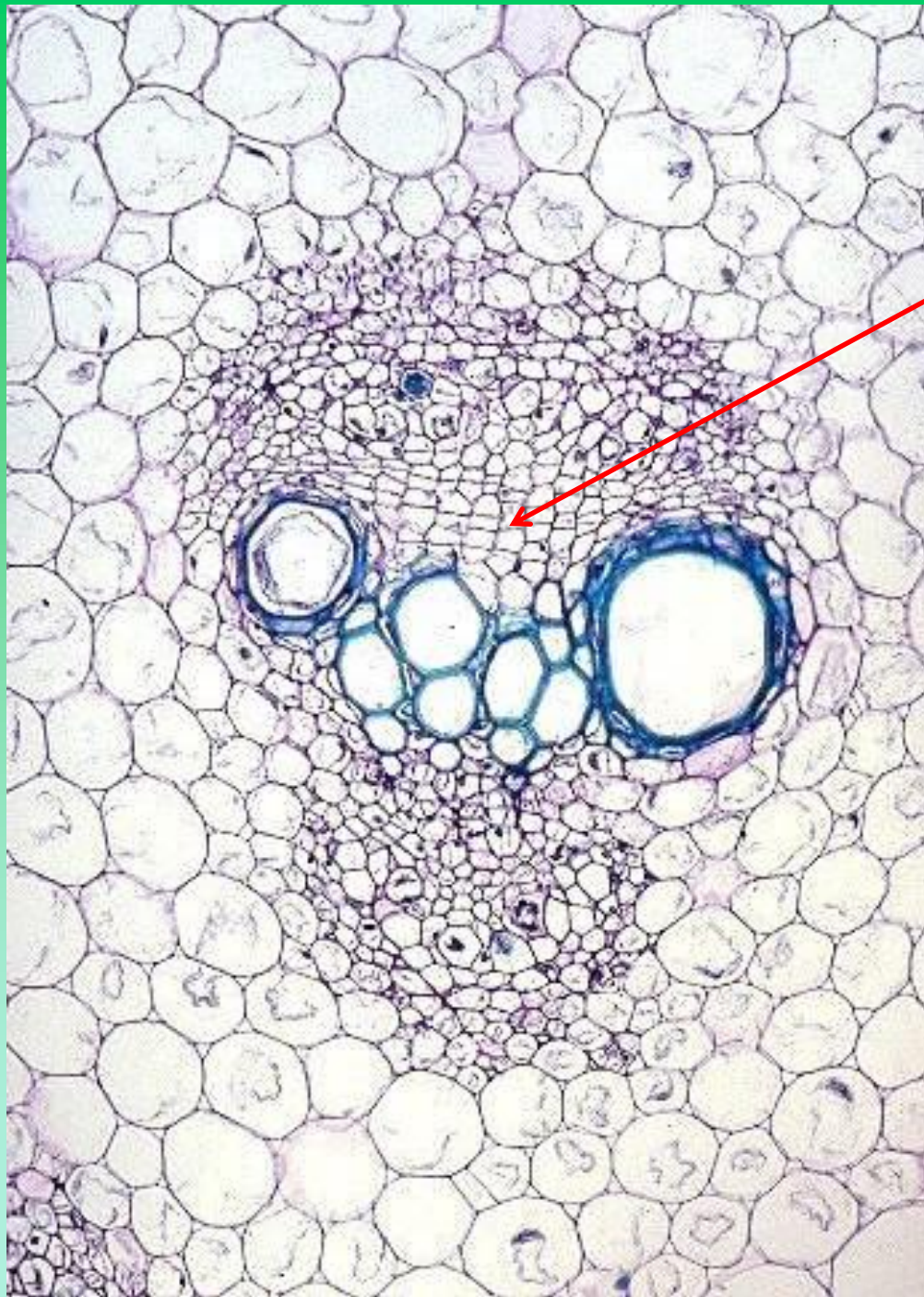


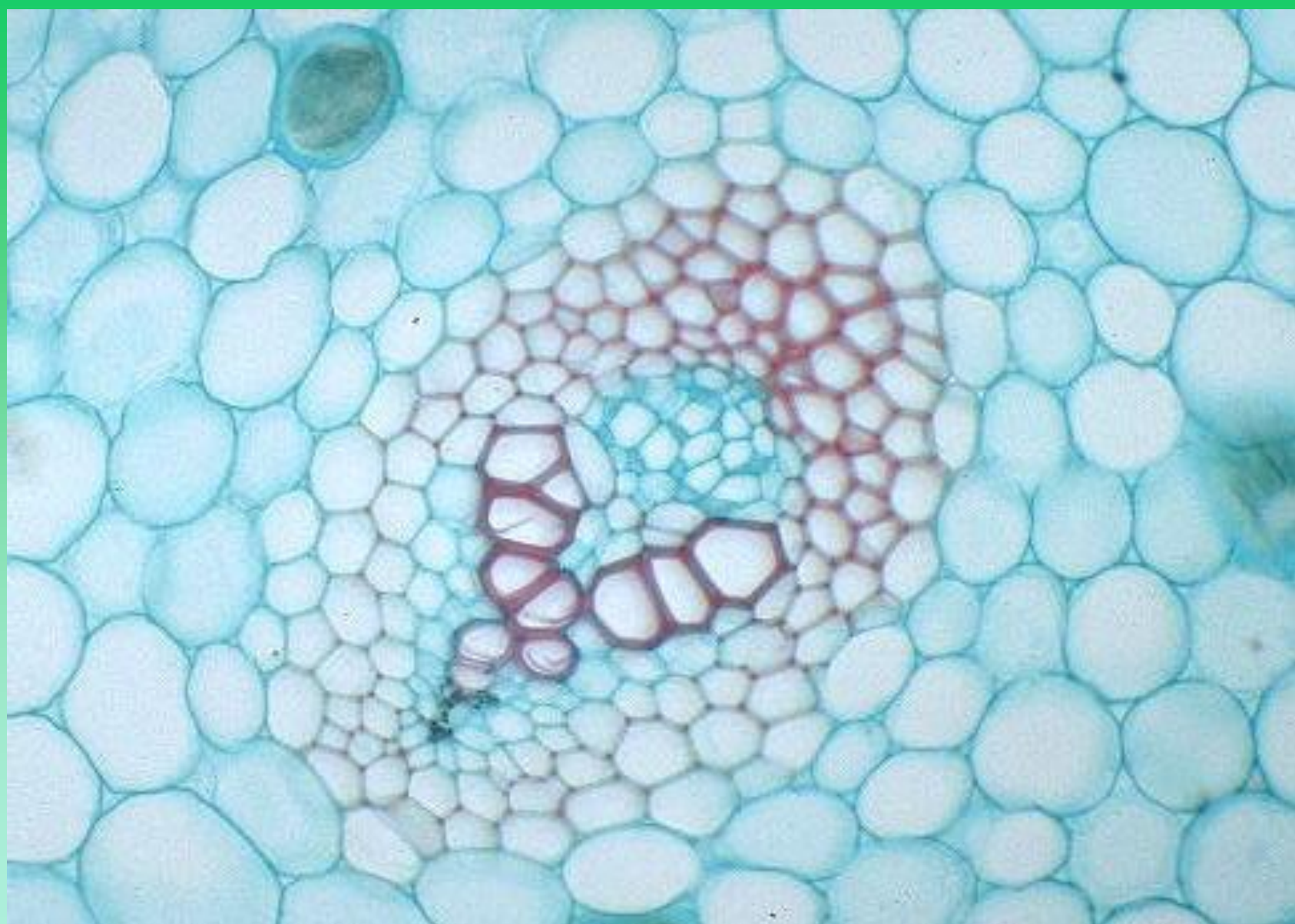
In figura è rappresentata una sezione trasversale di:

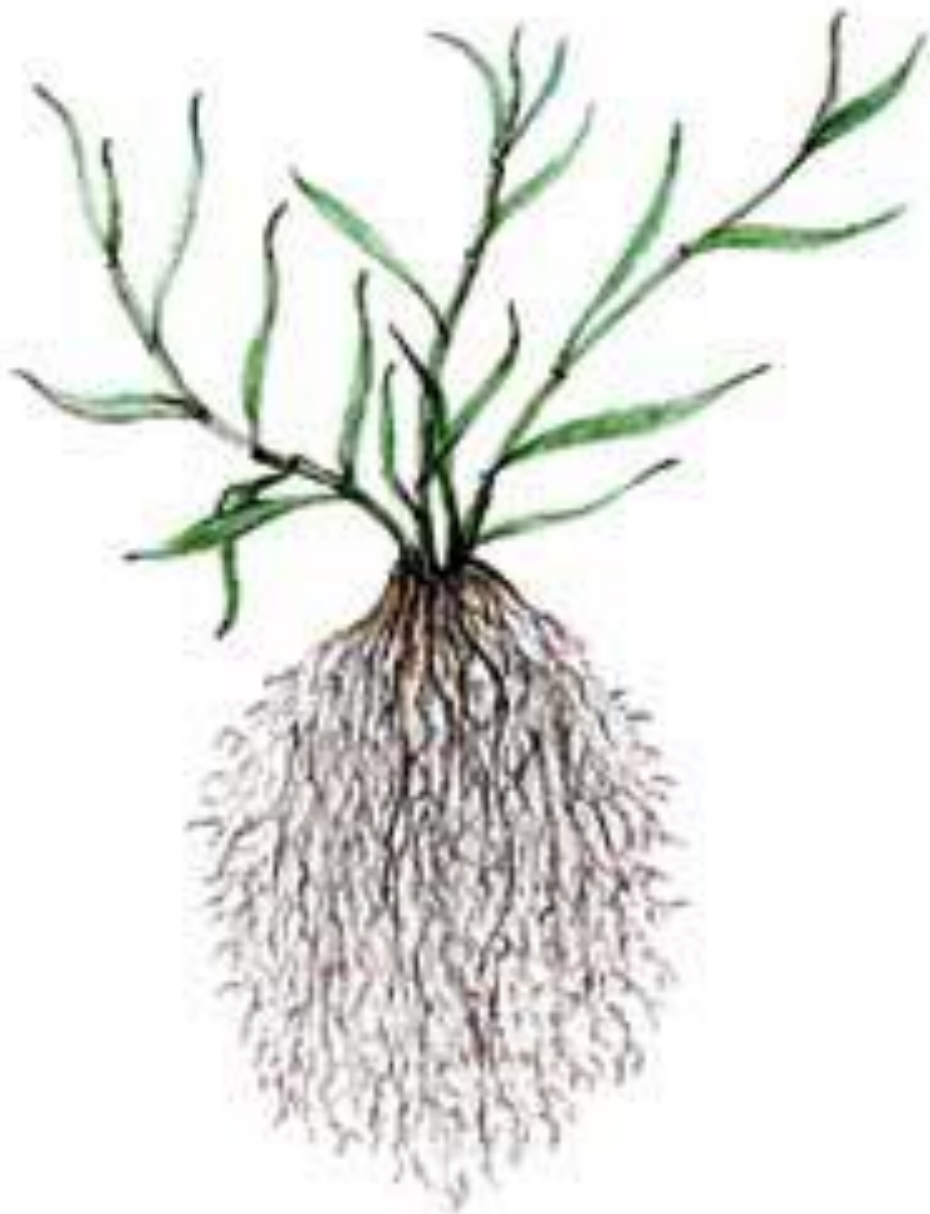
- 1 una radice
- 2 un fusto di una monocotiledone
- 3 un fusto di una dicotiledone



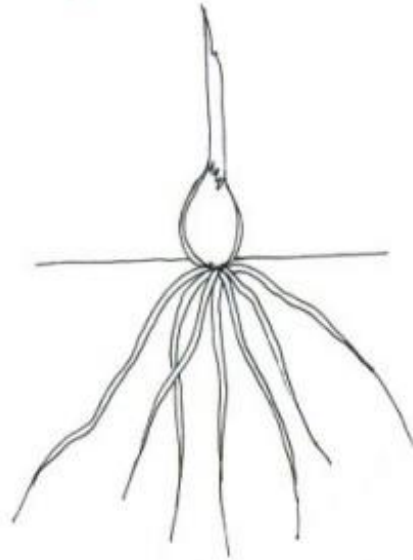
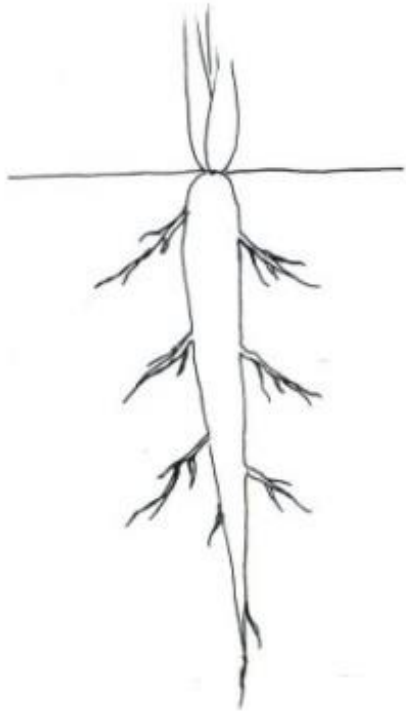


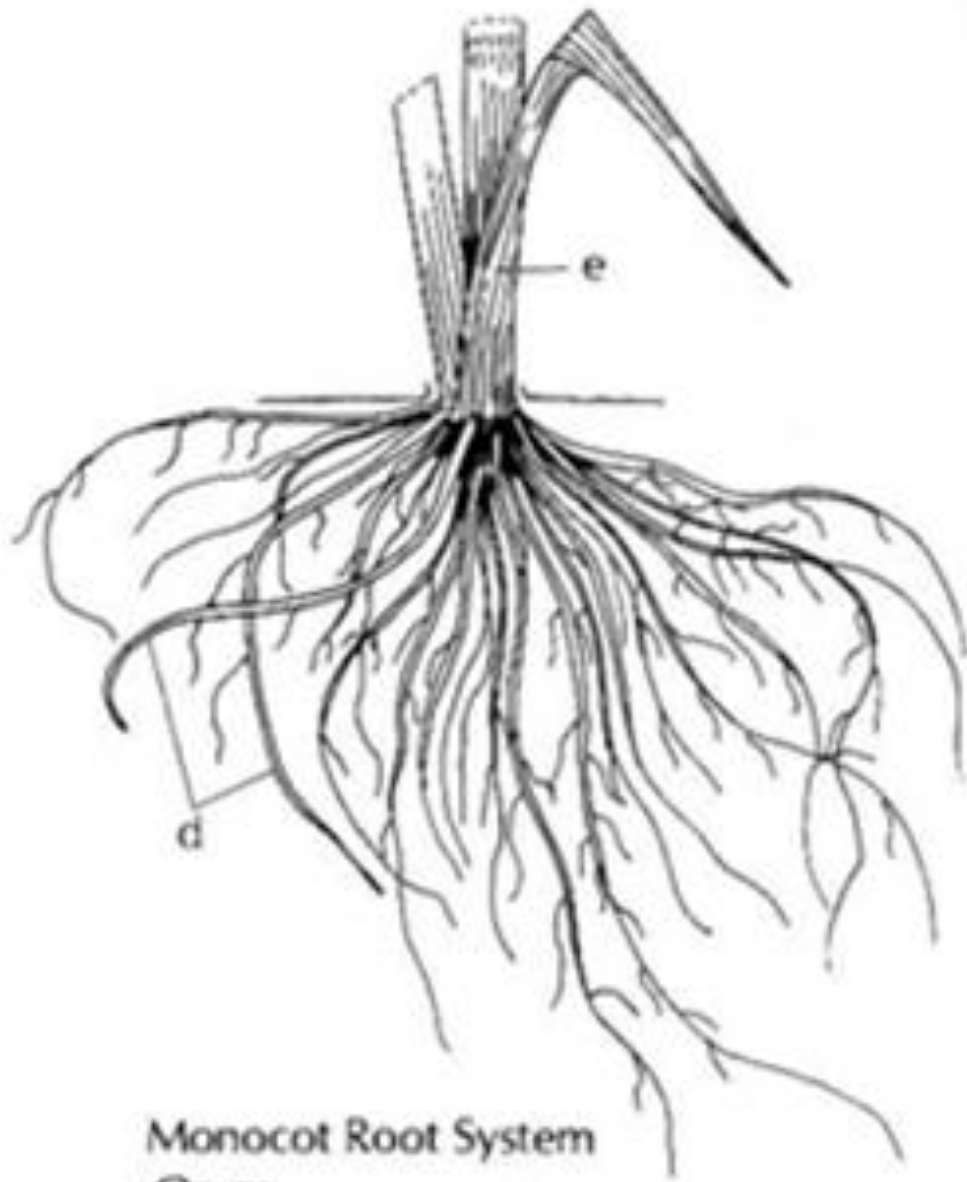






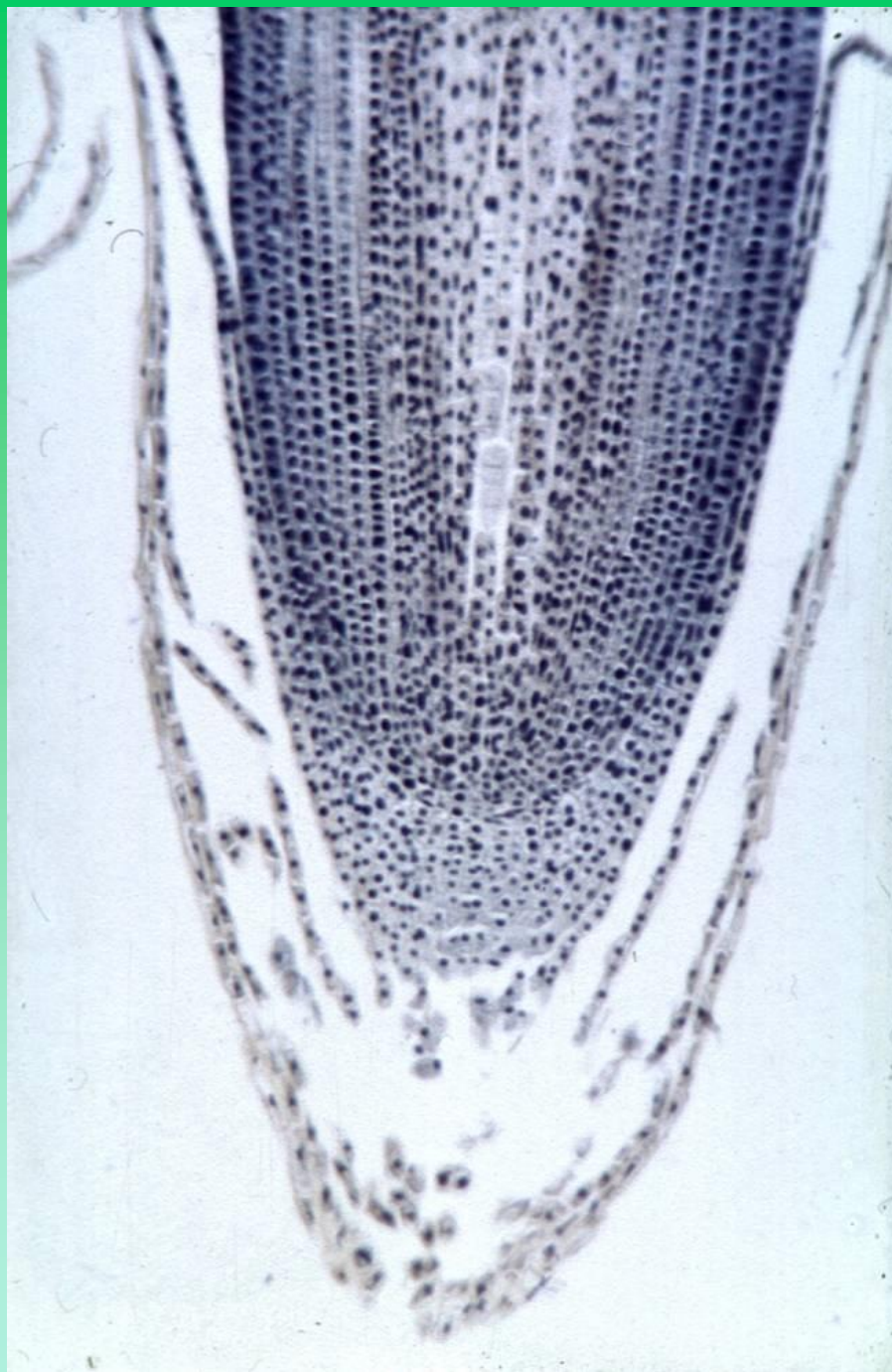
## Tipi di radice

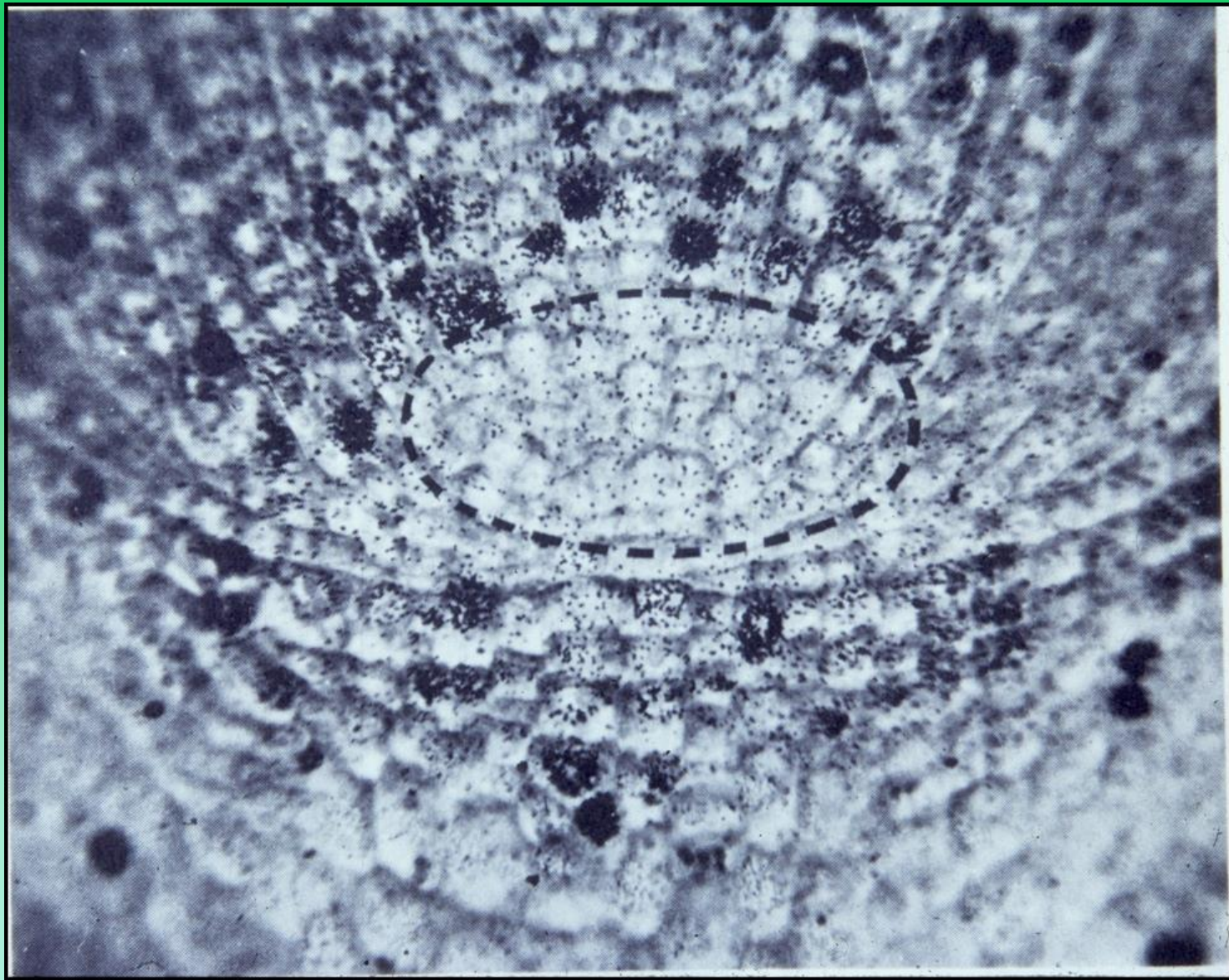




Monocot Root System  
*Oryza*  
Rice

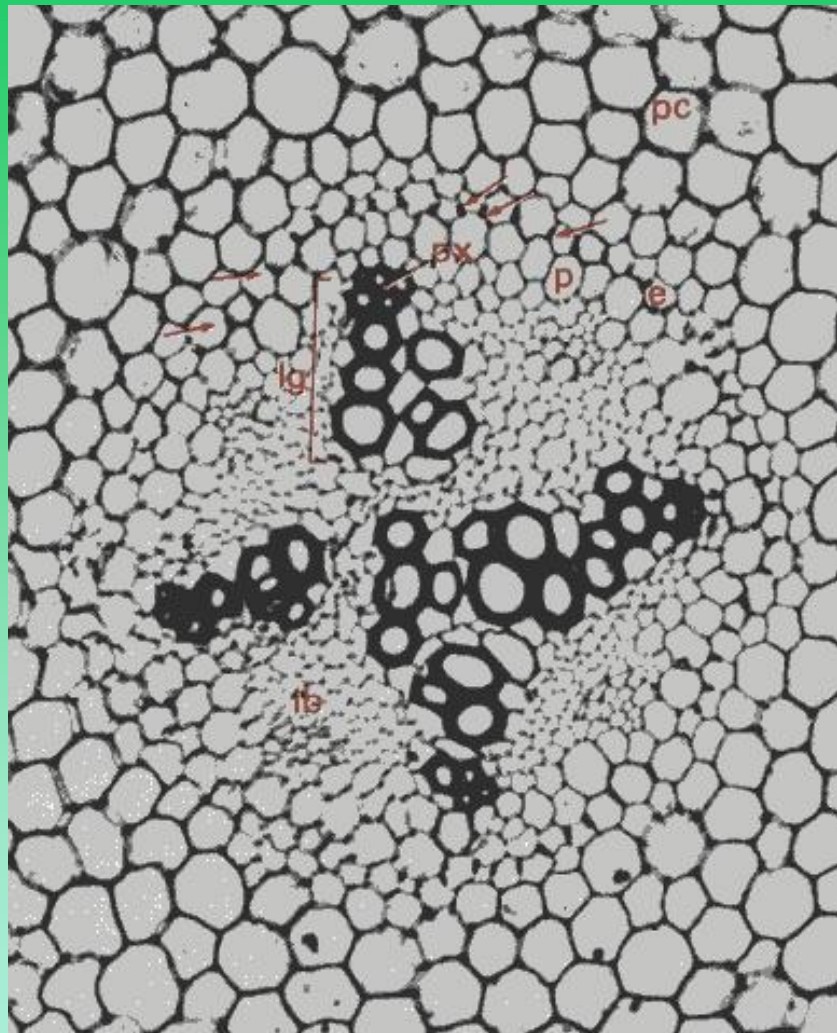
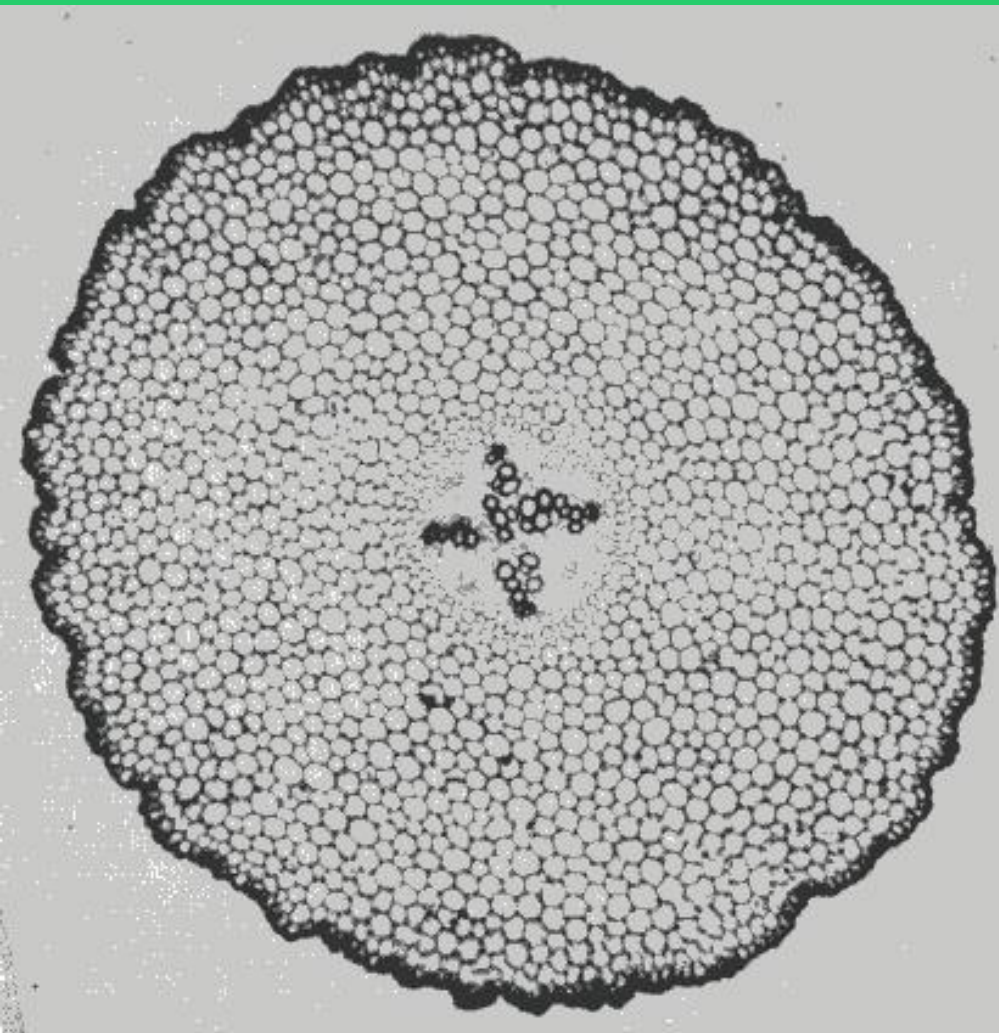


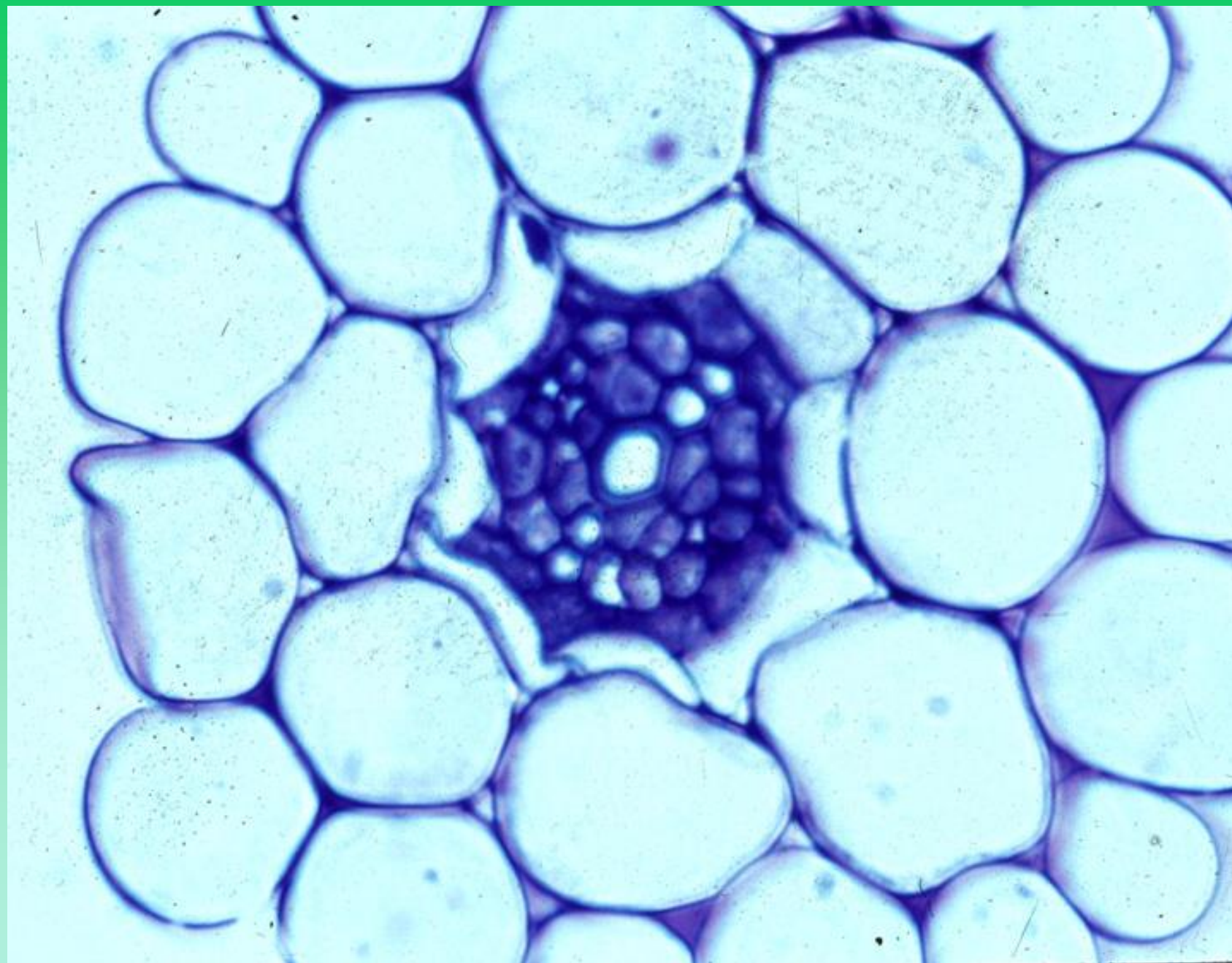


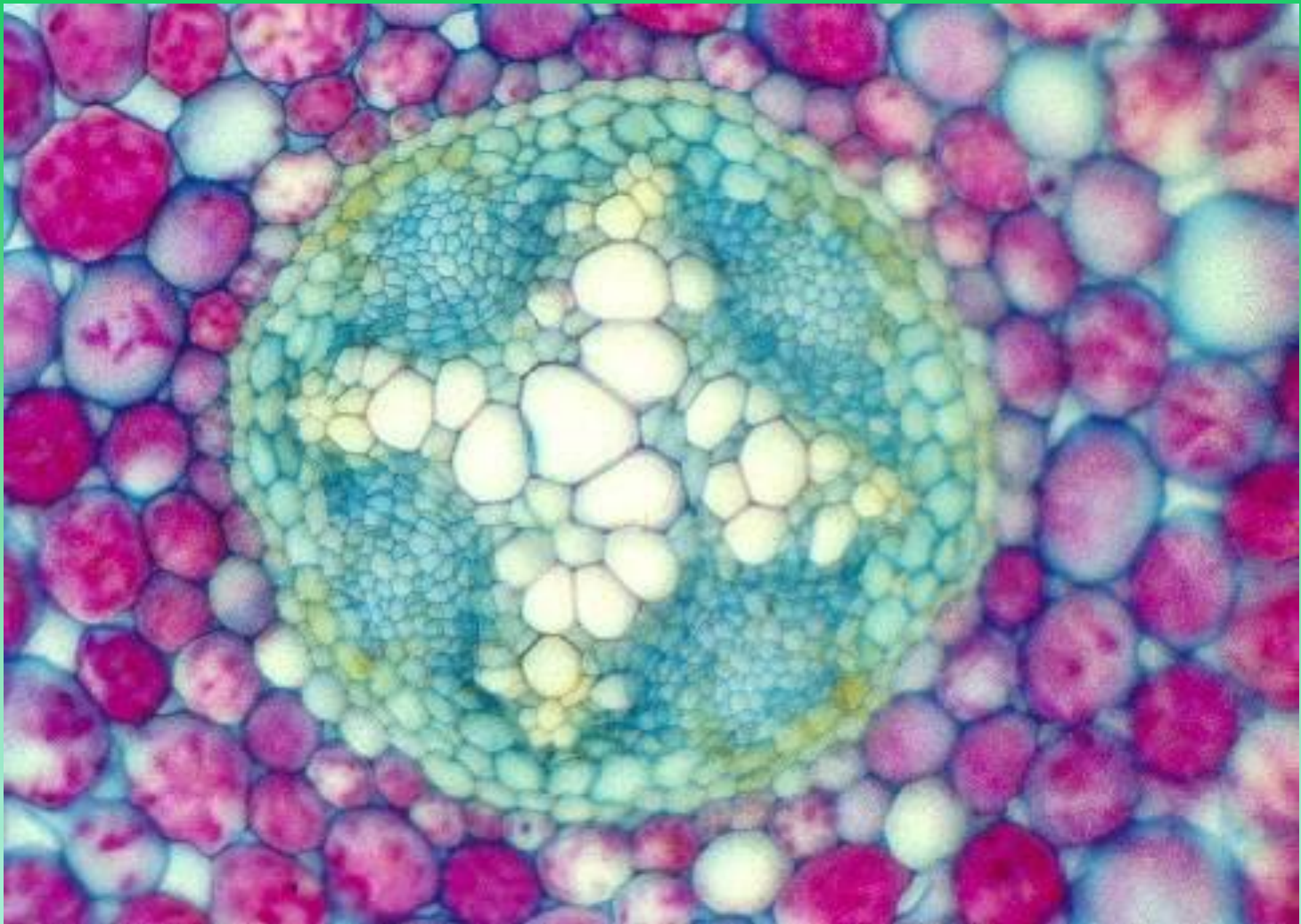


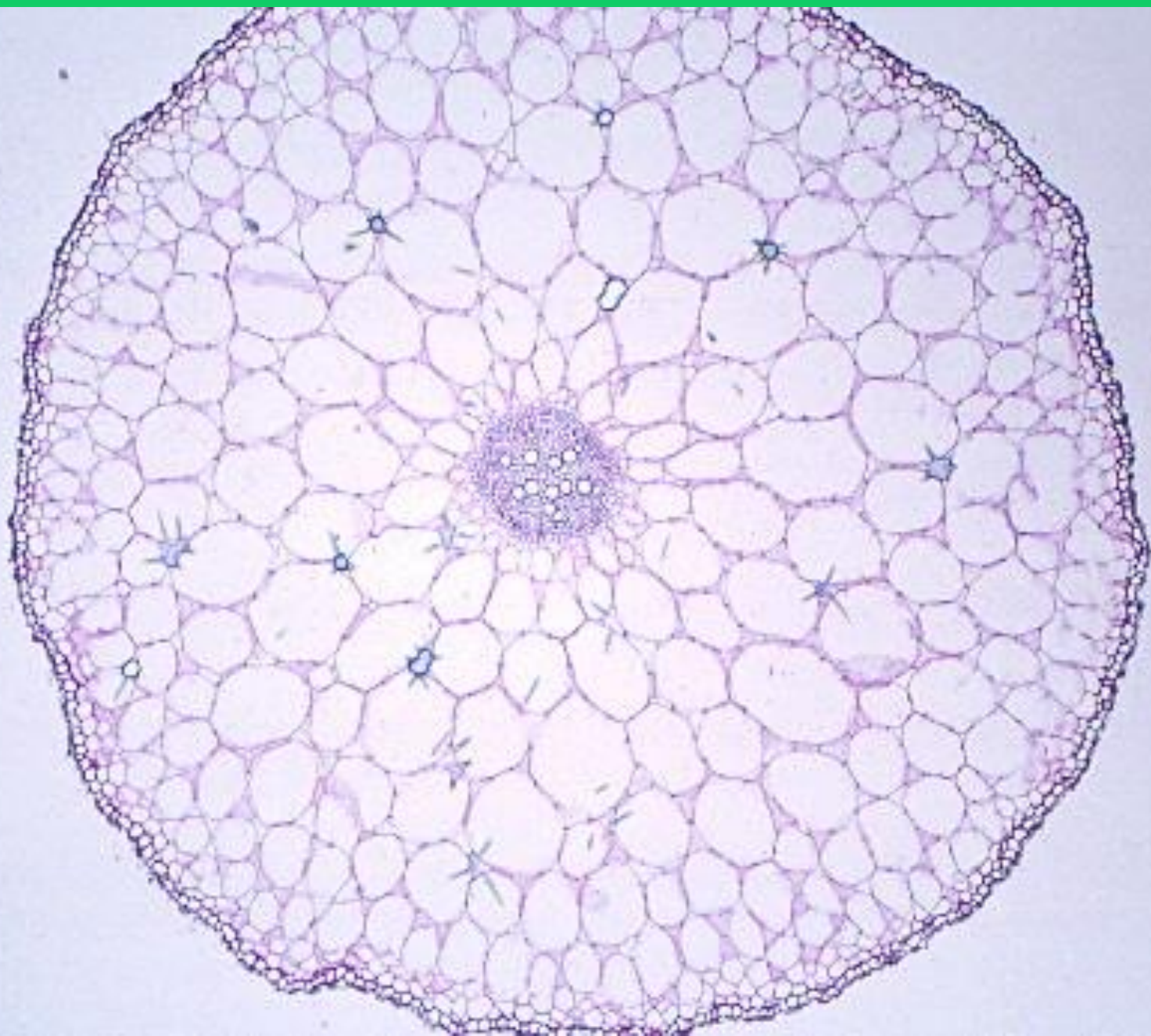


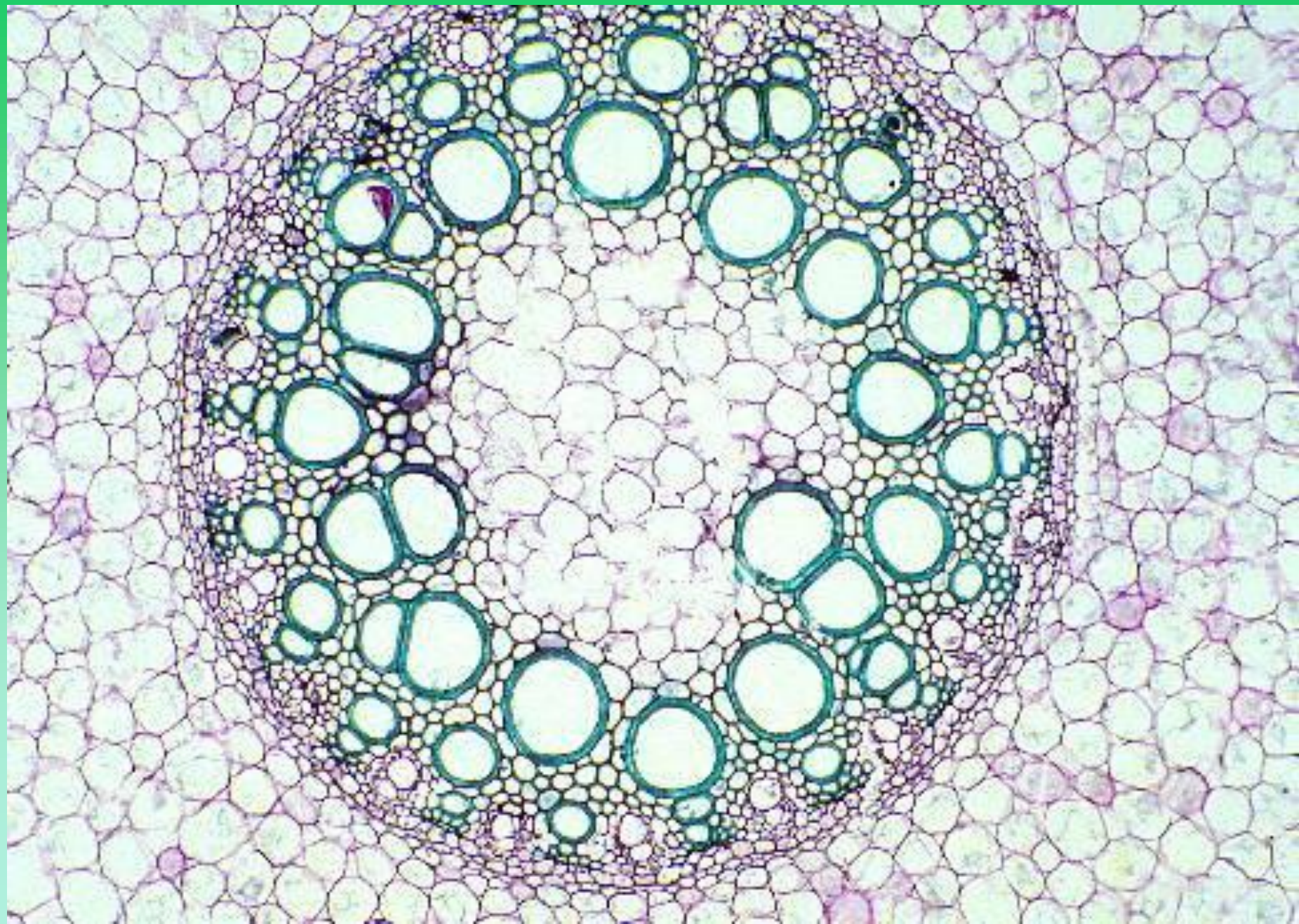


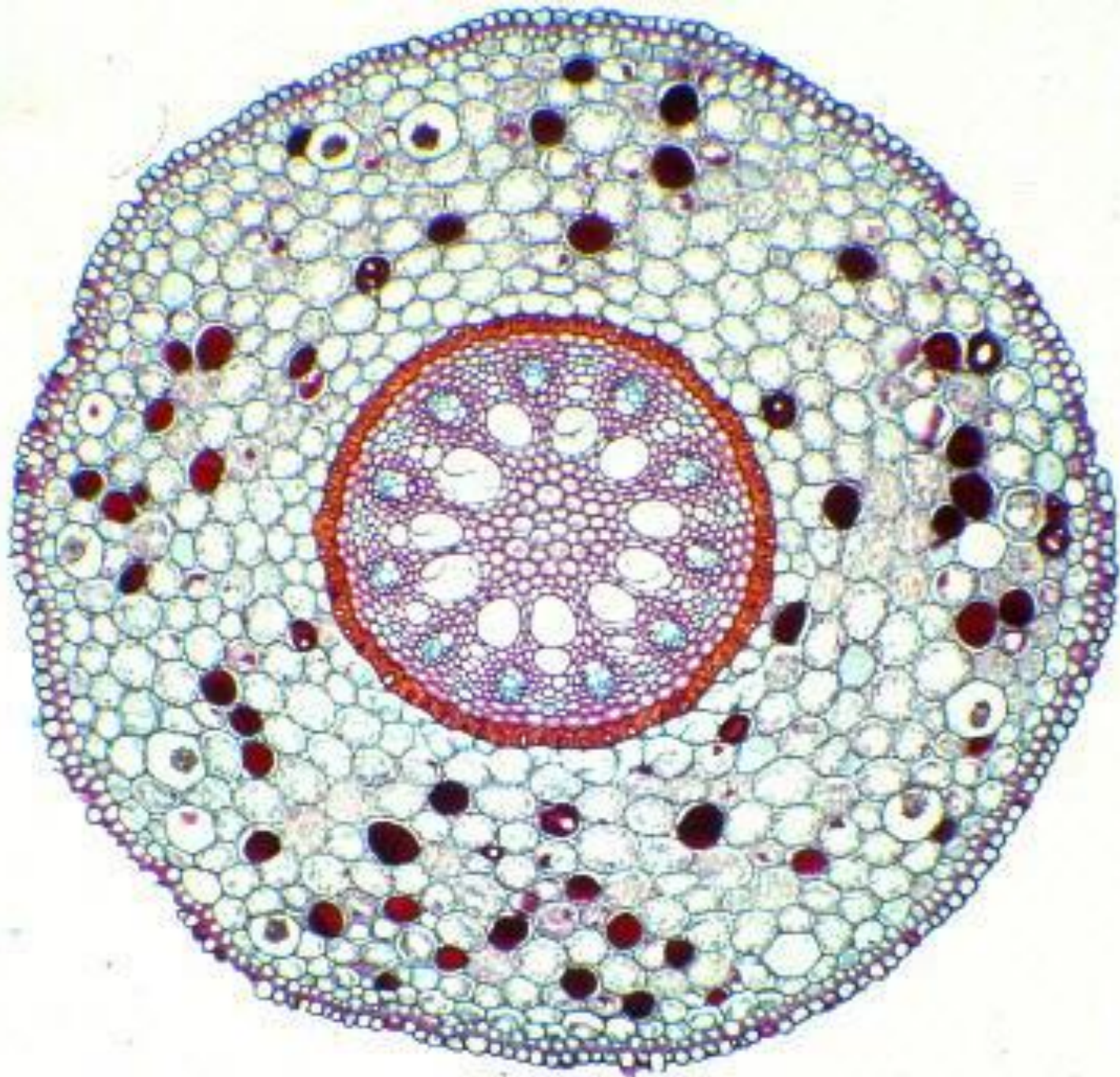


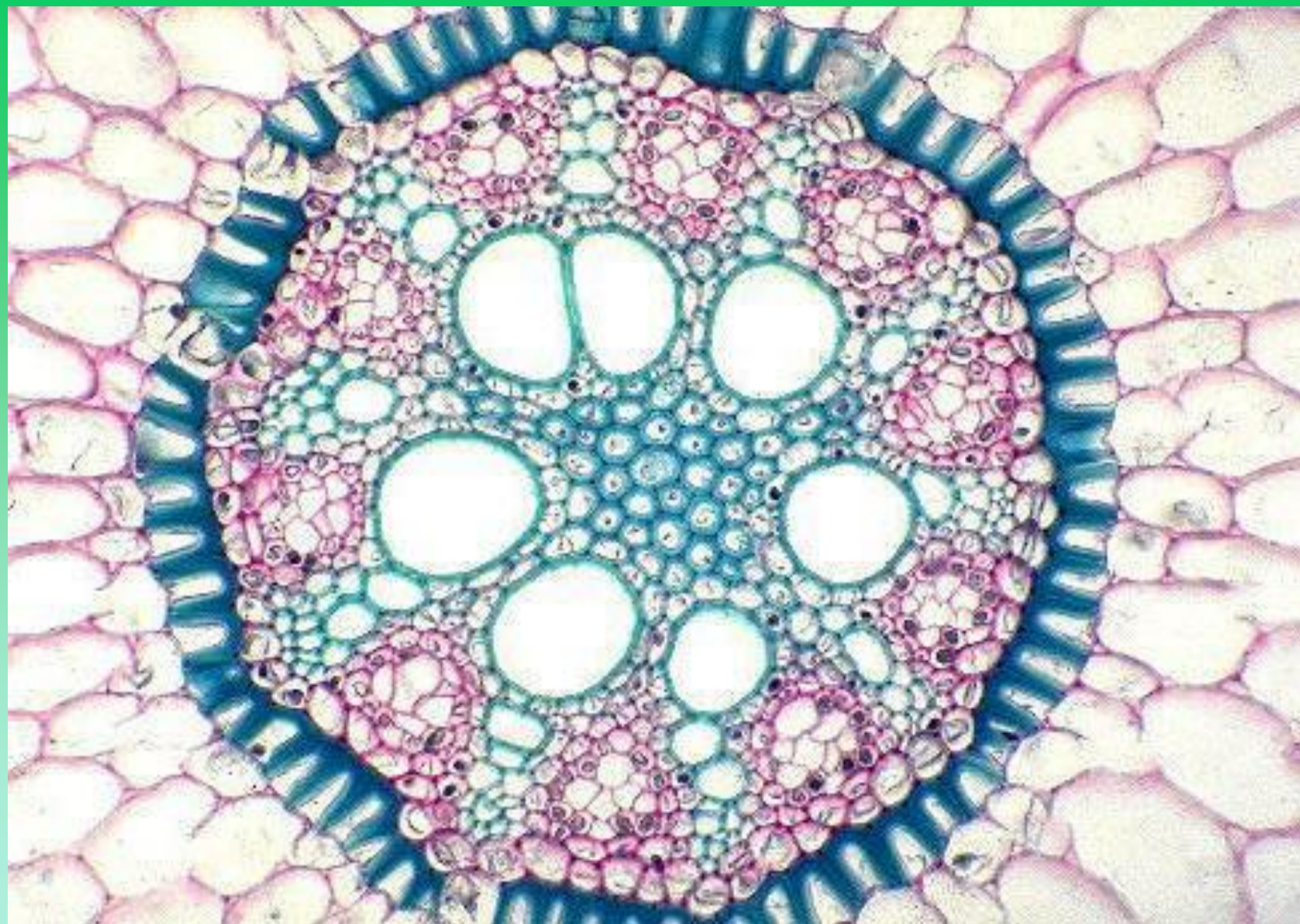




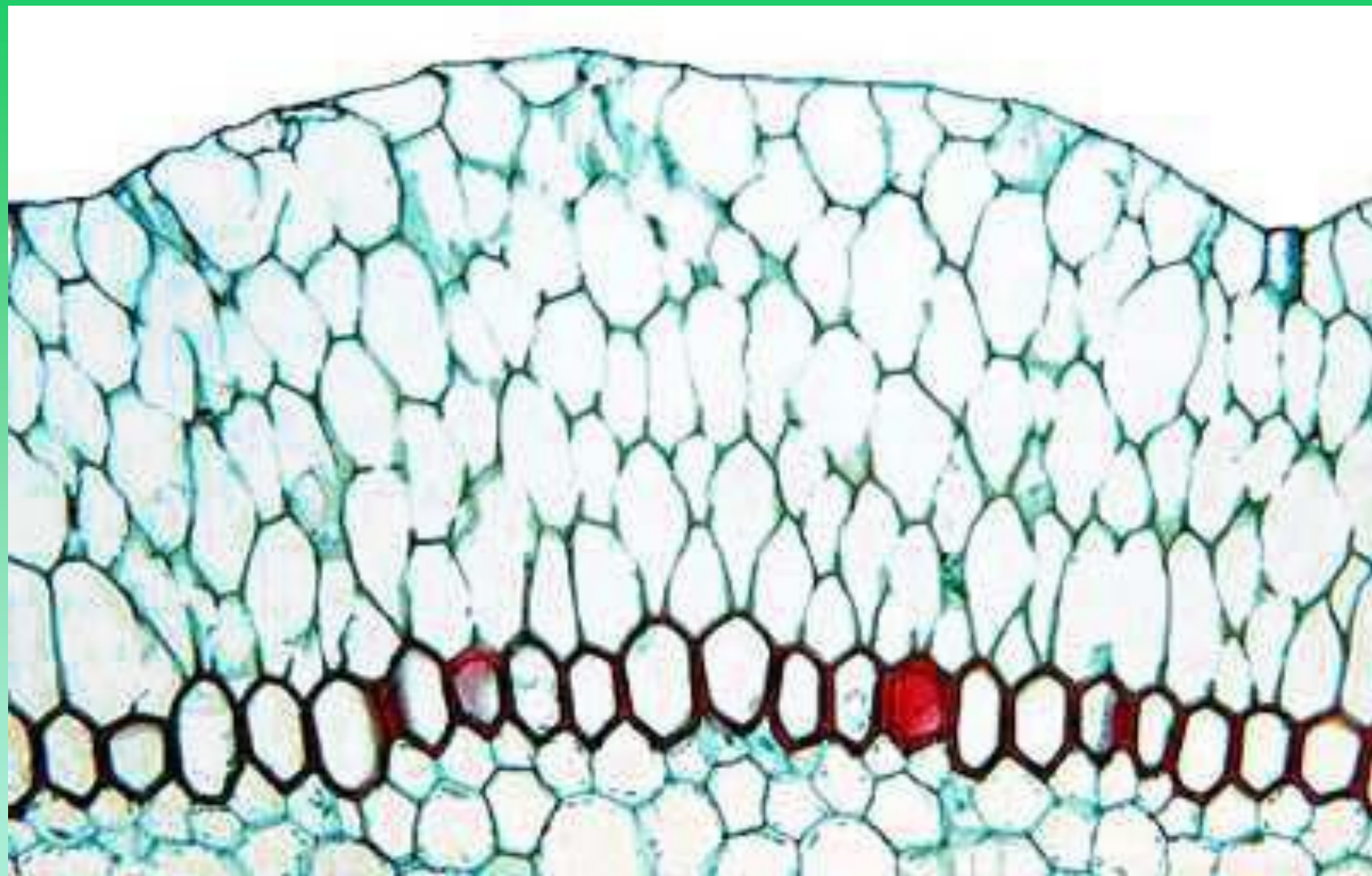


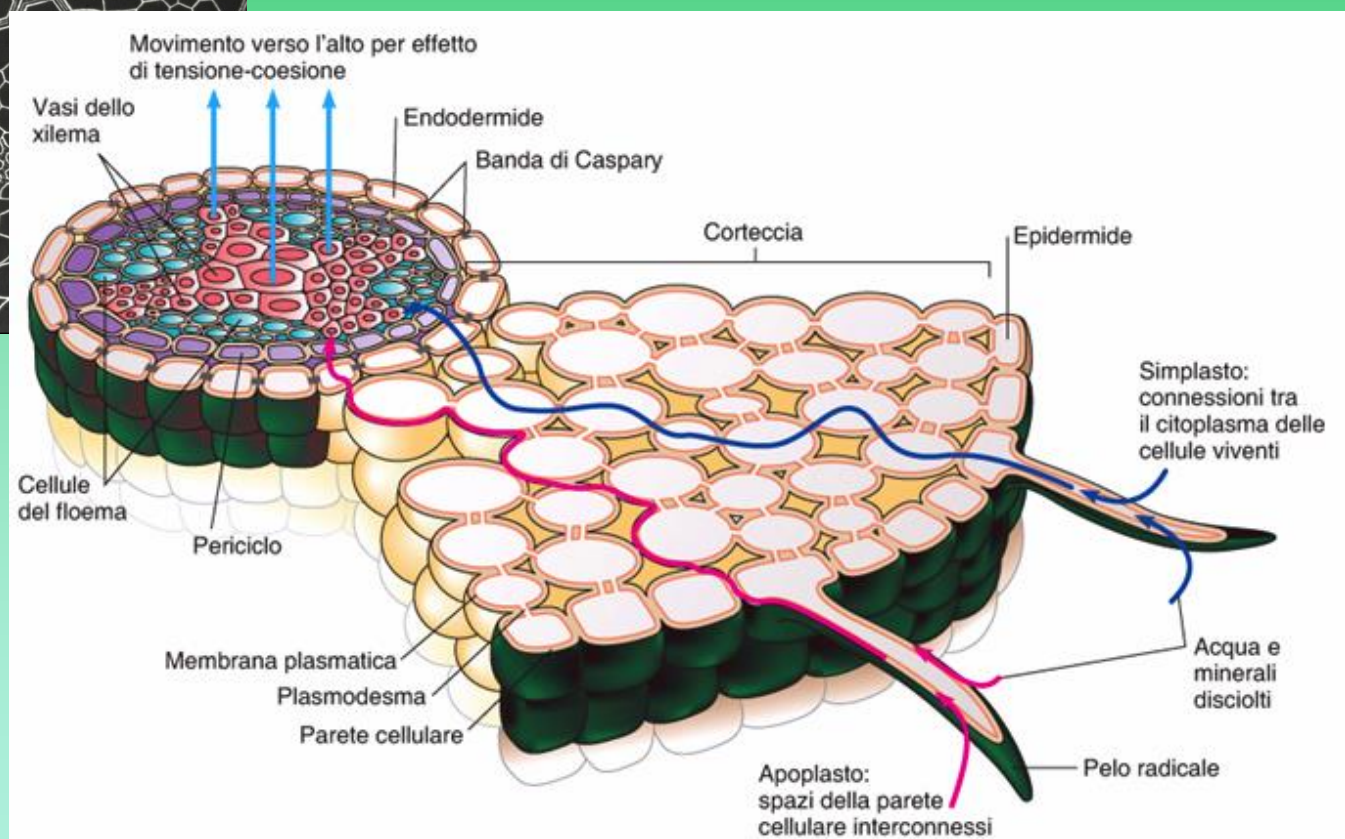
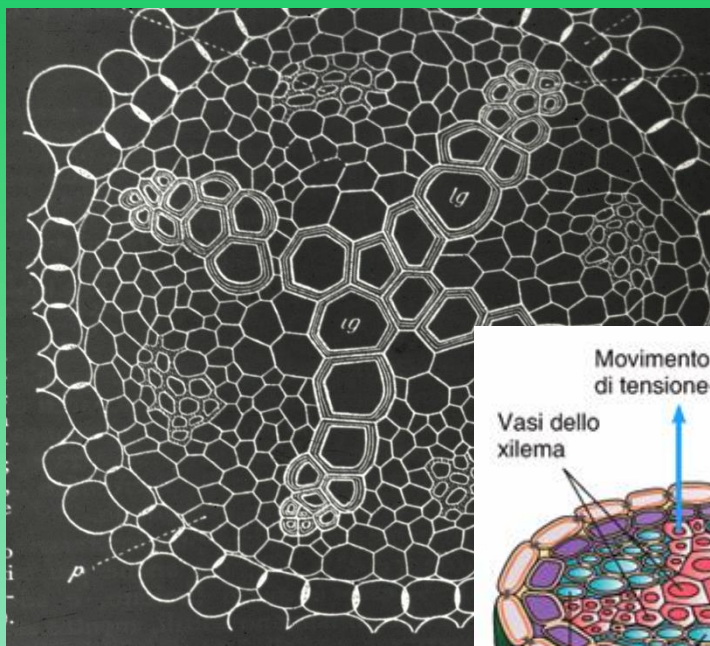


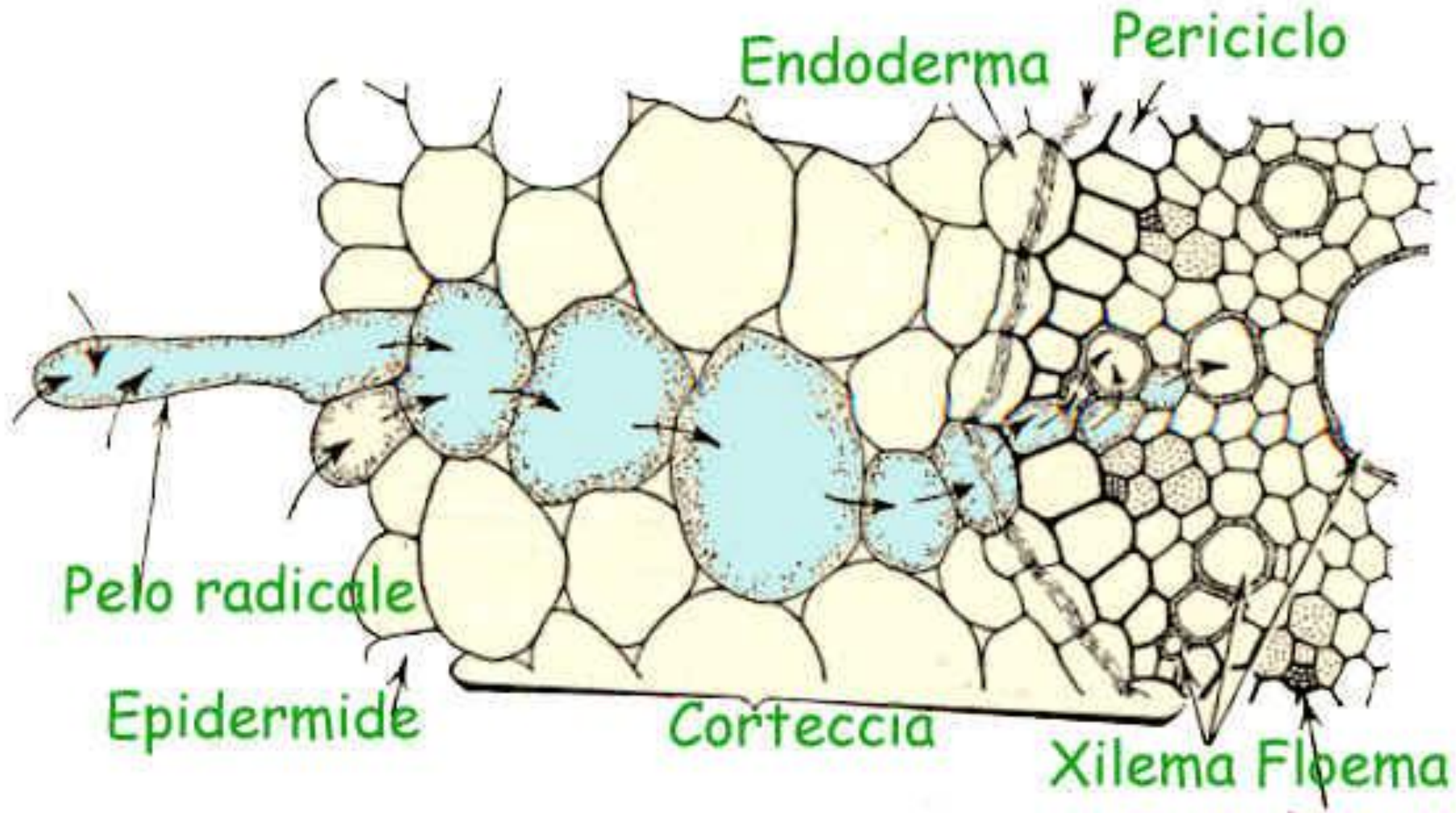


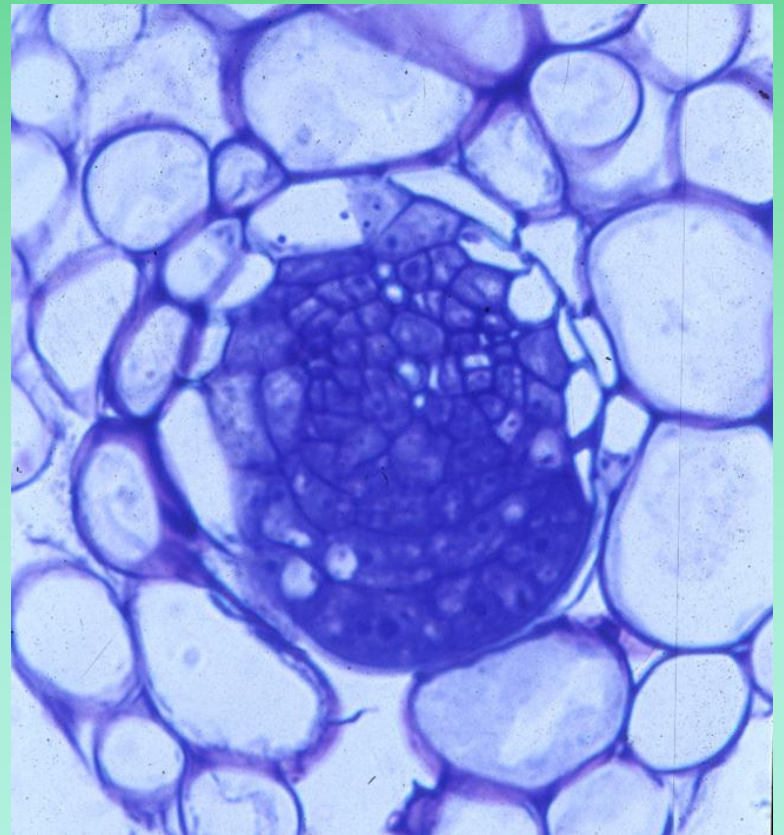
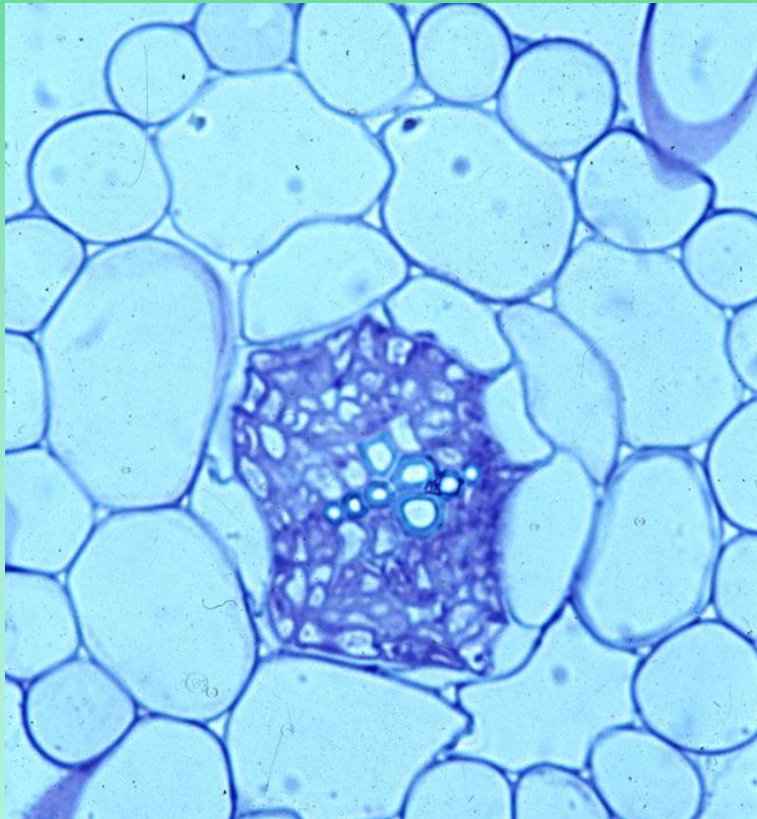
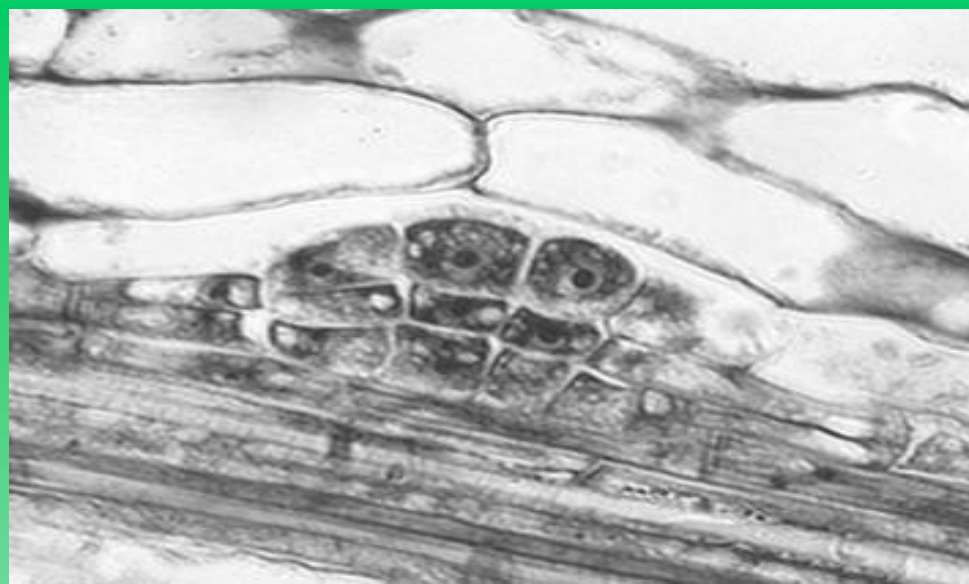


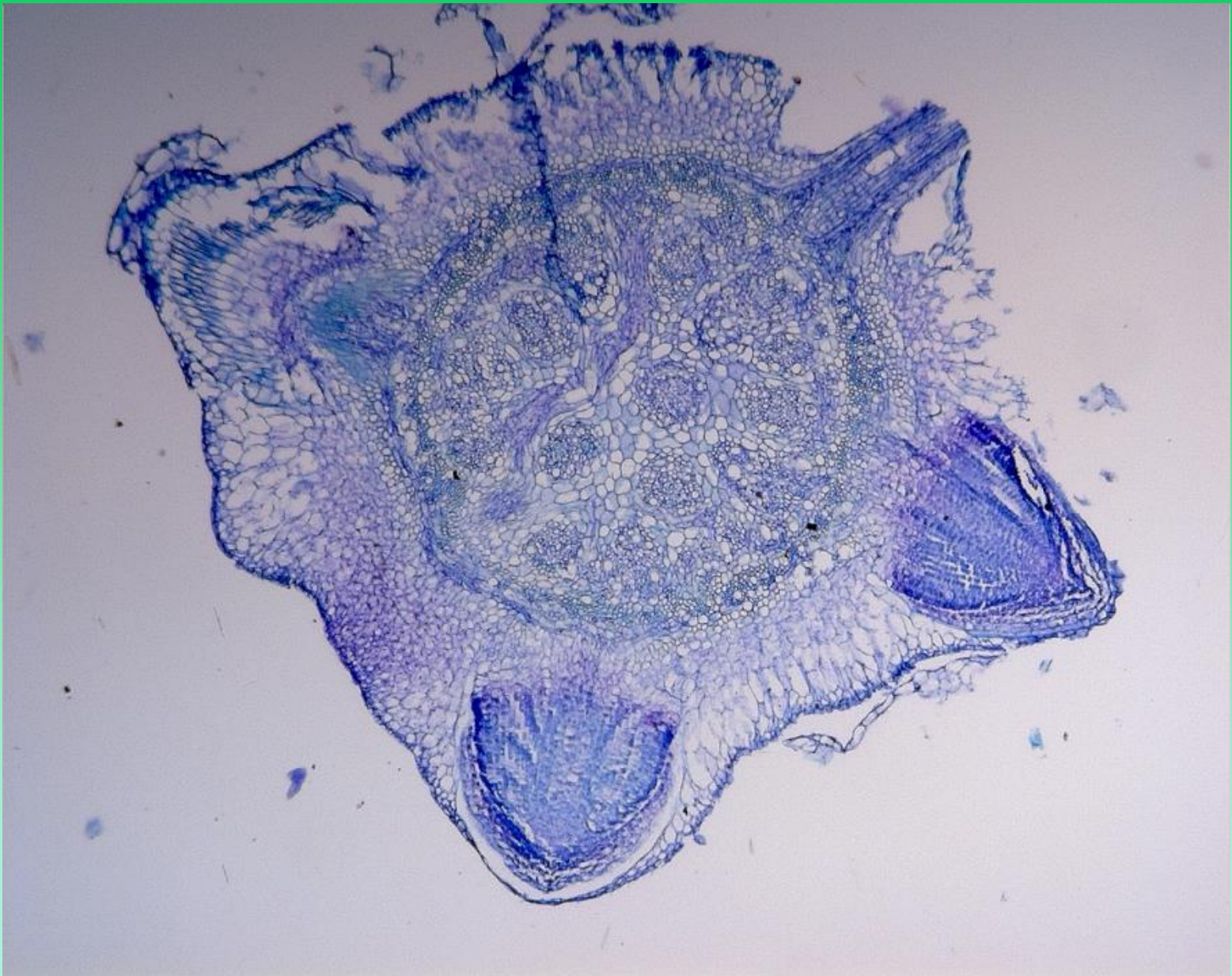










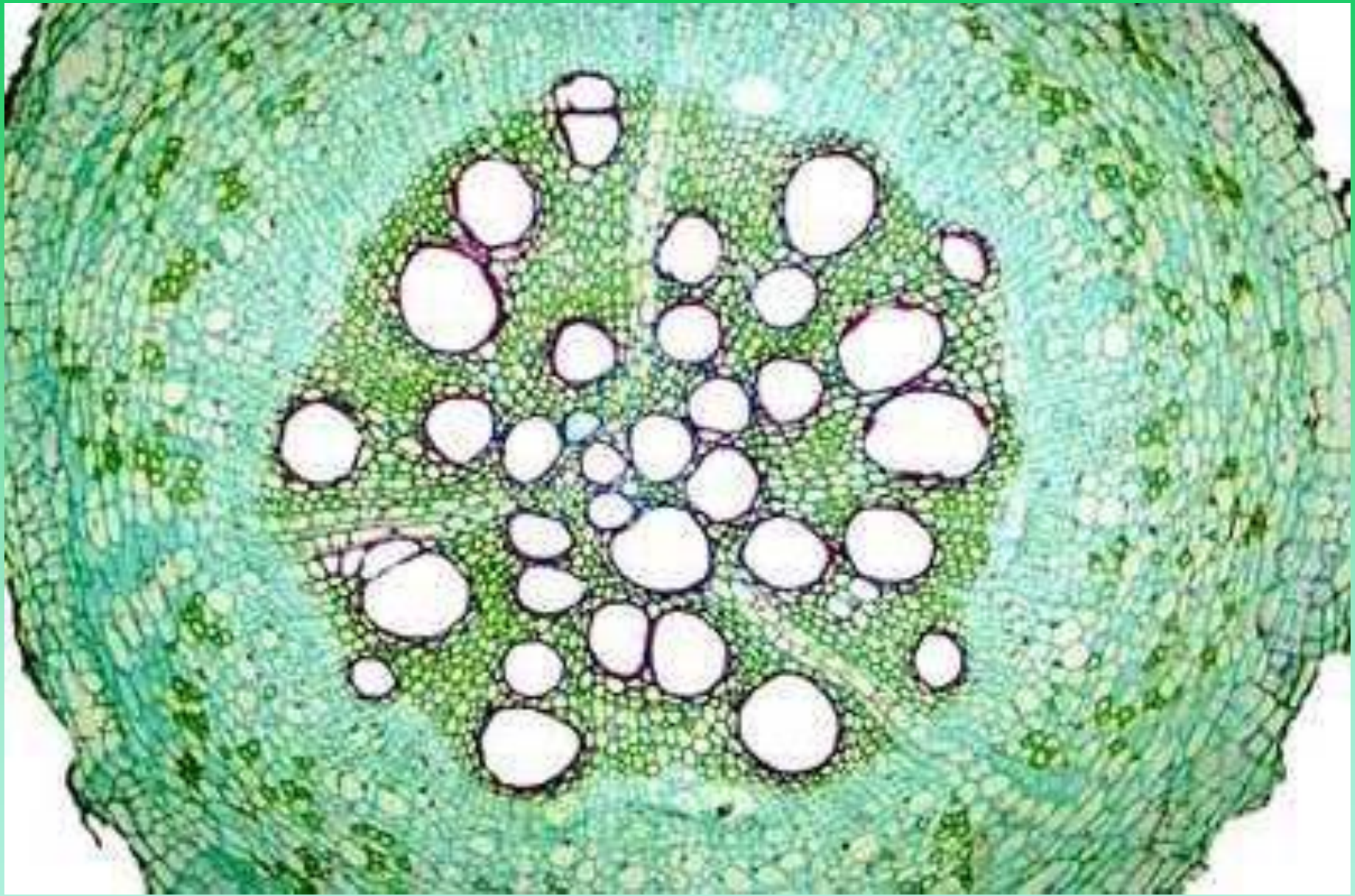


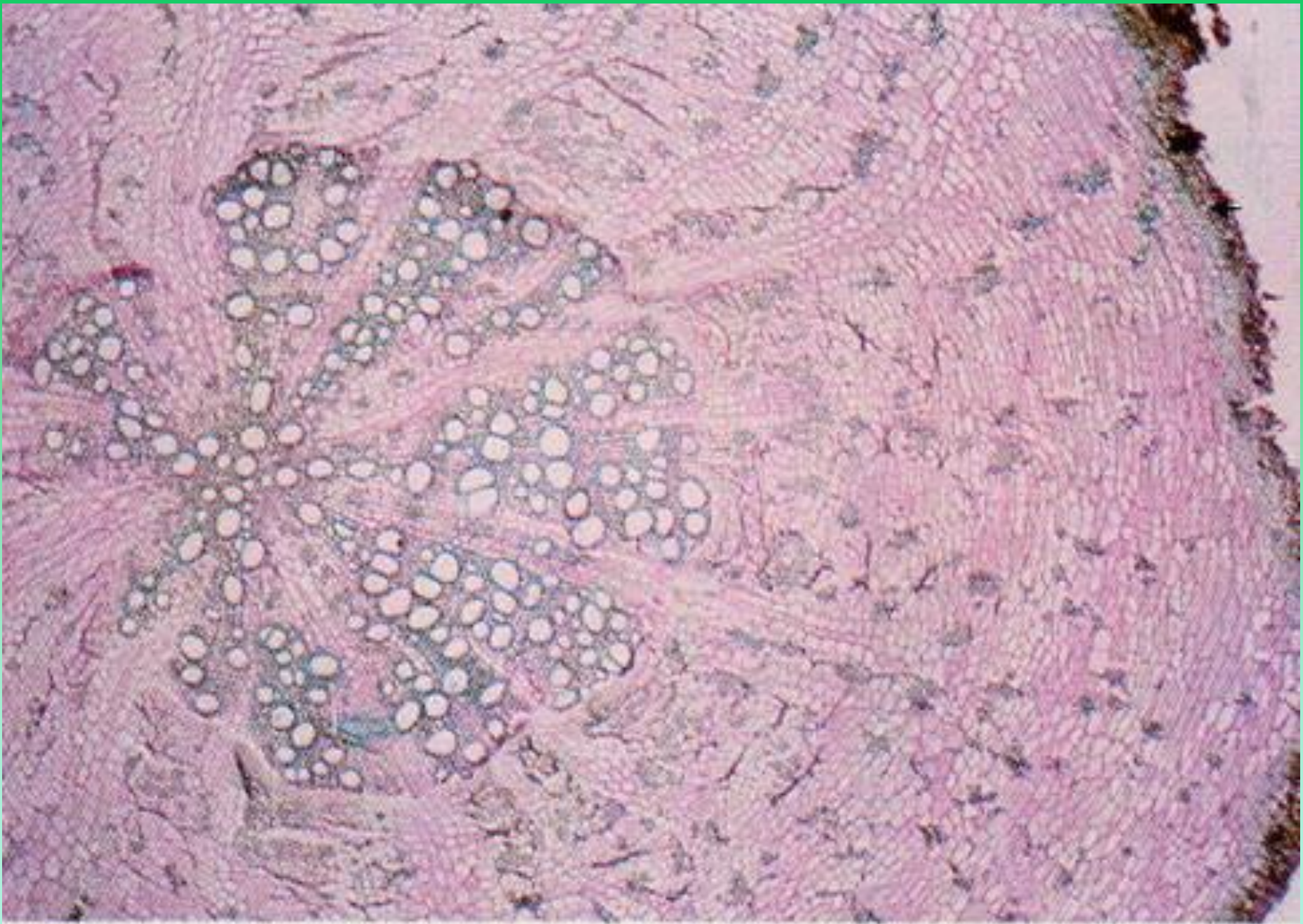
Lateral root



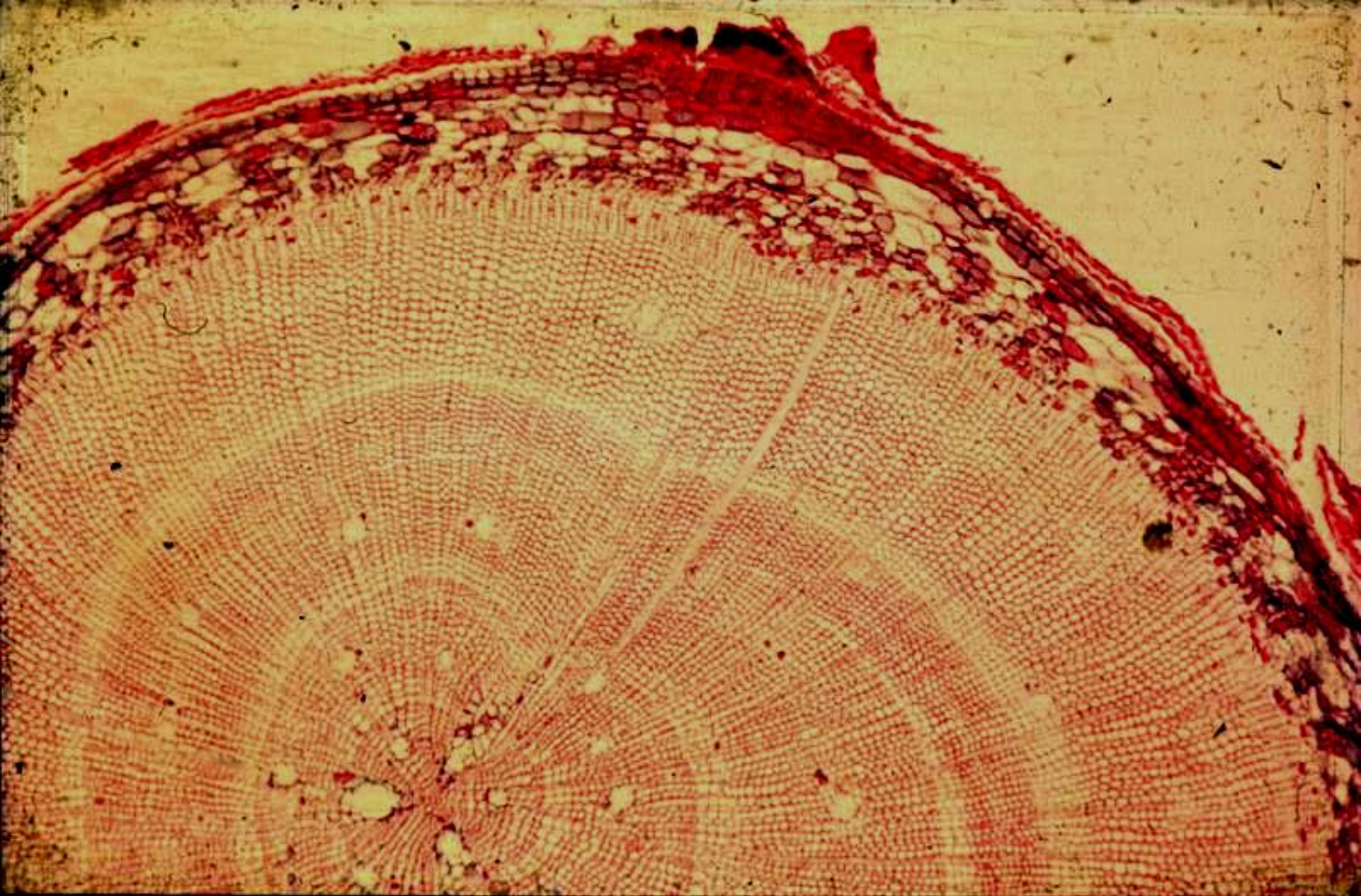
Expanded epidermis  
and cortex of  
parental root

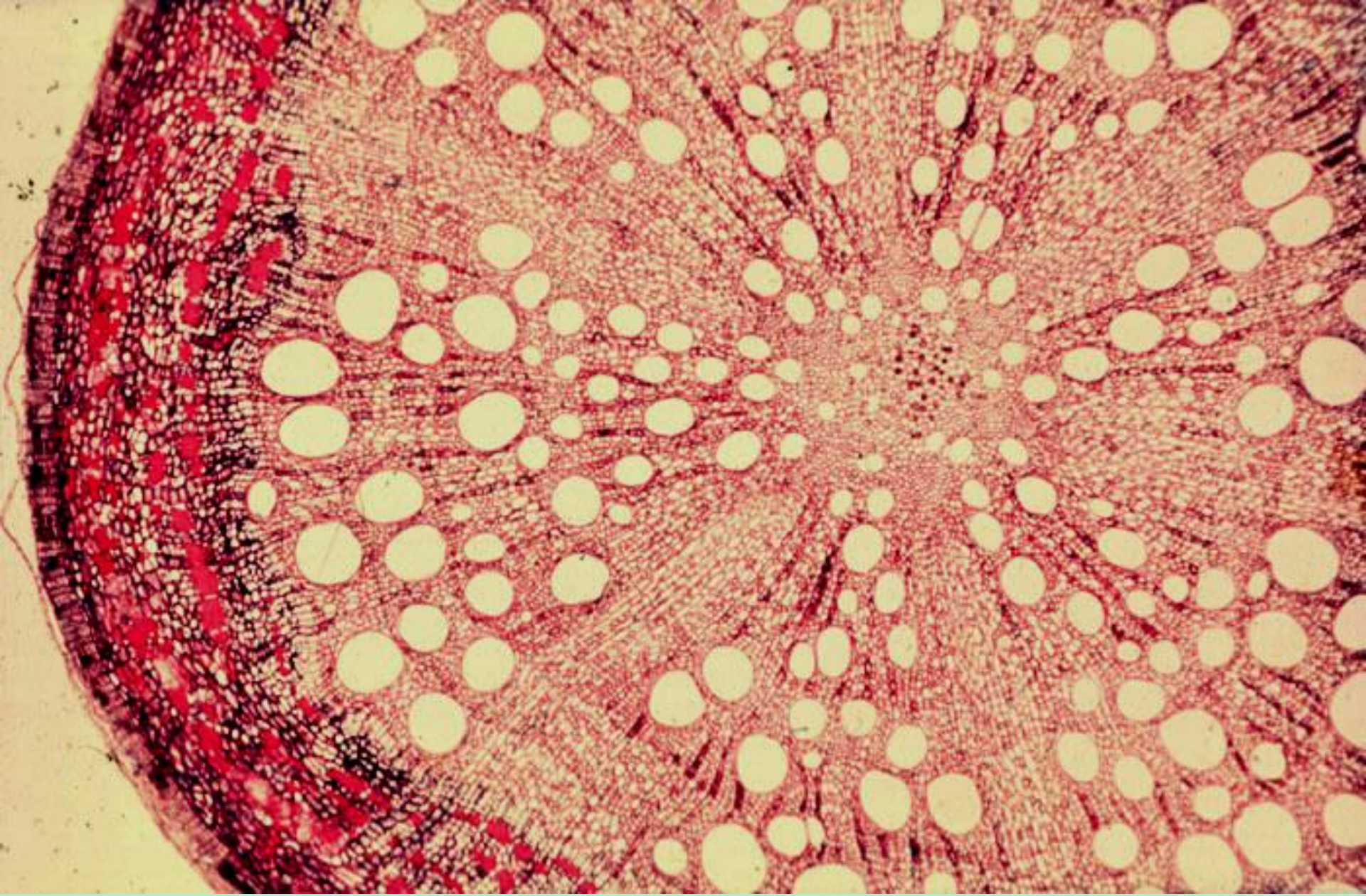
Vascular  
tissues

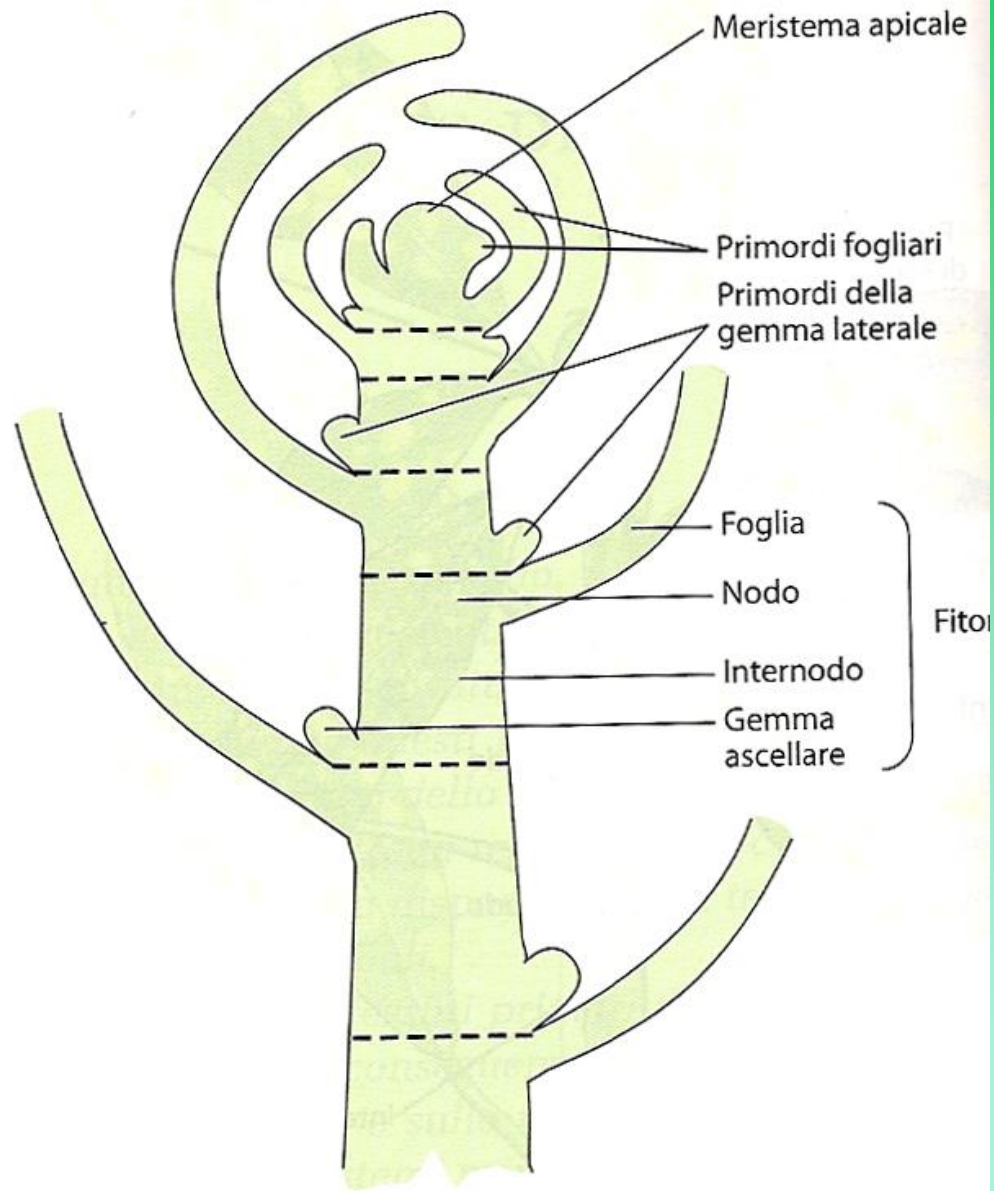


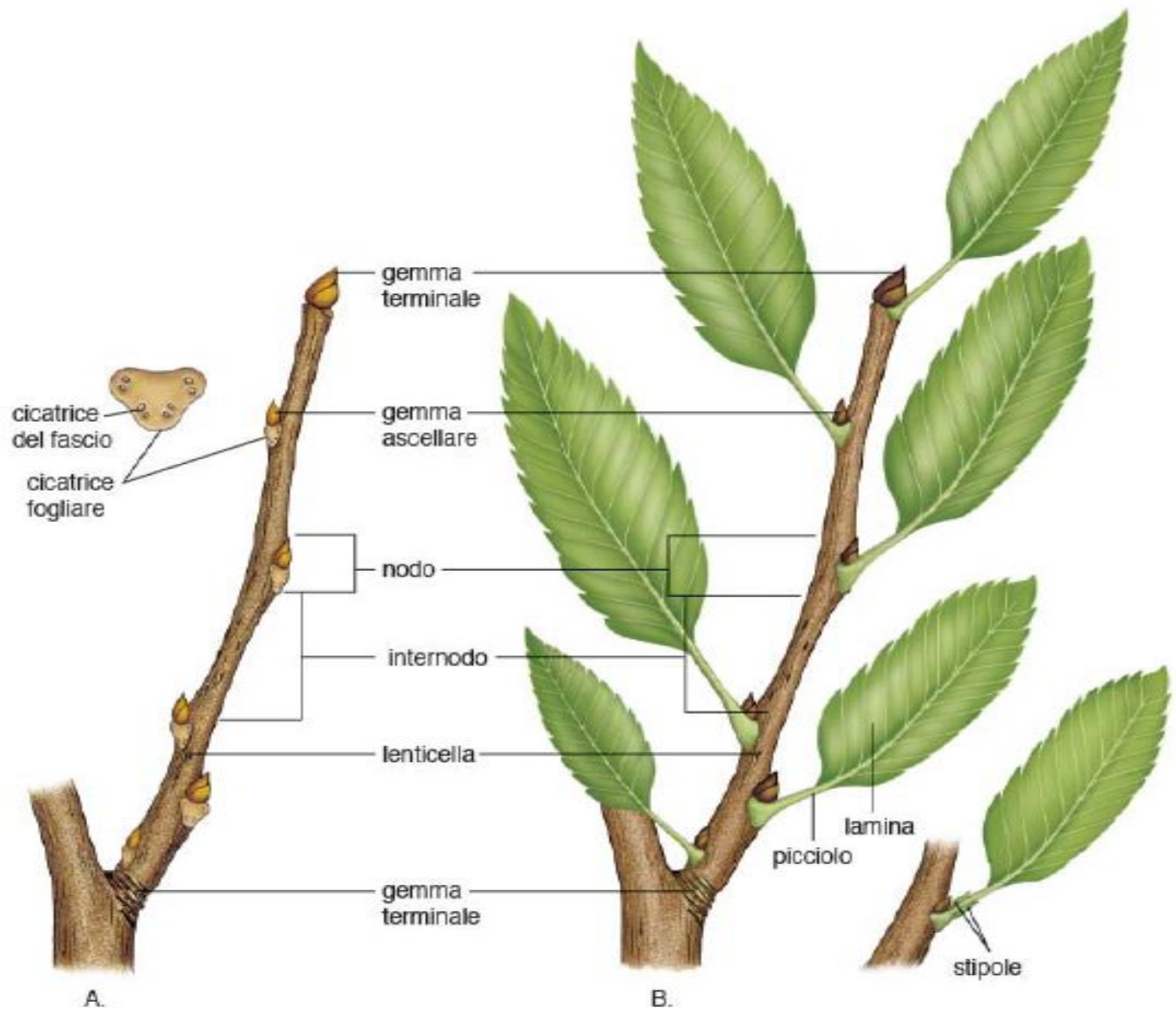












**Figura 6.1** Un ramo legnoso. *A.* Il ramo è nella sua condizione invernale. *B.* Il ramo come appariva l'estate precedente.



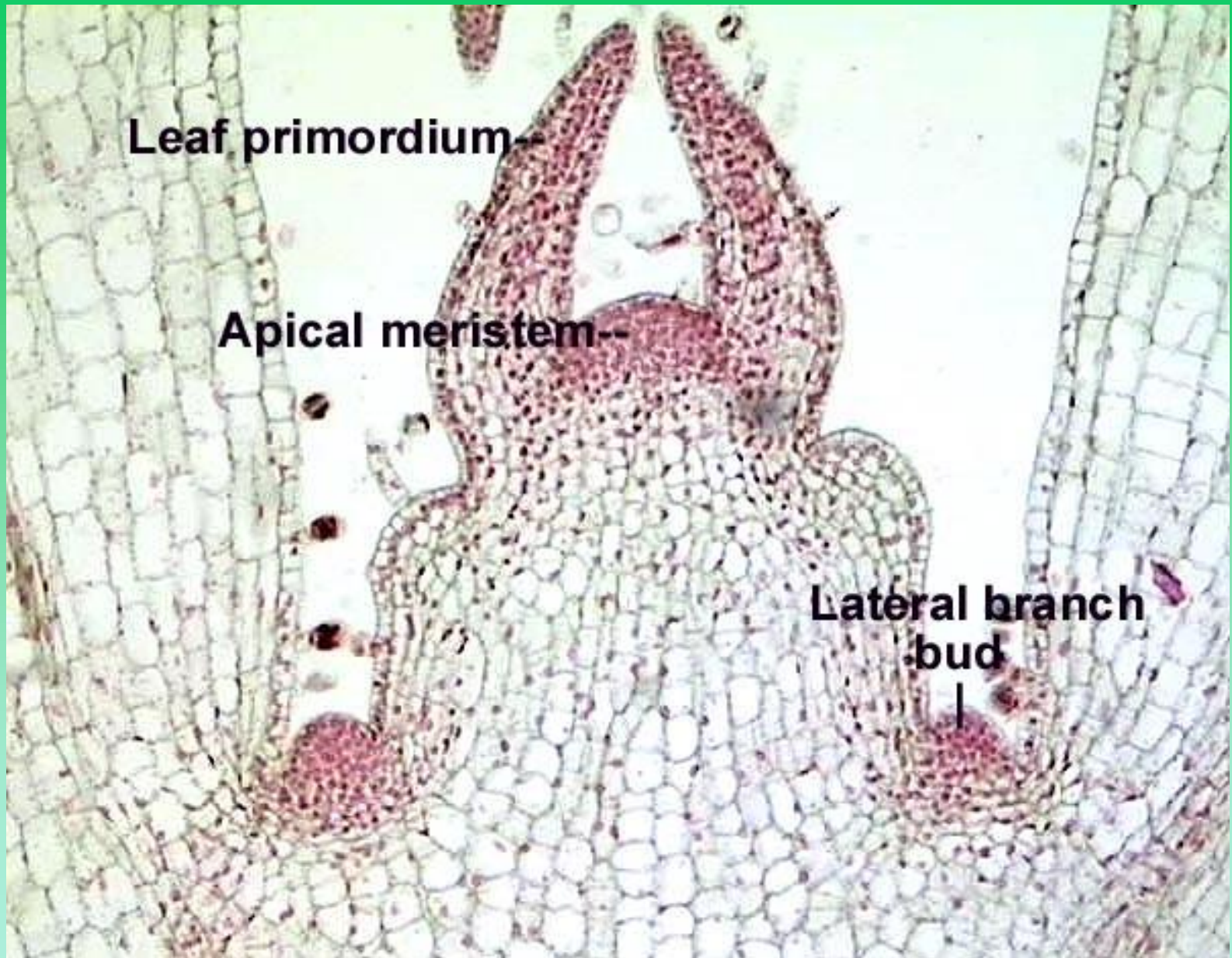
(b)

50  $\mu$ m

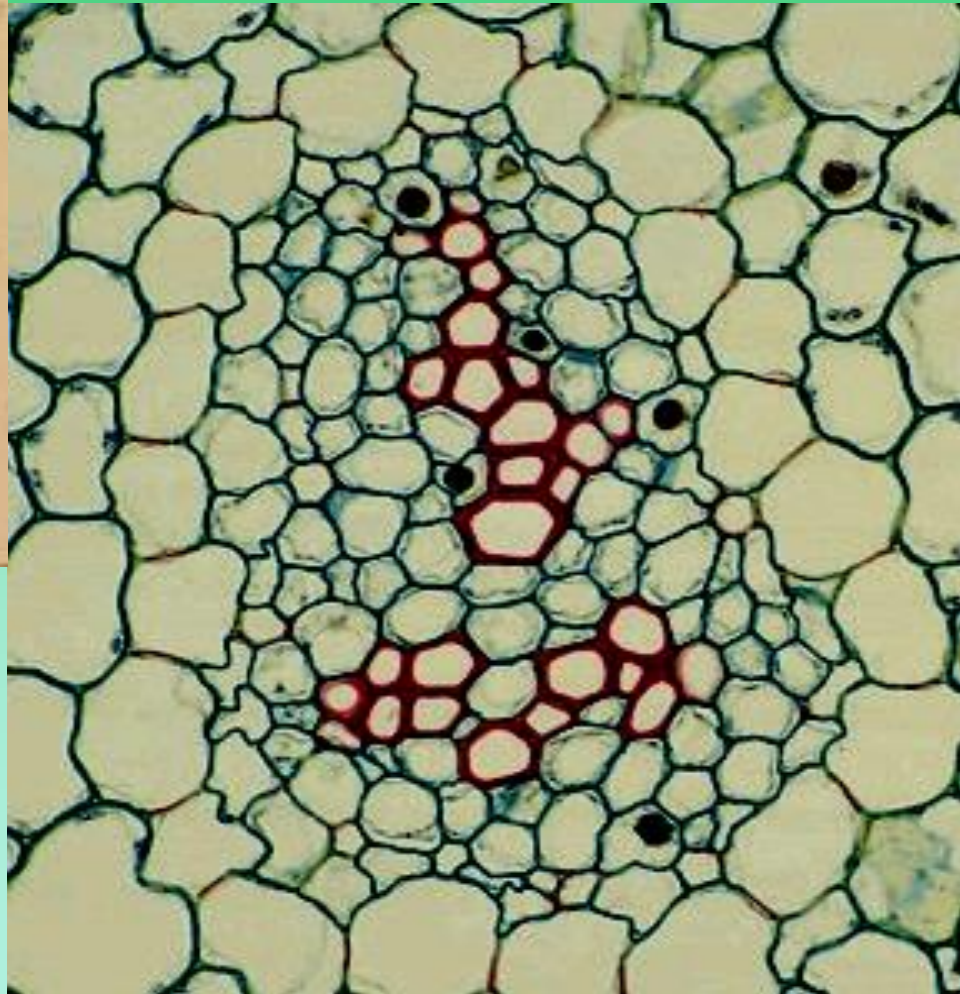
**Leaf primordium**

**Apical meristem**

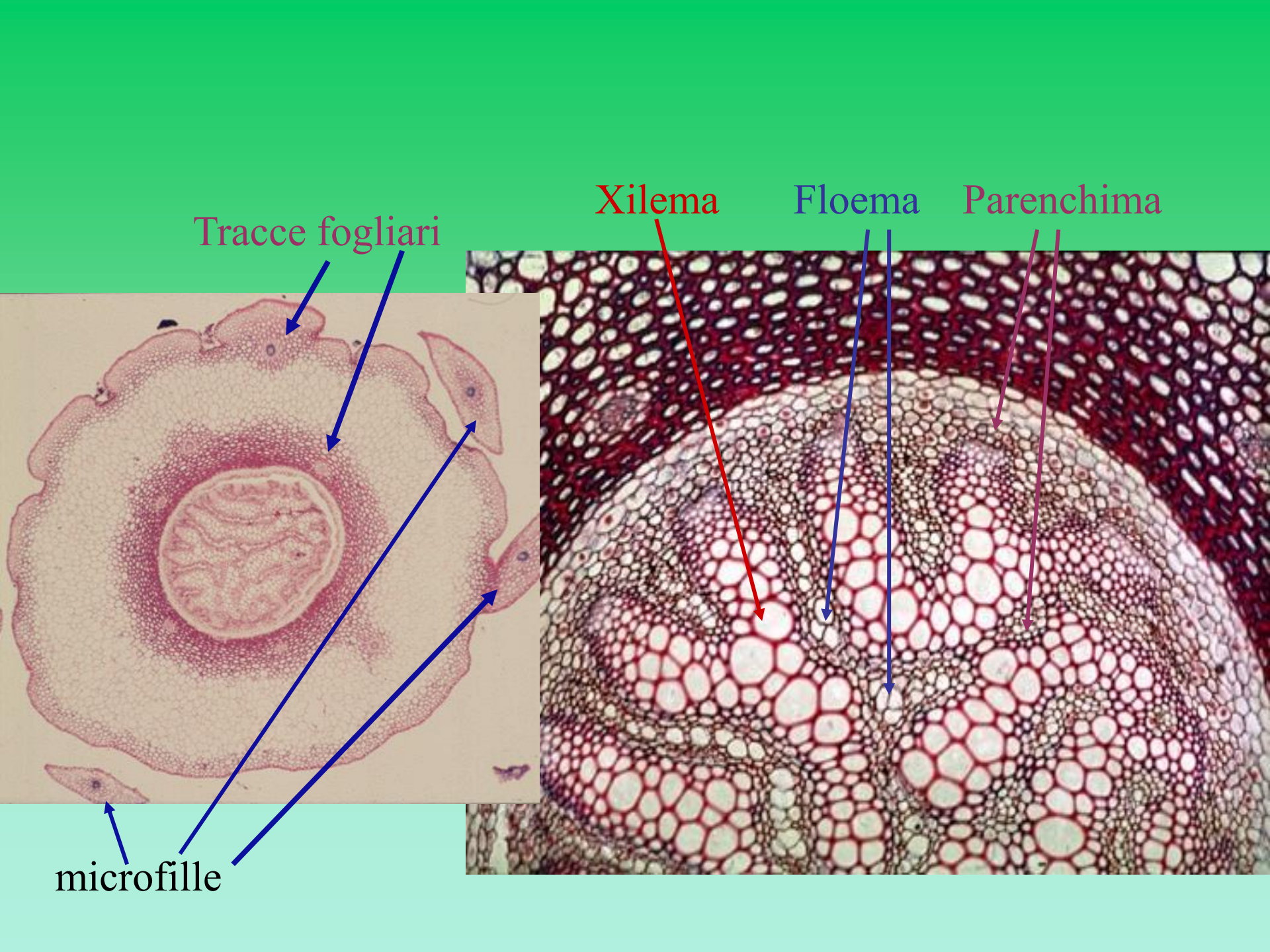
**Lateral branch  
bud**











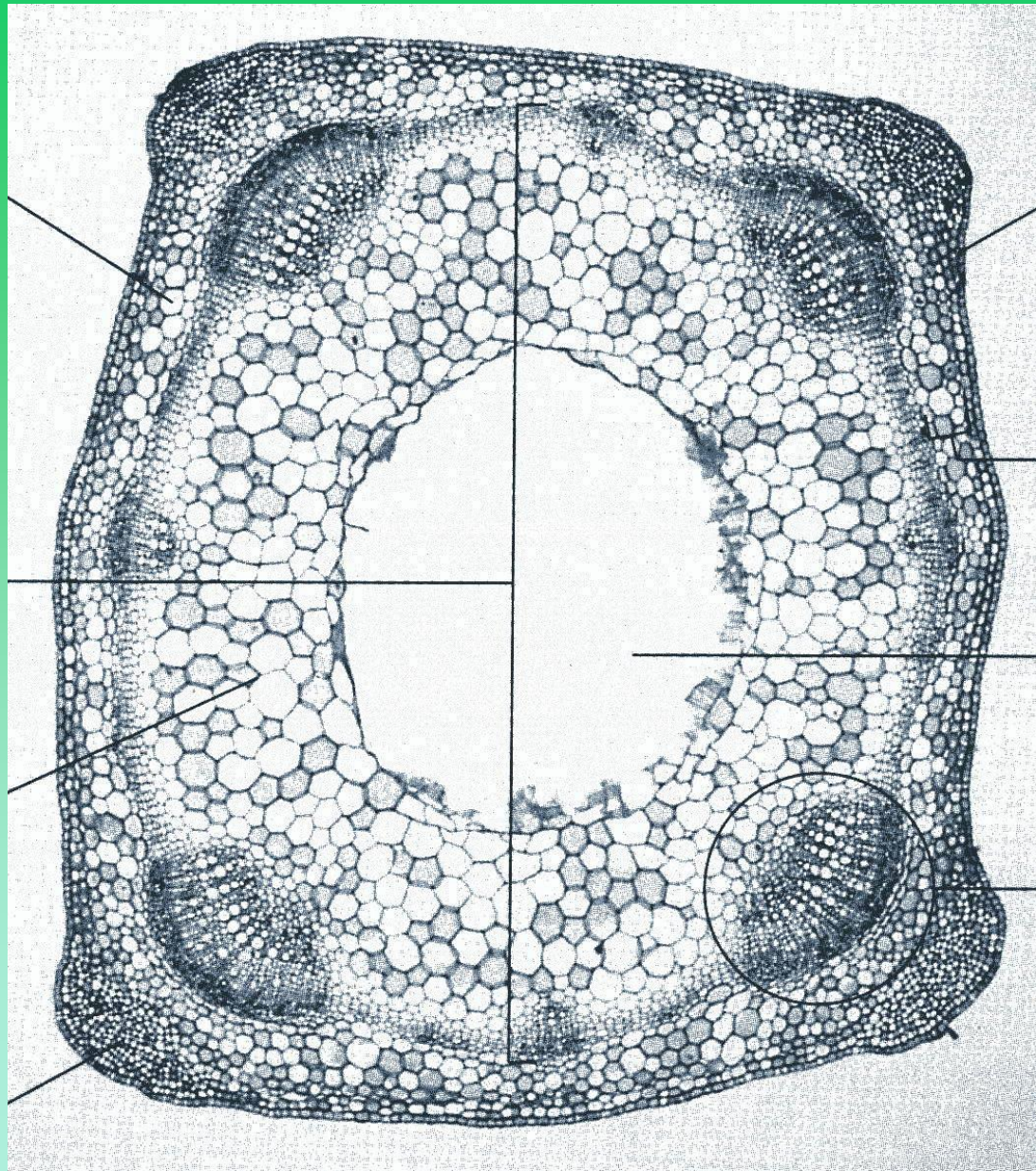
Tracce fogliari

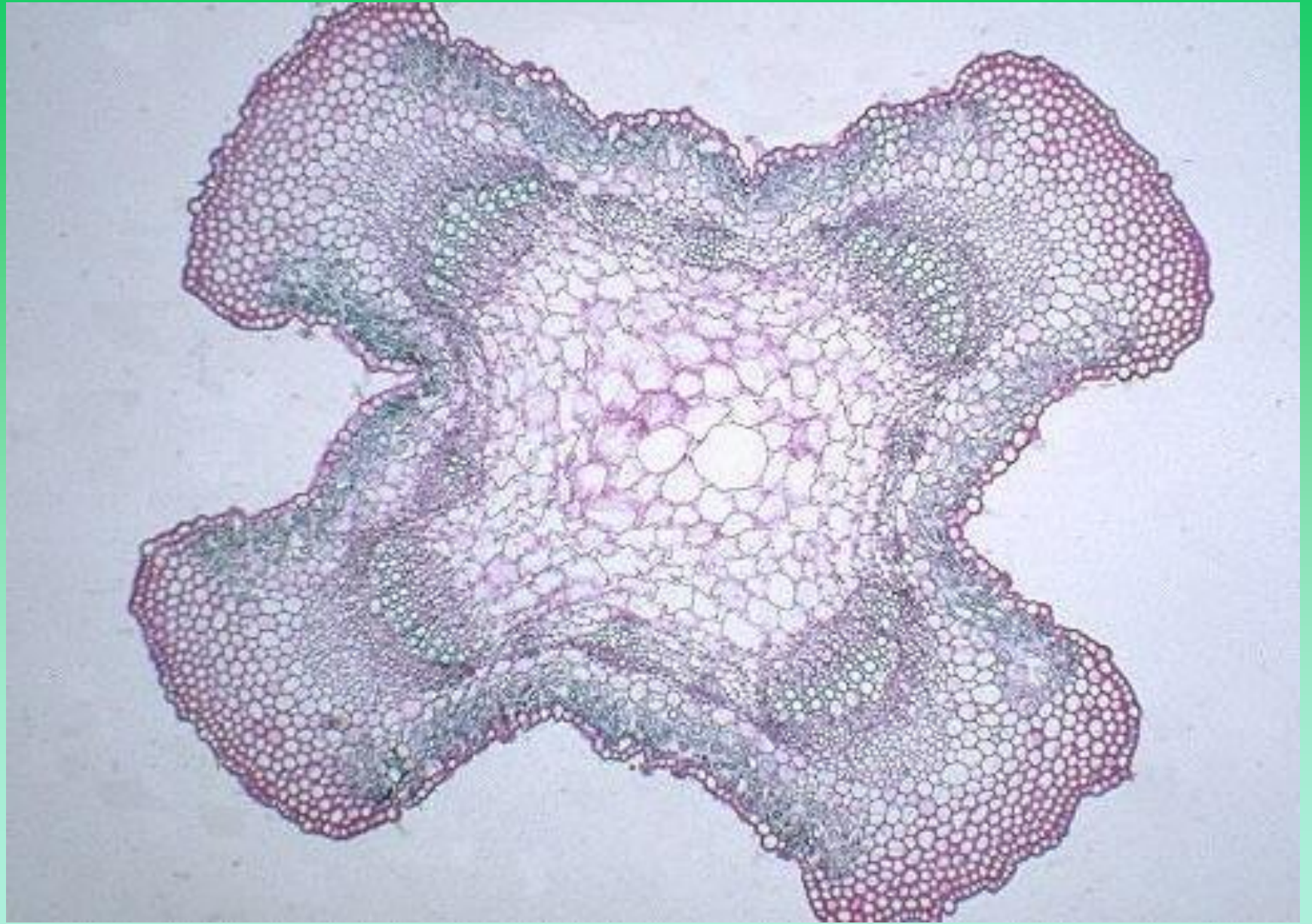
Xilema

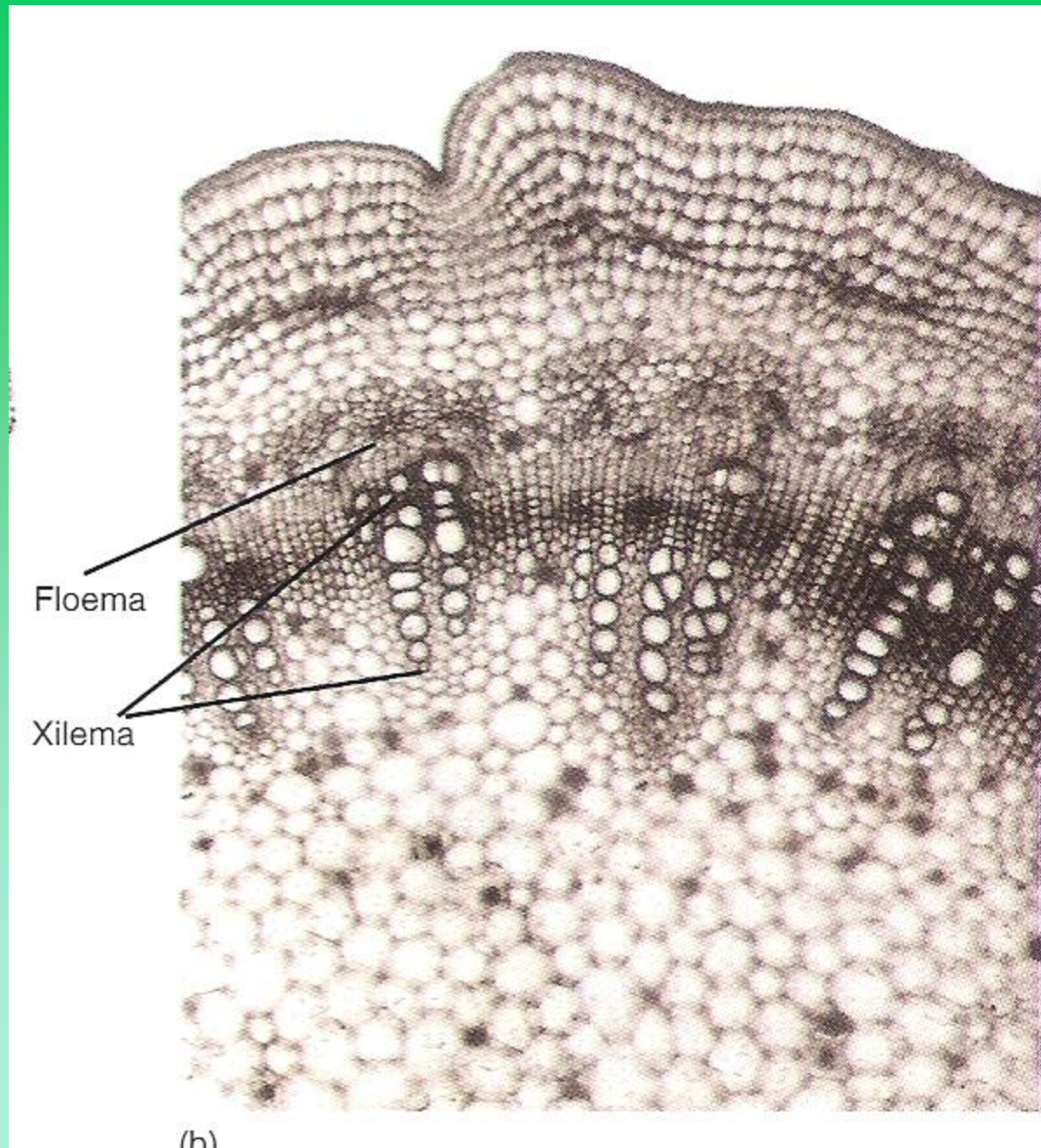
Floema

Parenchima

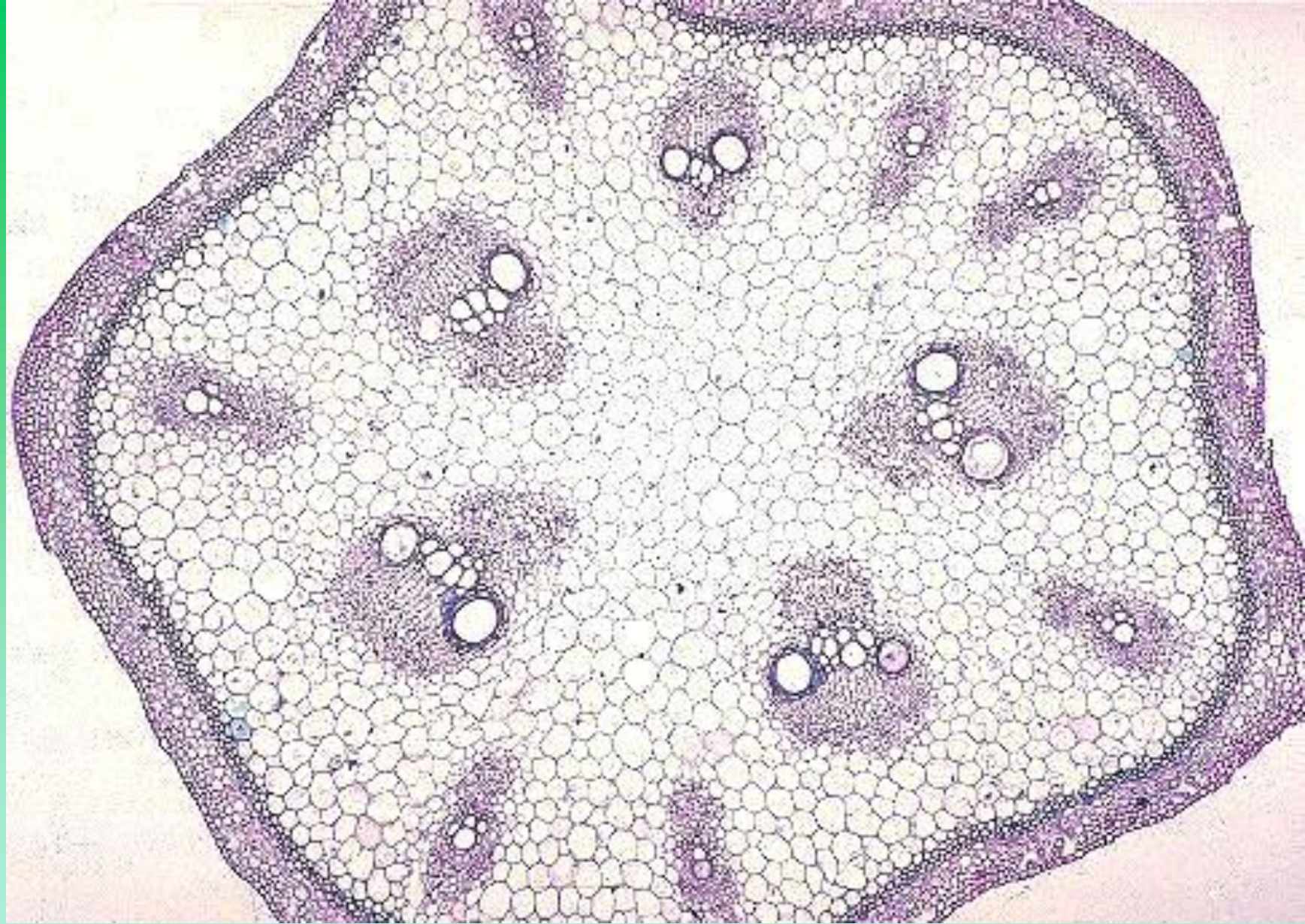
microfille

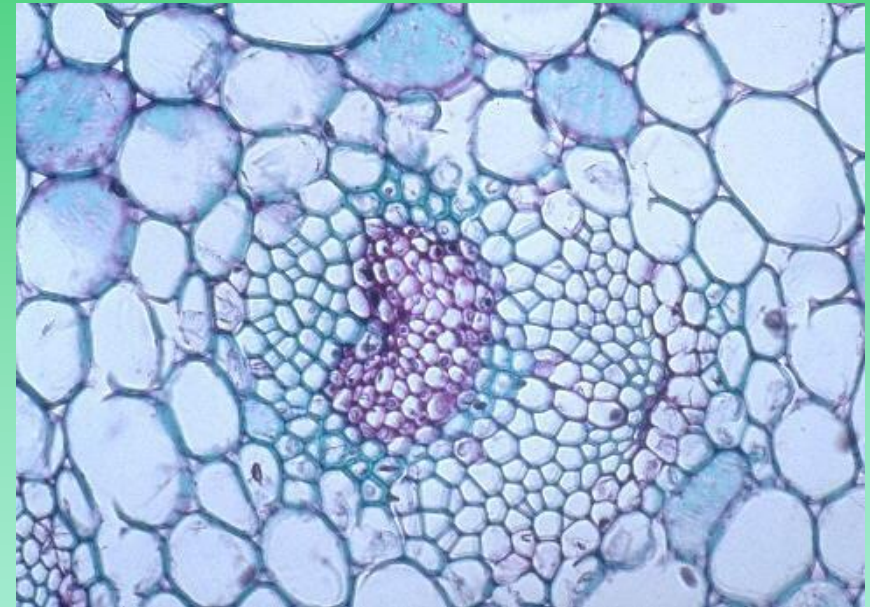
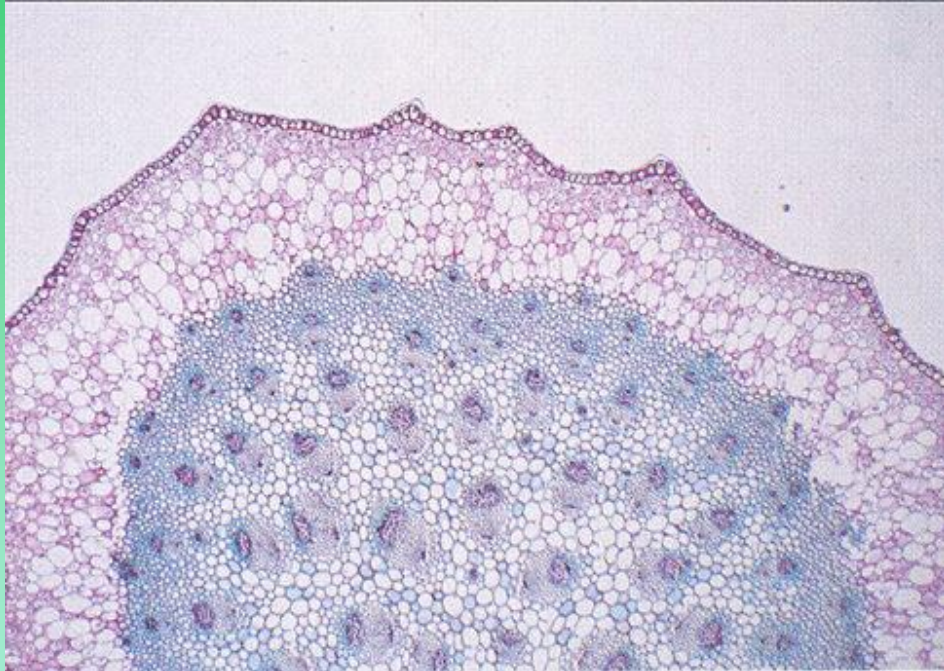


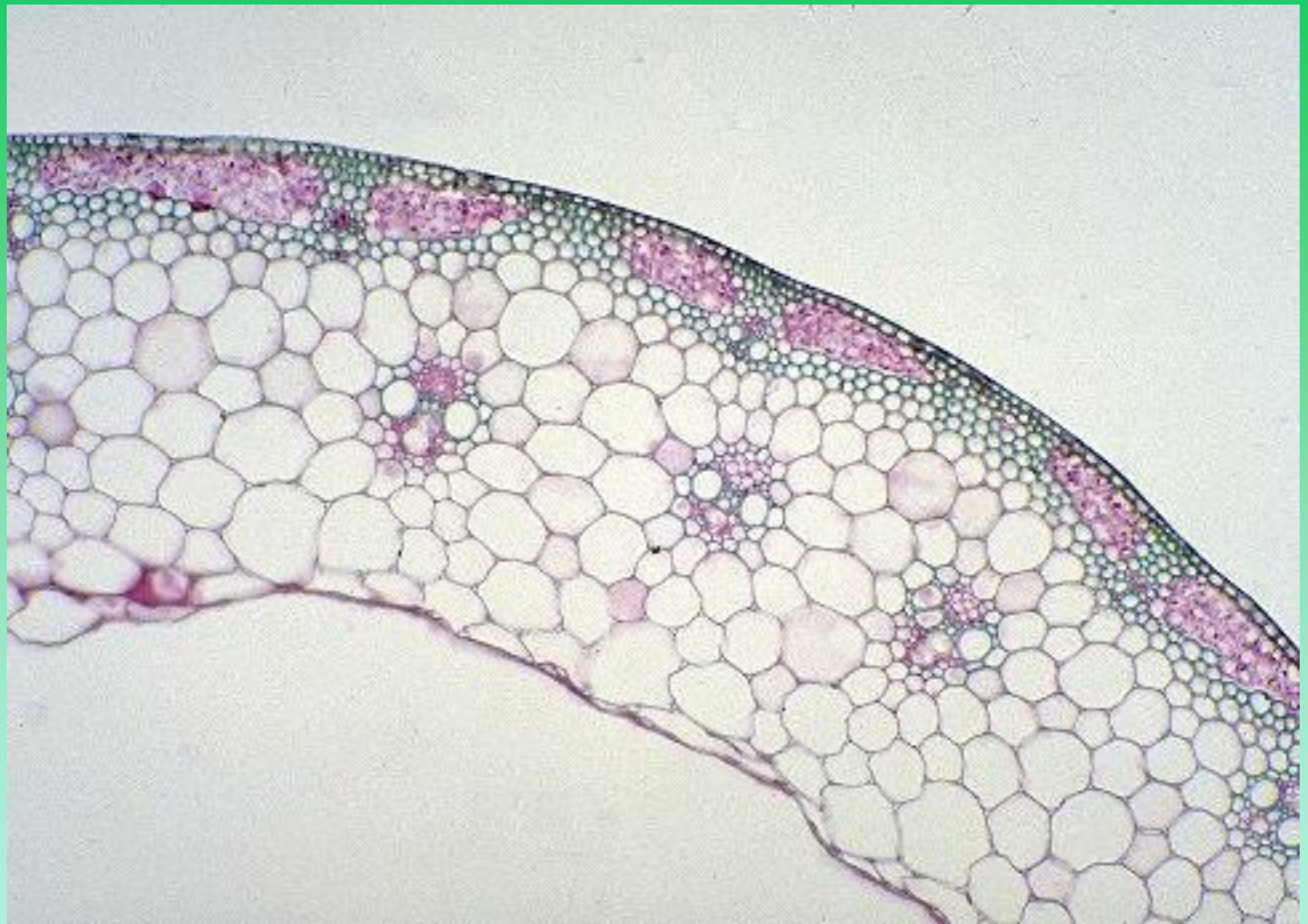




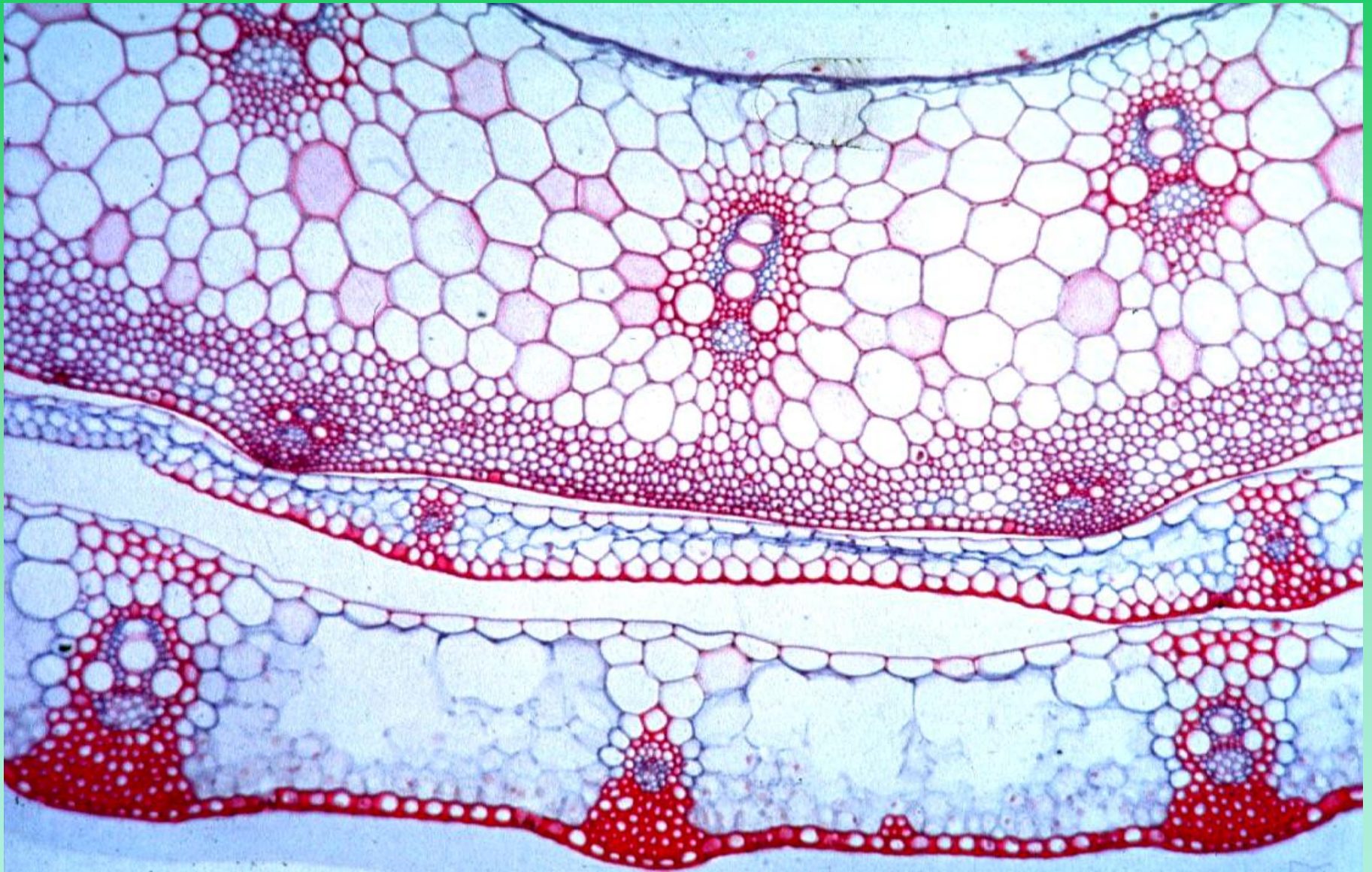


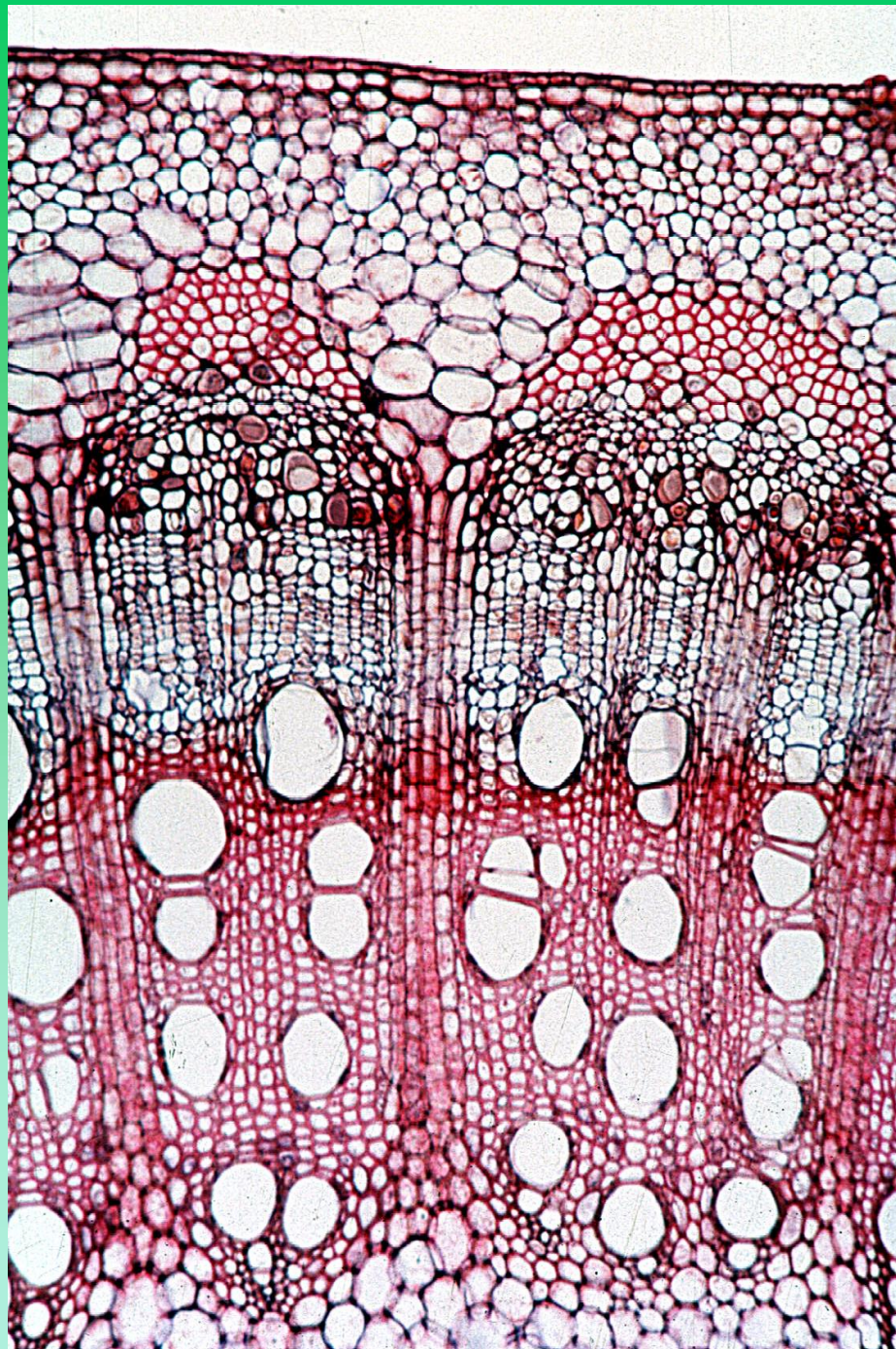


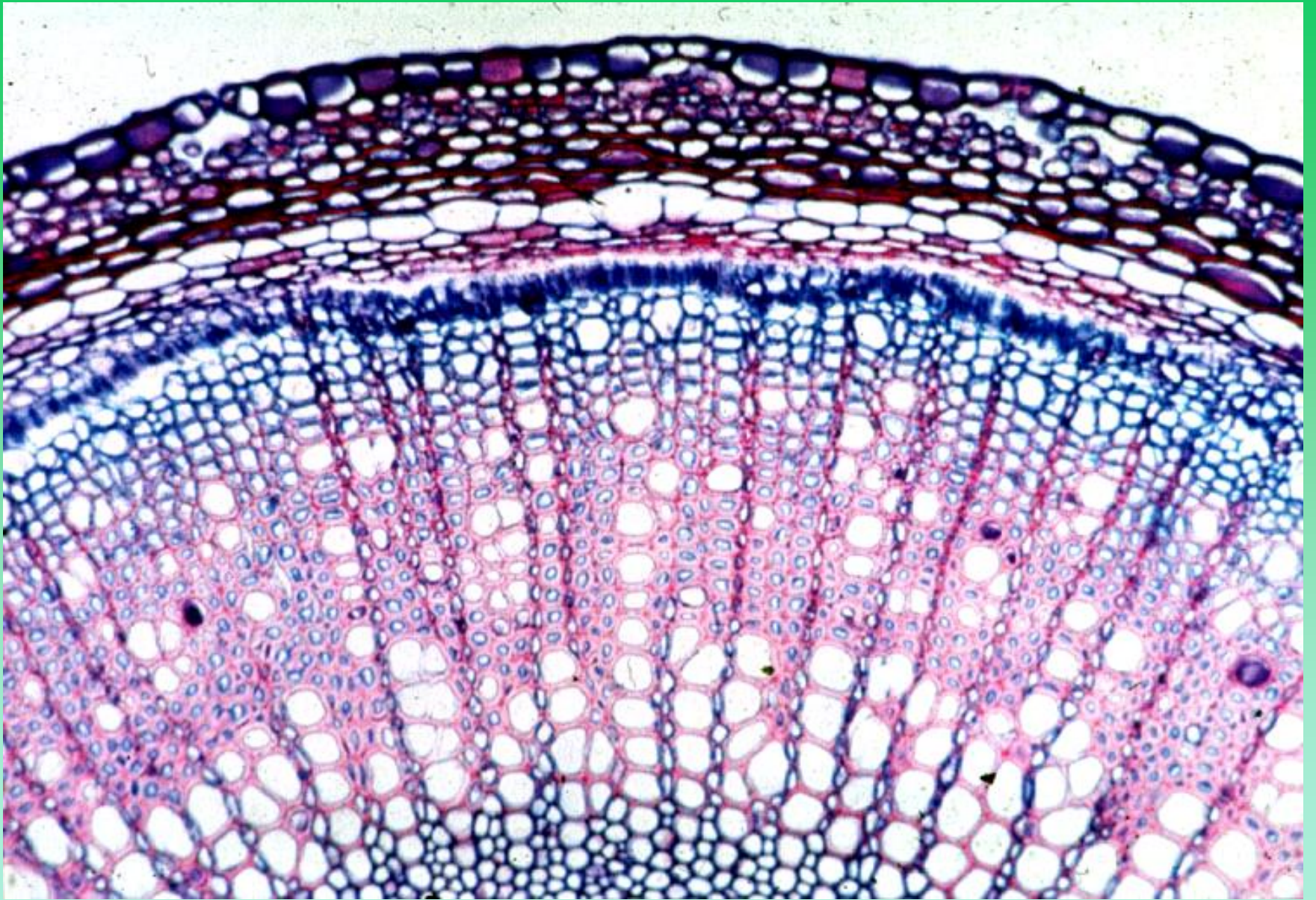


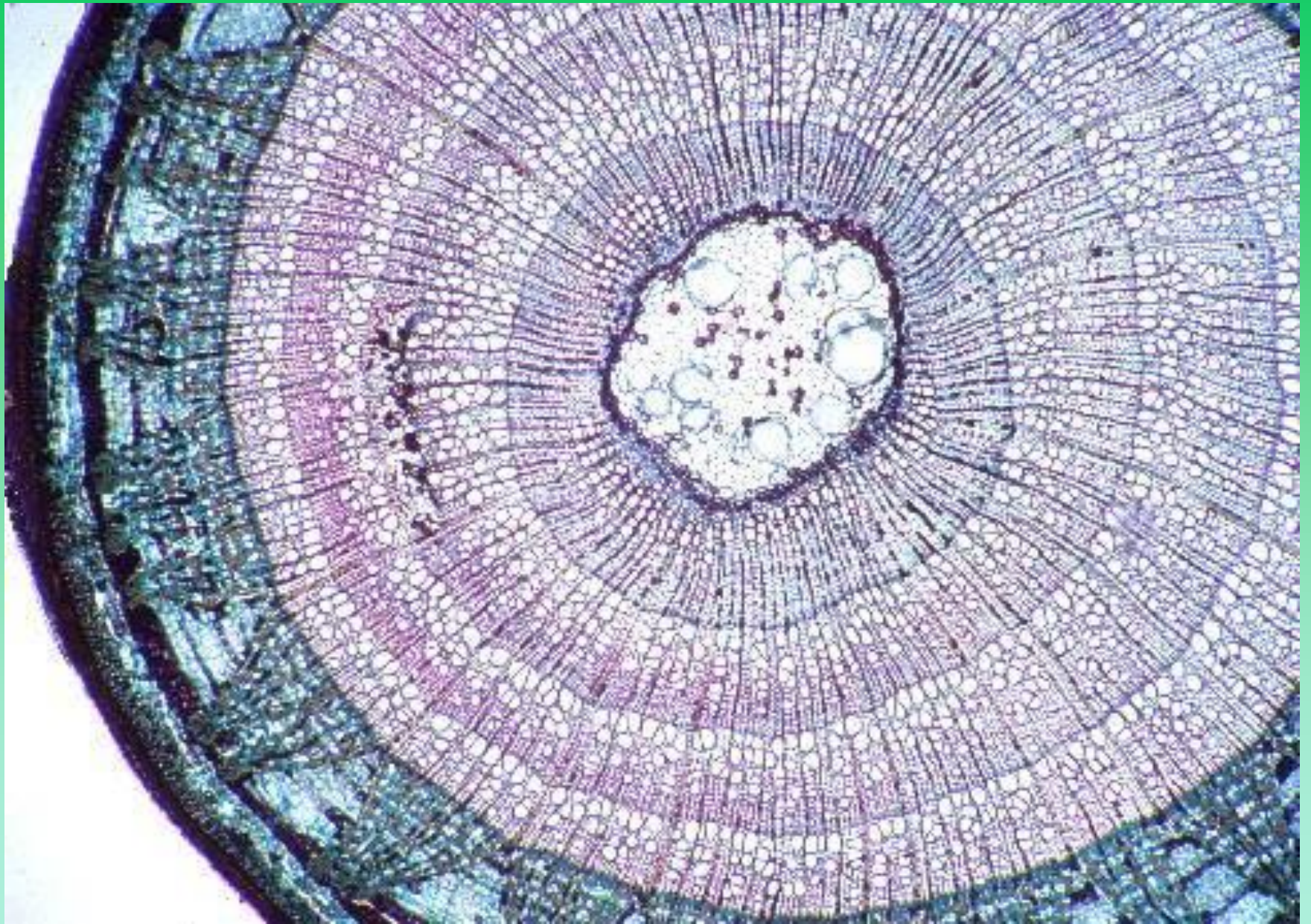




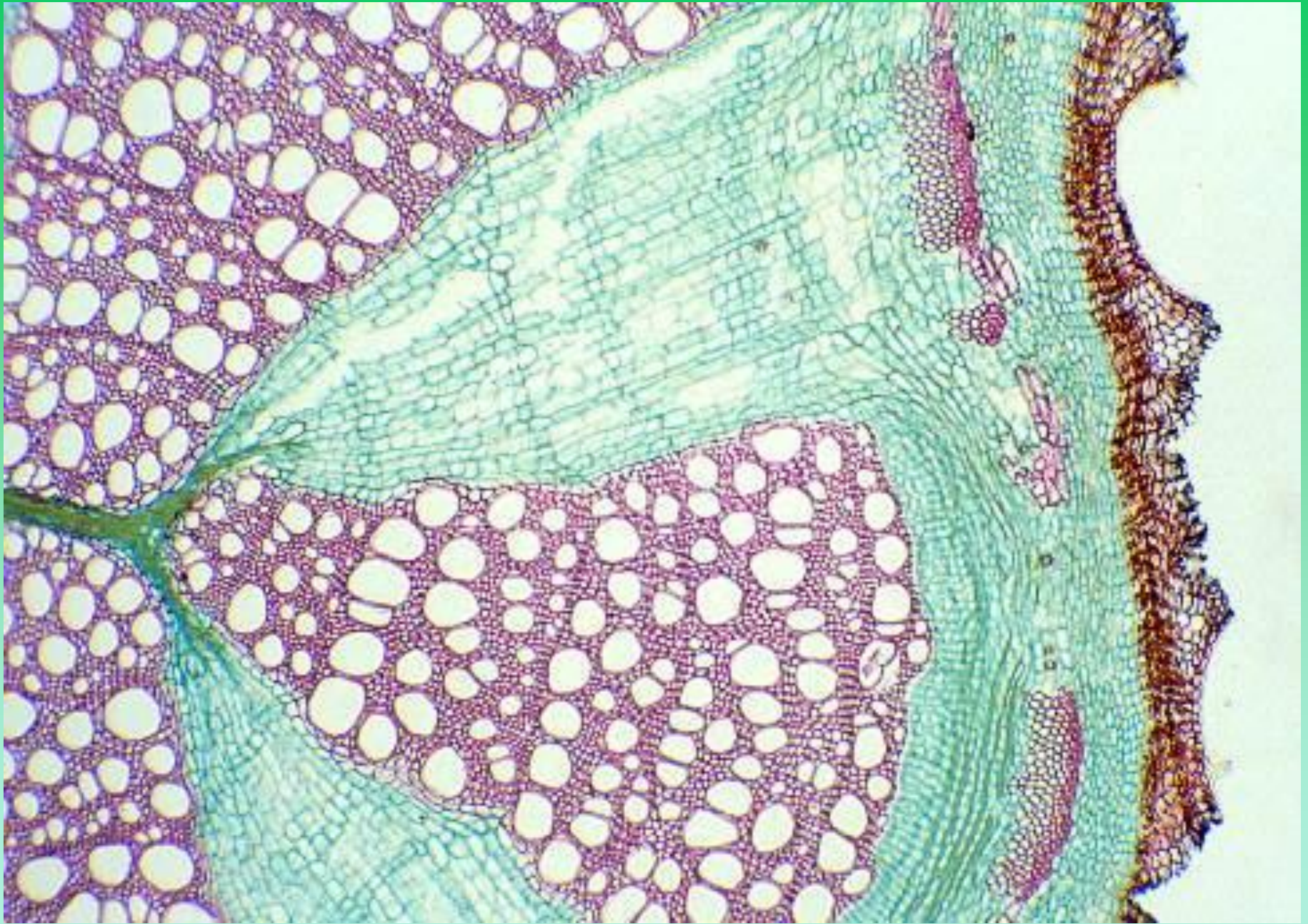


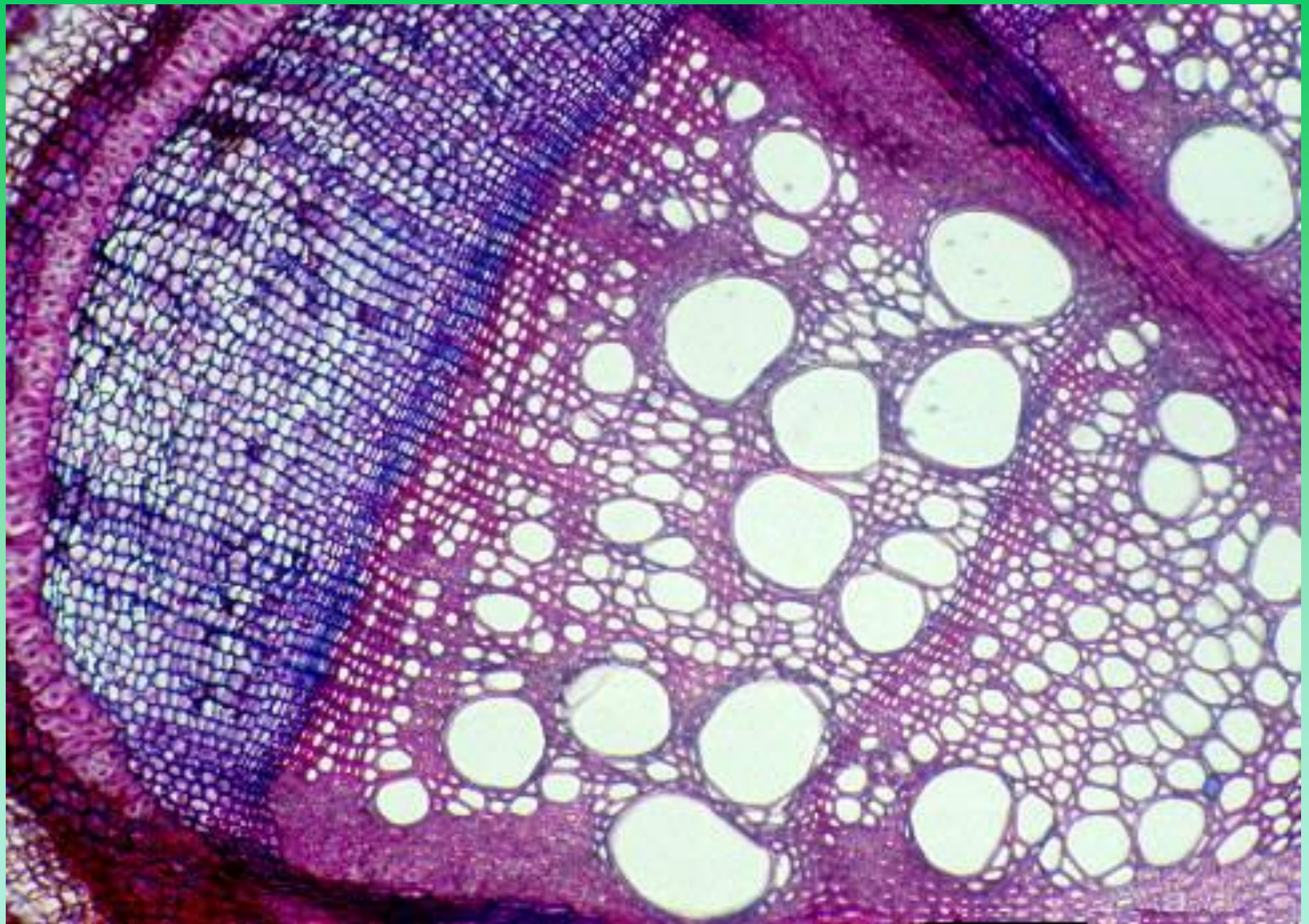


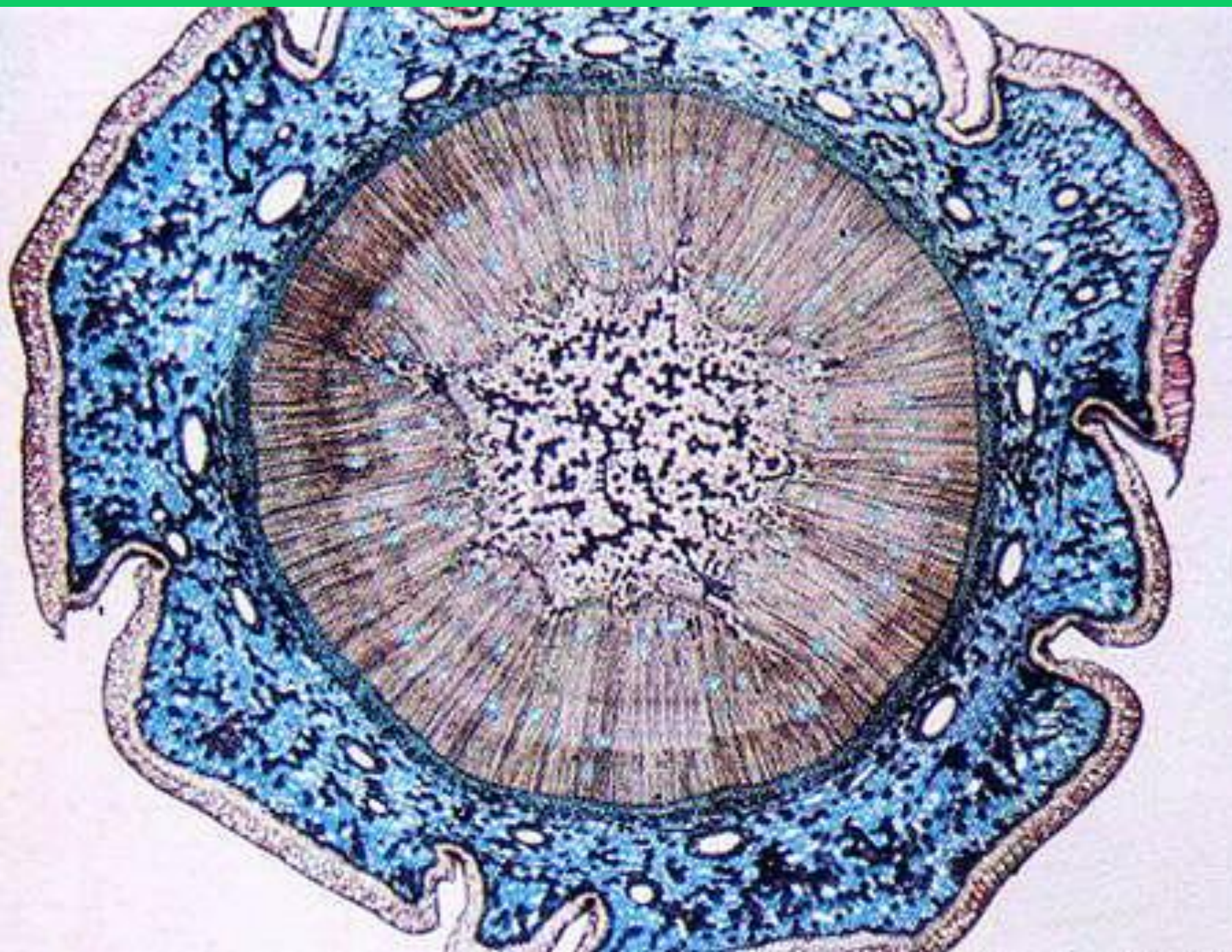




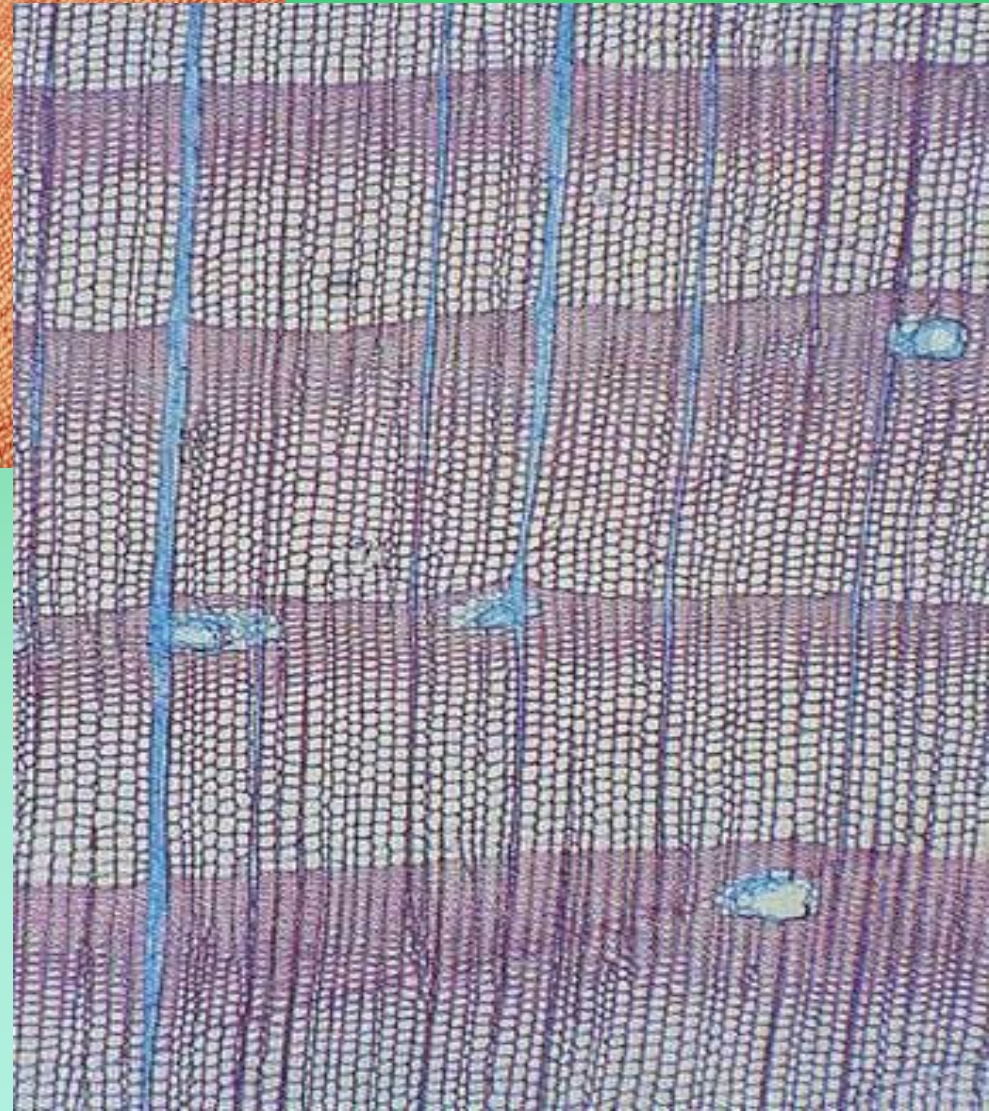
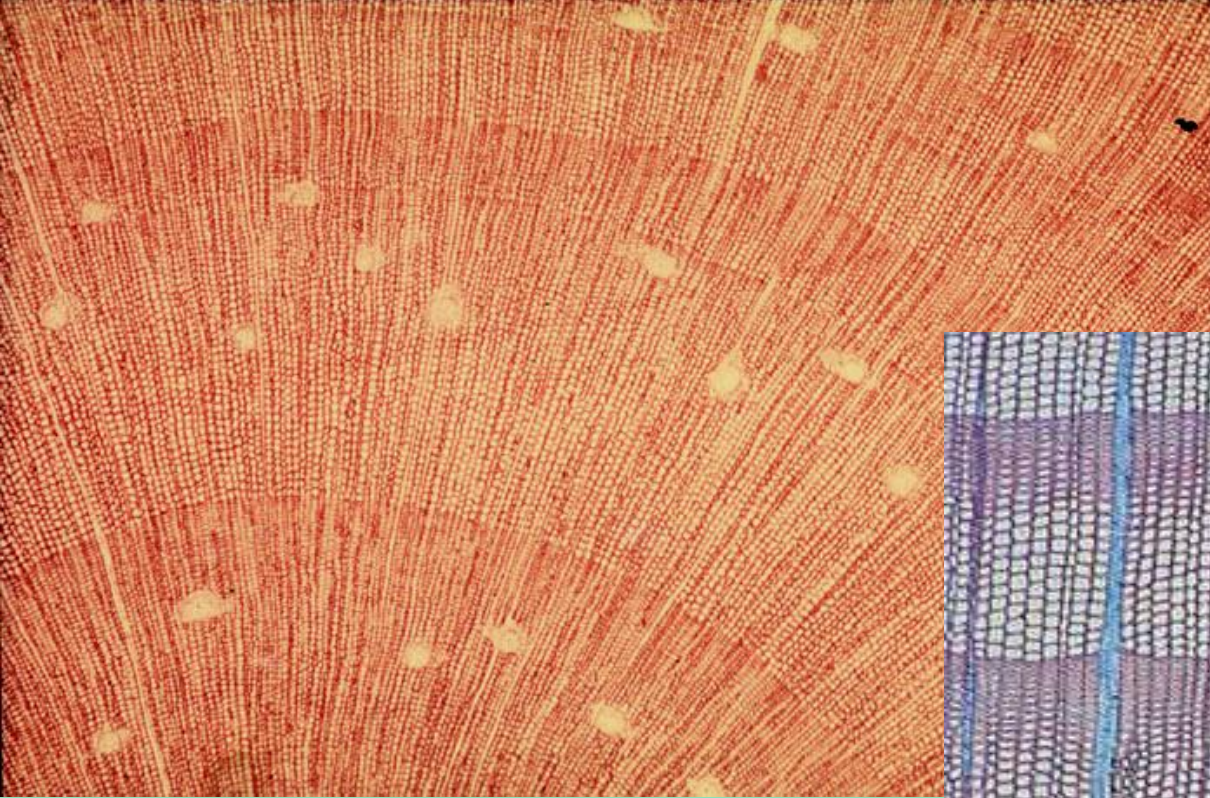


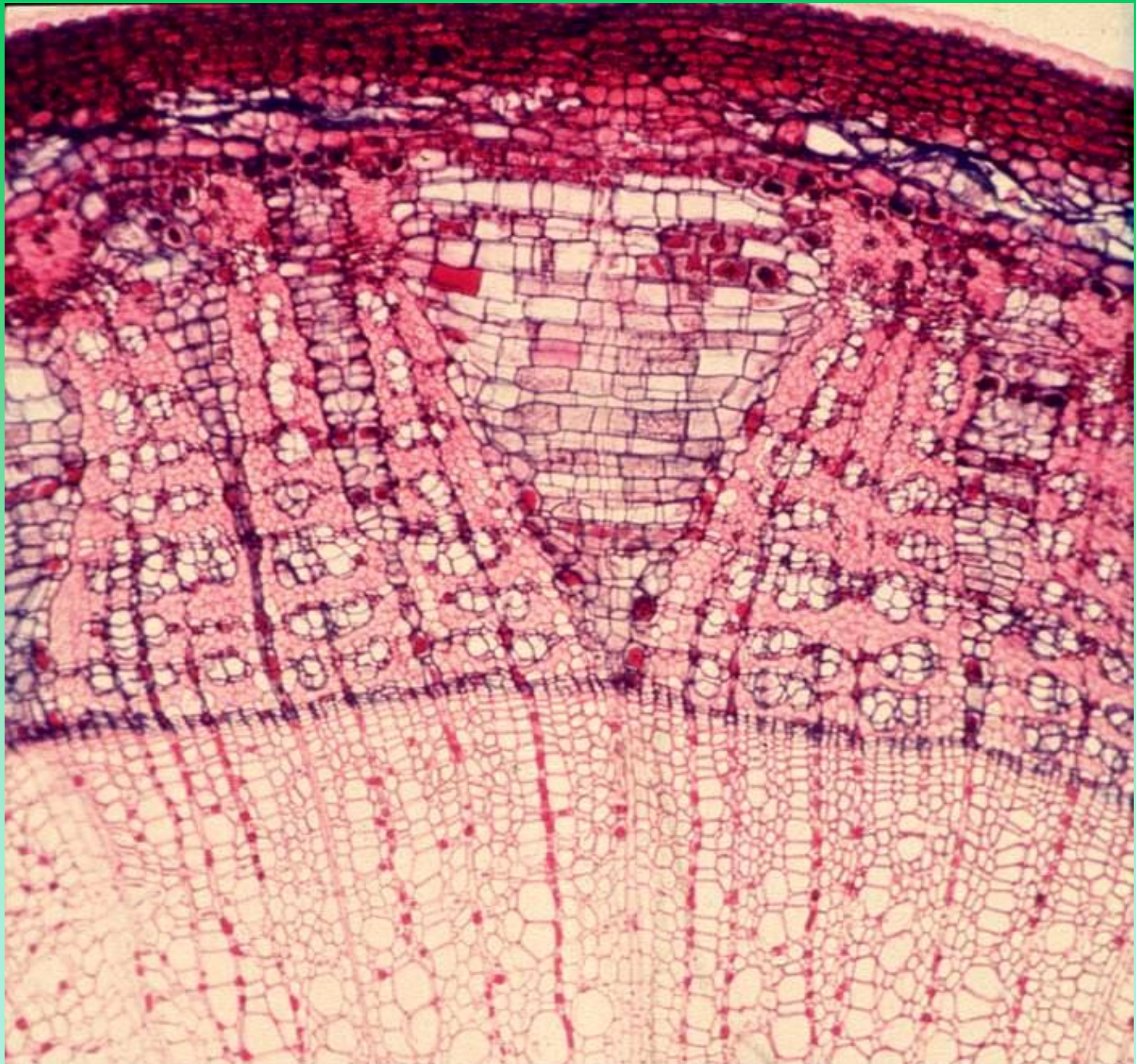


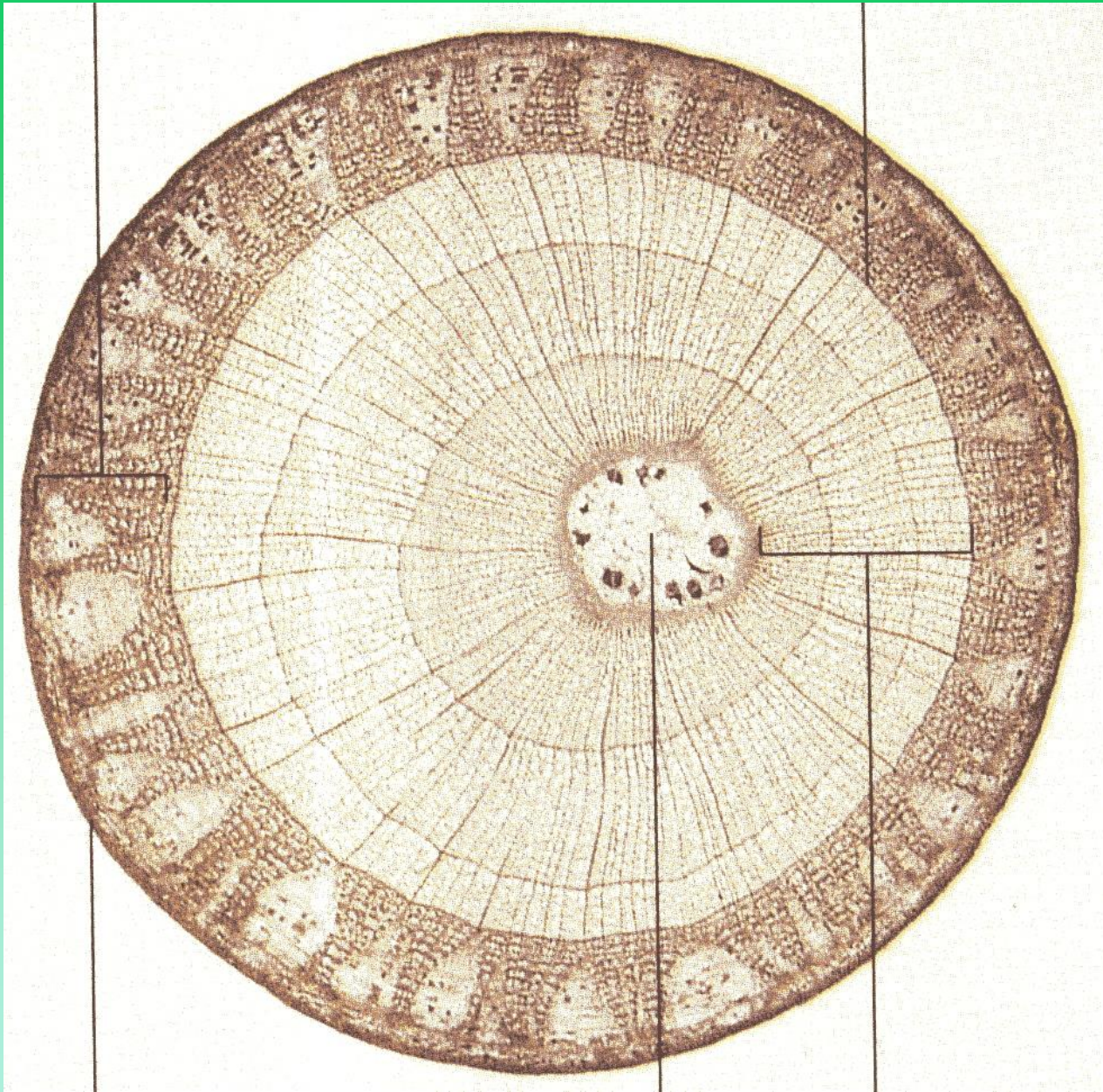


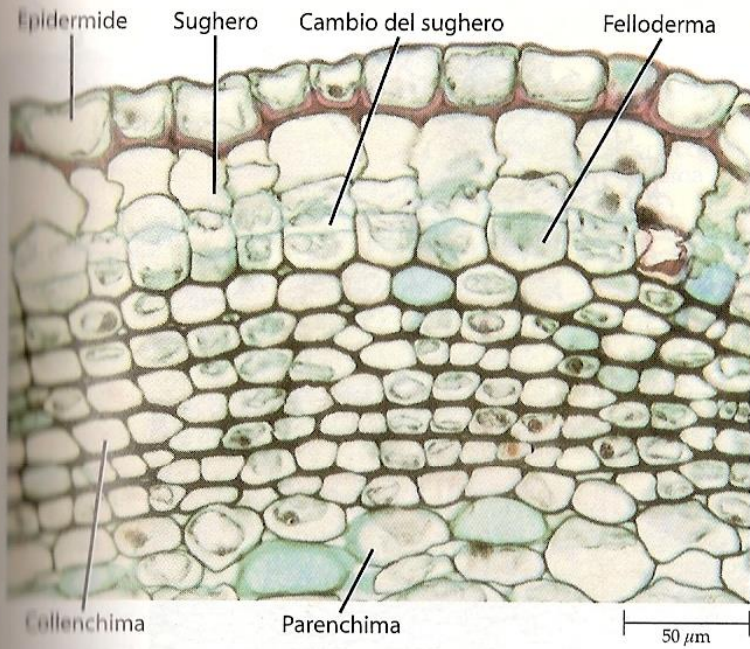




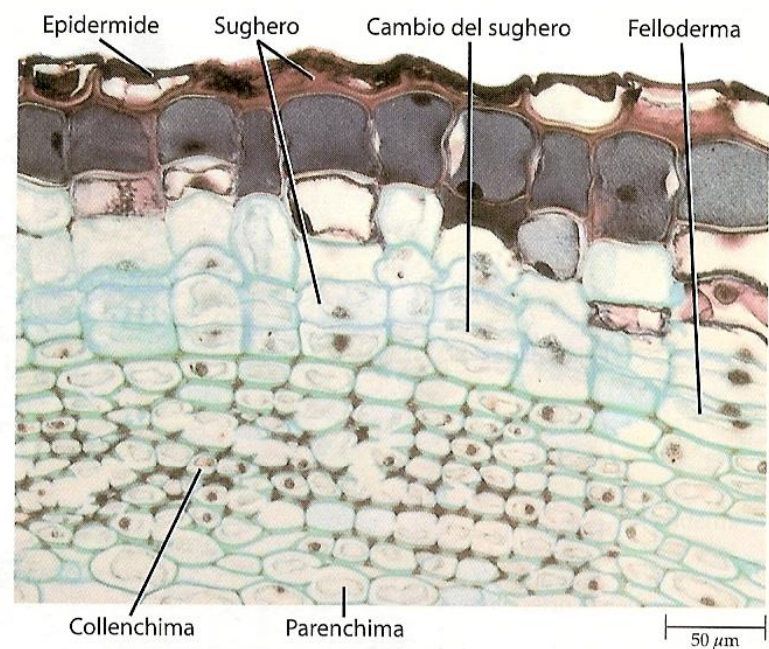




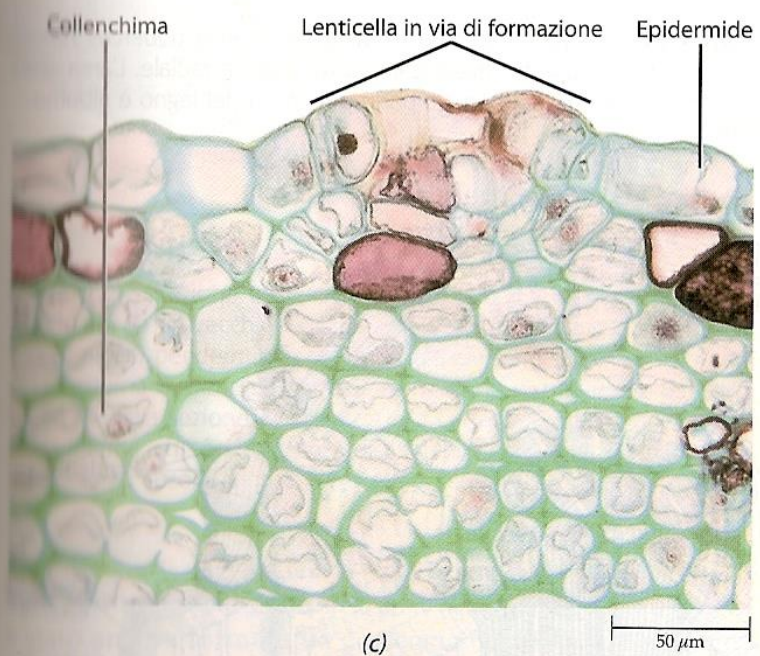




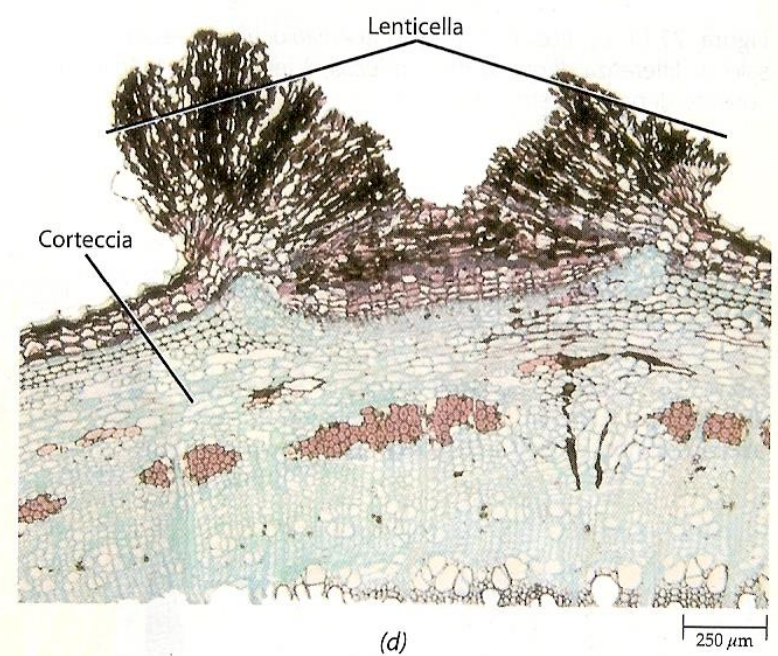
(a)



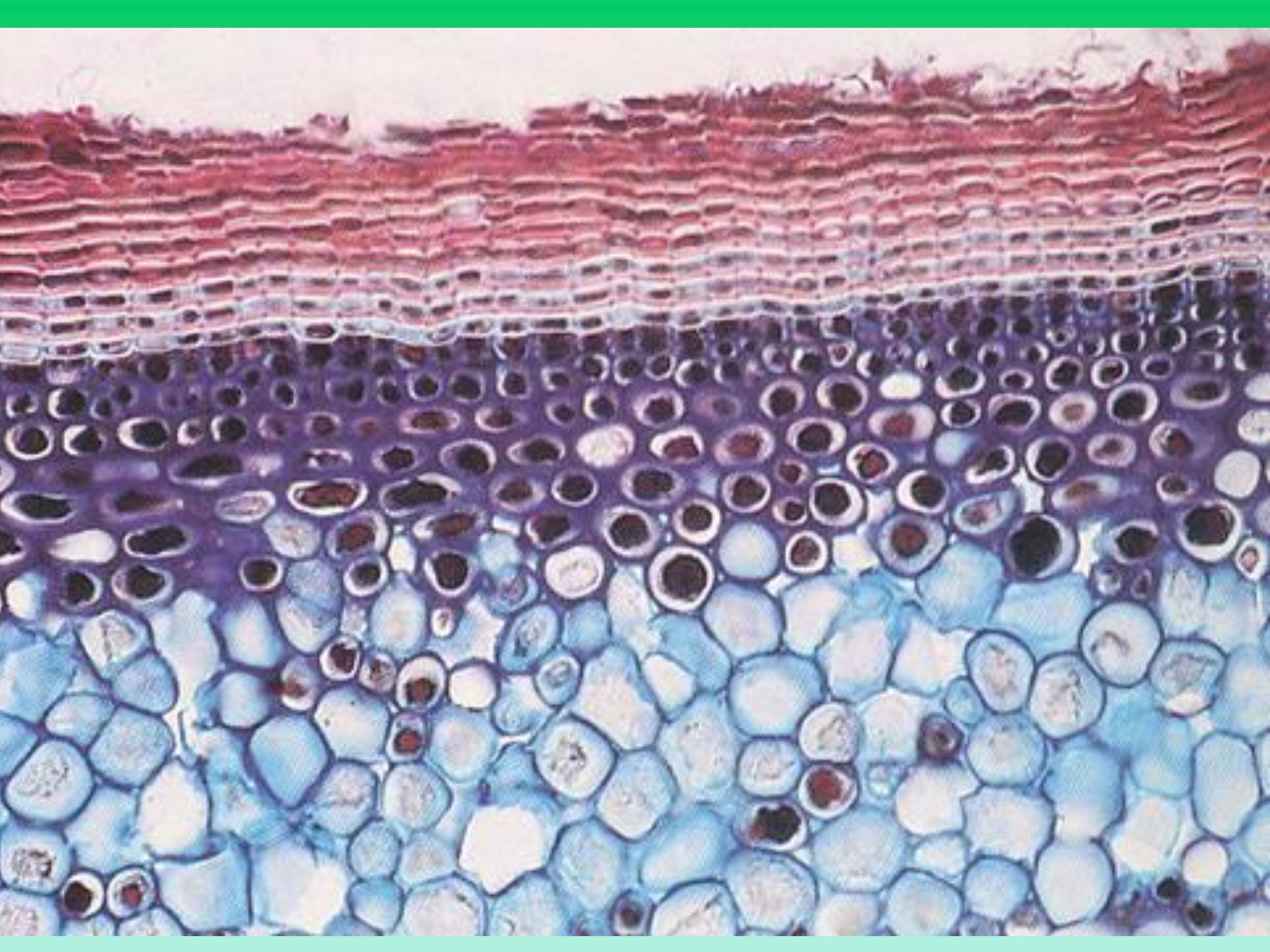
(b)

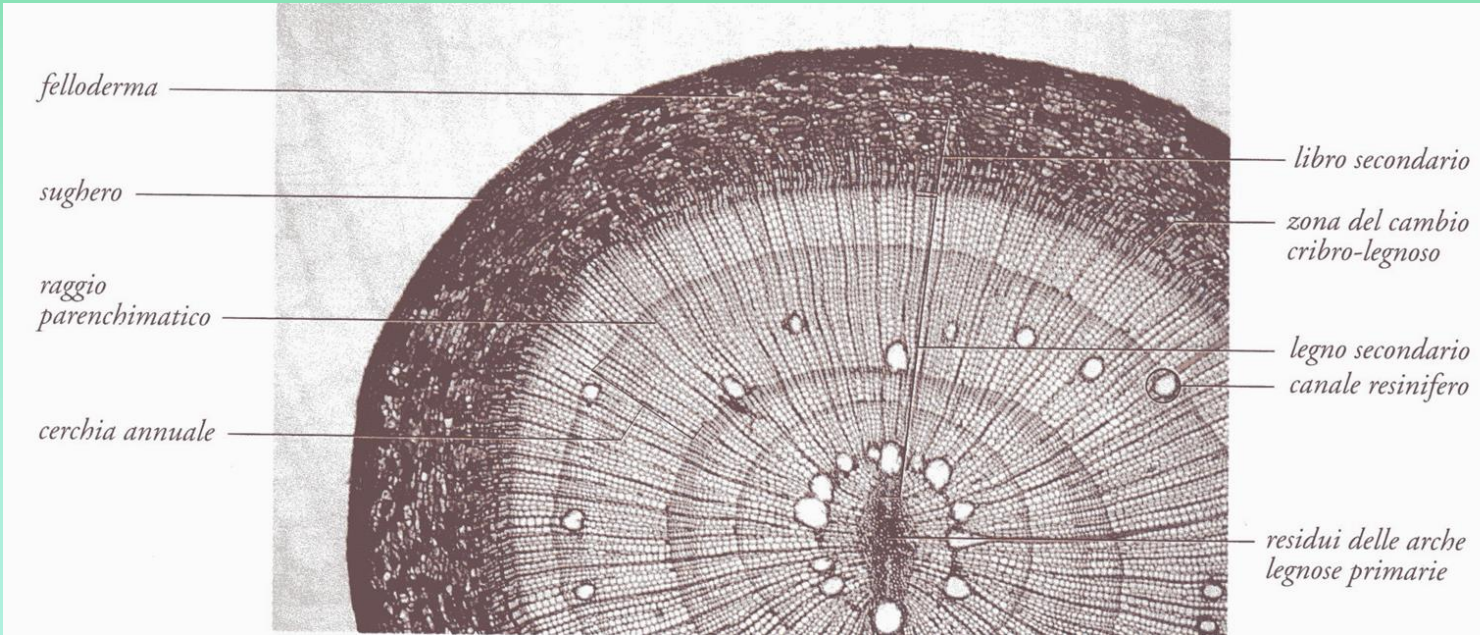
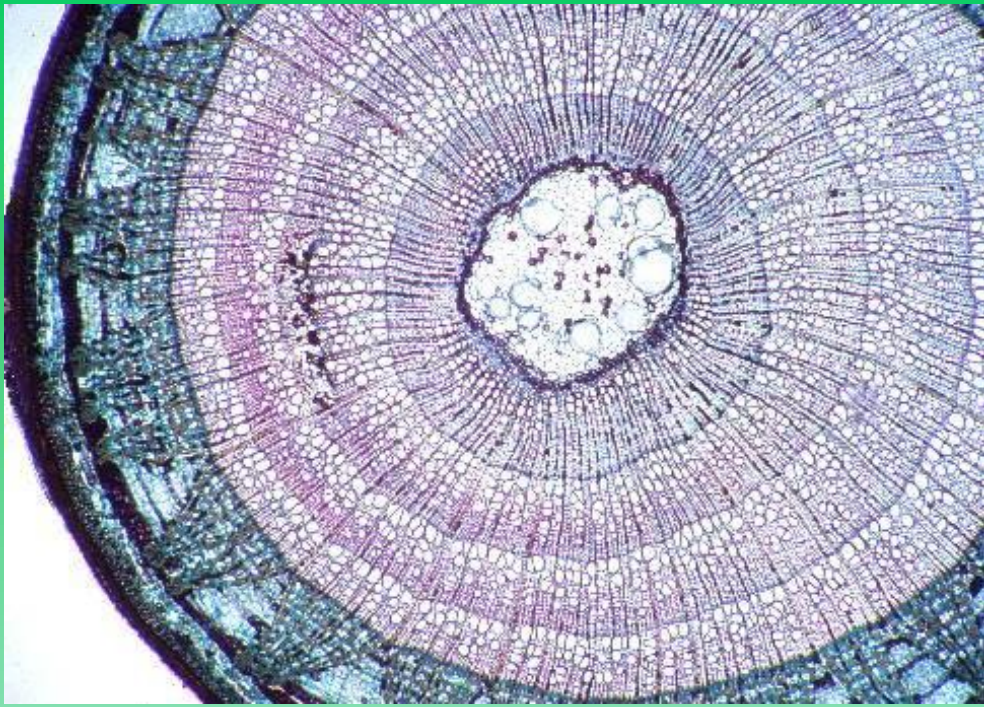


(c)



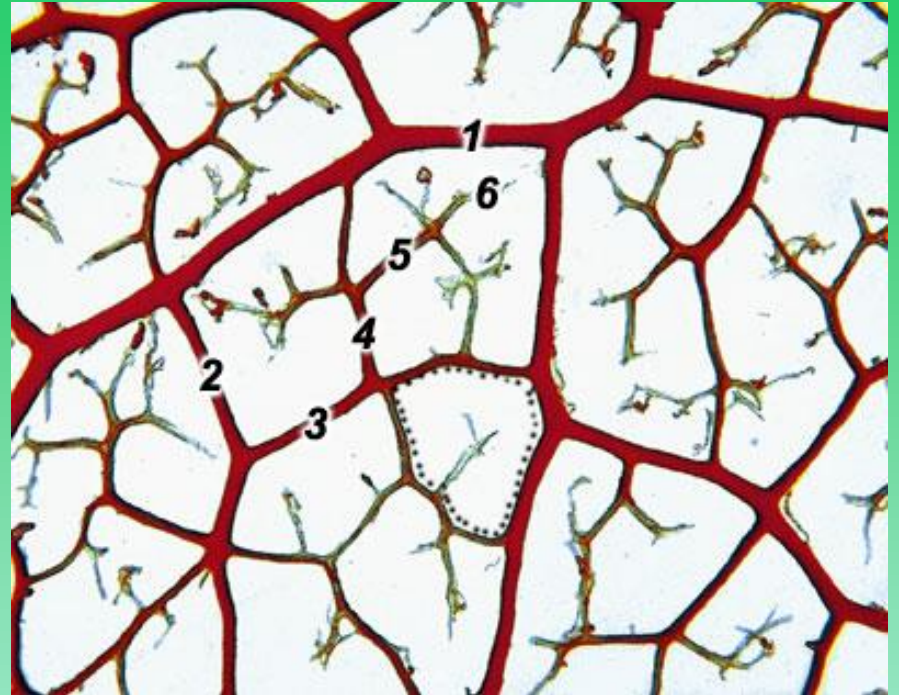
(d)





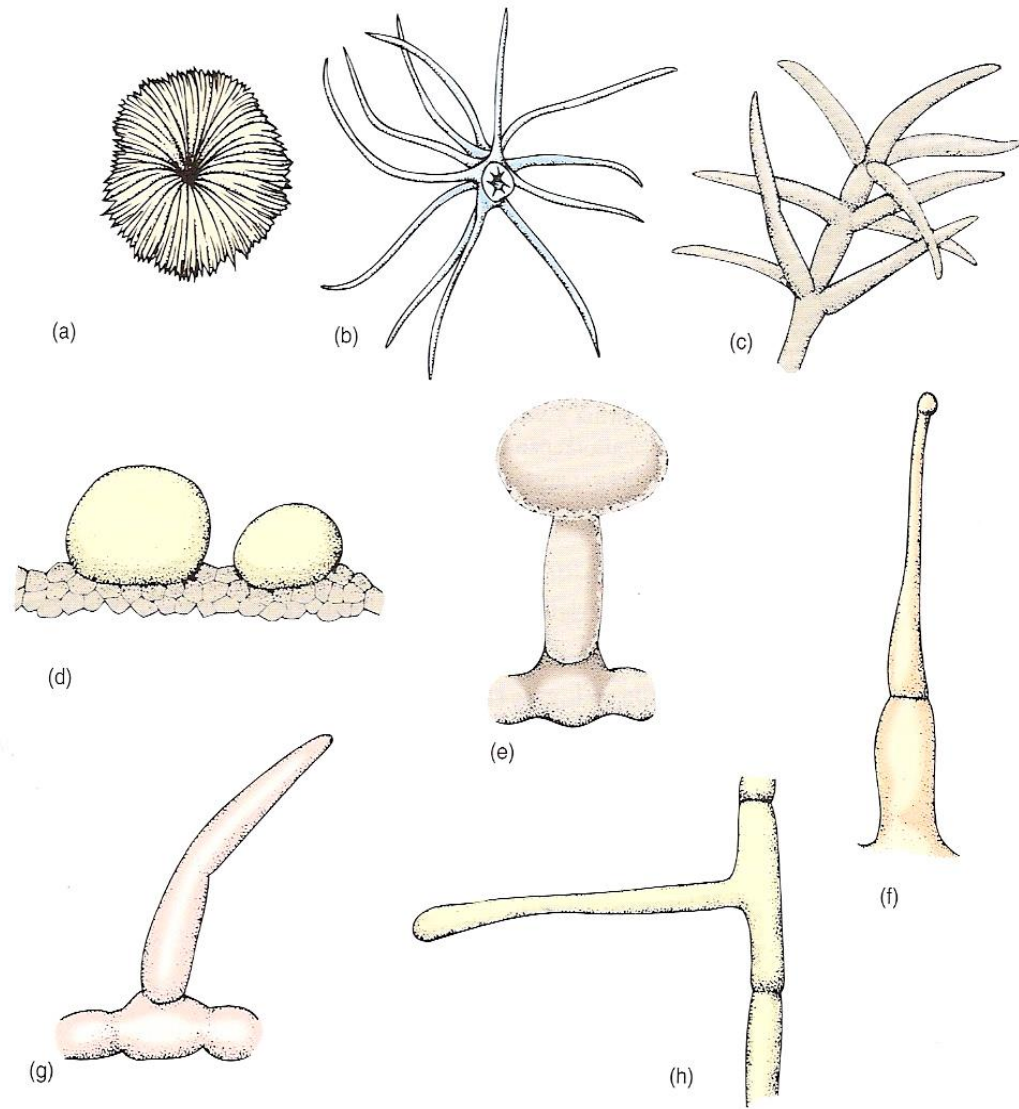


(b)

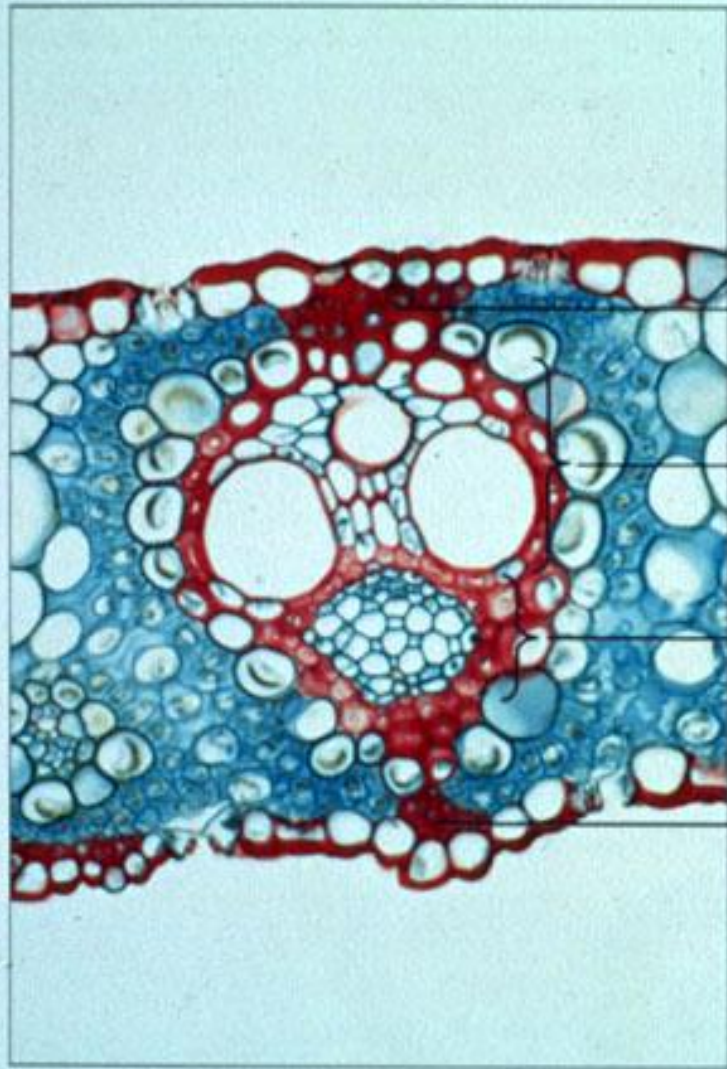








**Figura 5.7 - Tricomi.** (a) Tricoma appiattito, a forma di squama, (b) e (c) tricomi ramificati. (d) Tricomi ghiandolari, a cellule grandi, singole. (e) Tricomi ghiandolari con una cellula basale, che forma un peducolo, portante in alto una "testa" costituita da una cellula secertrice. (f) Tricoma ghiandolare come quelli dell'ortica, capace di iniettare sostanze tossiche in eventuali organismi attaccanti. (g) e (h) Tricomi semplici, non ghiandolari e non ramificati. (Per ulteriori informazioni, *vedi* la descrizione dei tessuti tegumentari e secretori/ghiandolari nel testo).

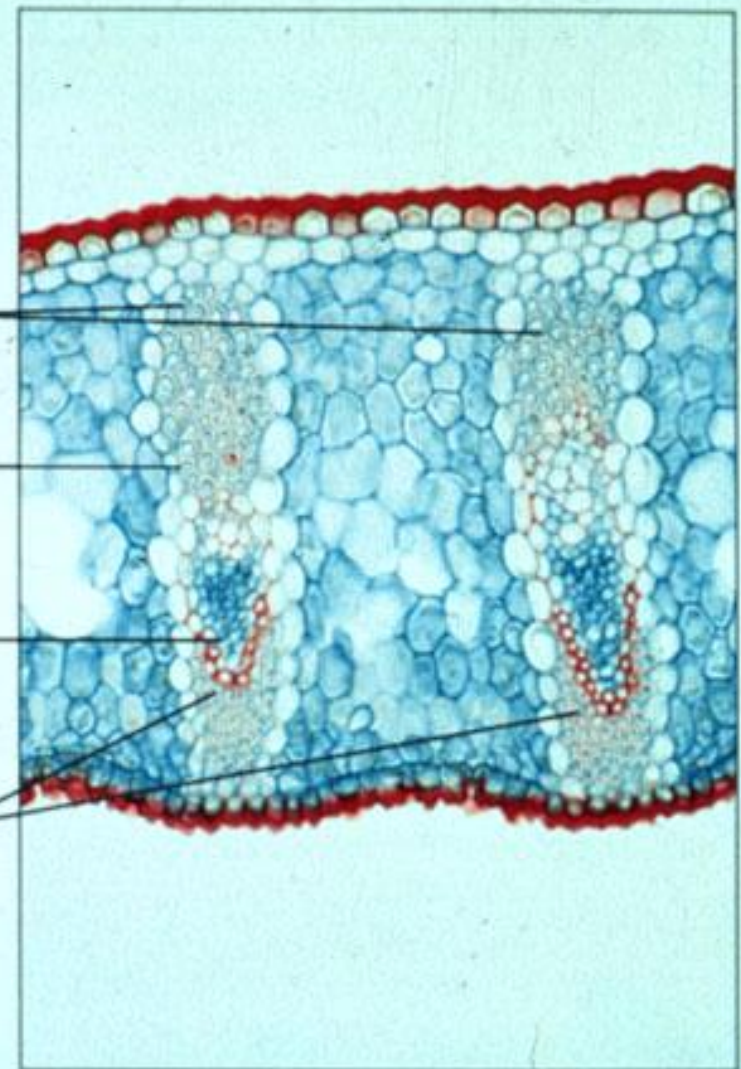


Bundle sheath extension

Xylem

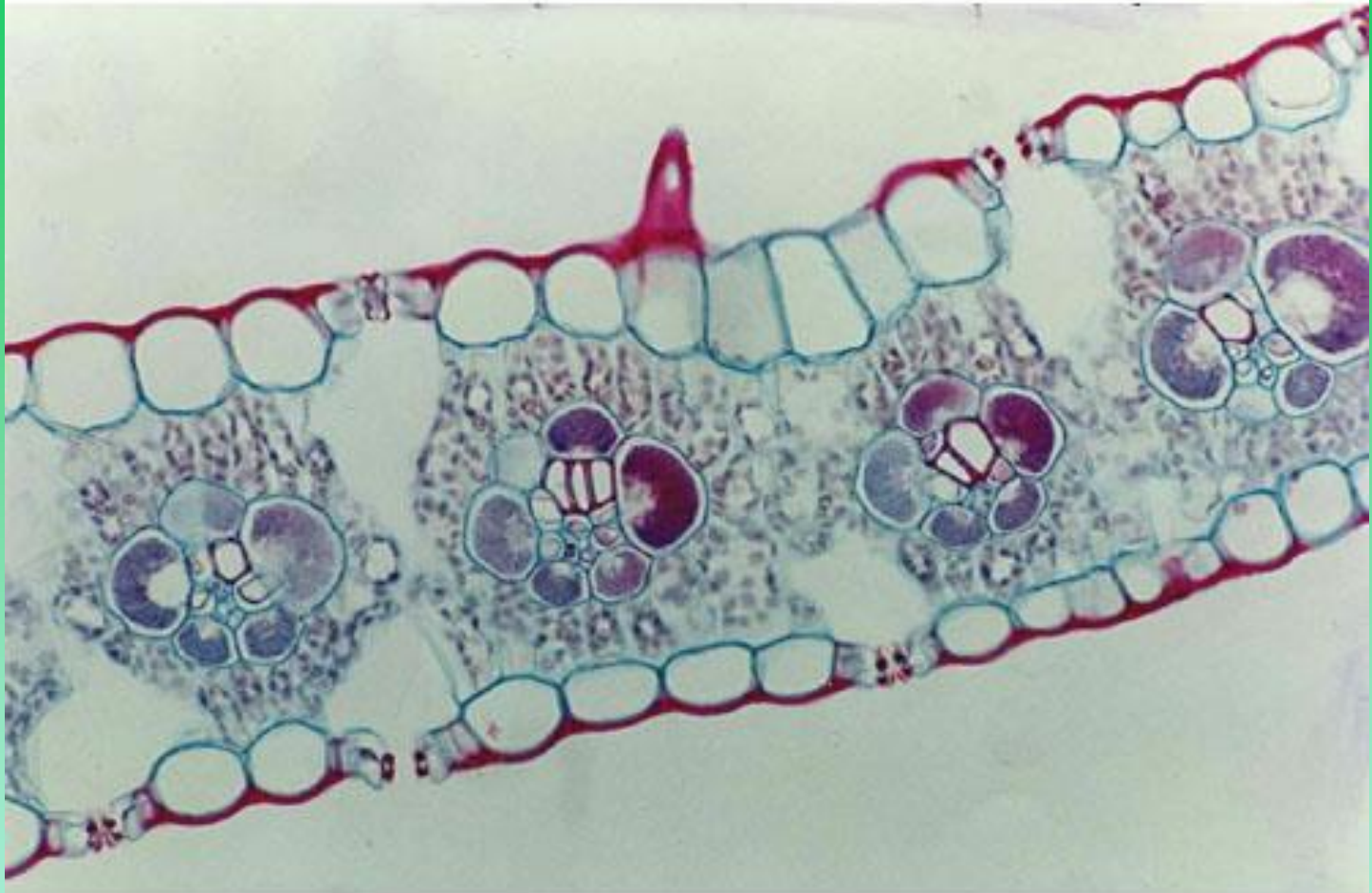
Phloem

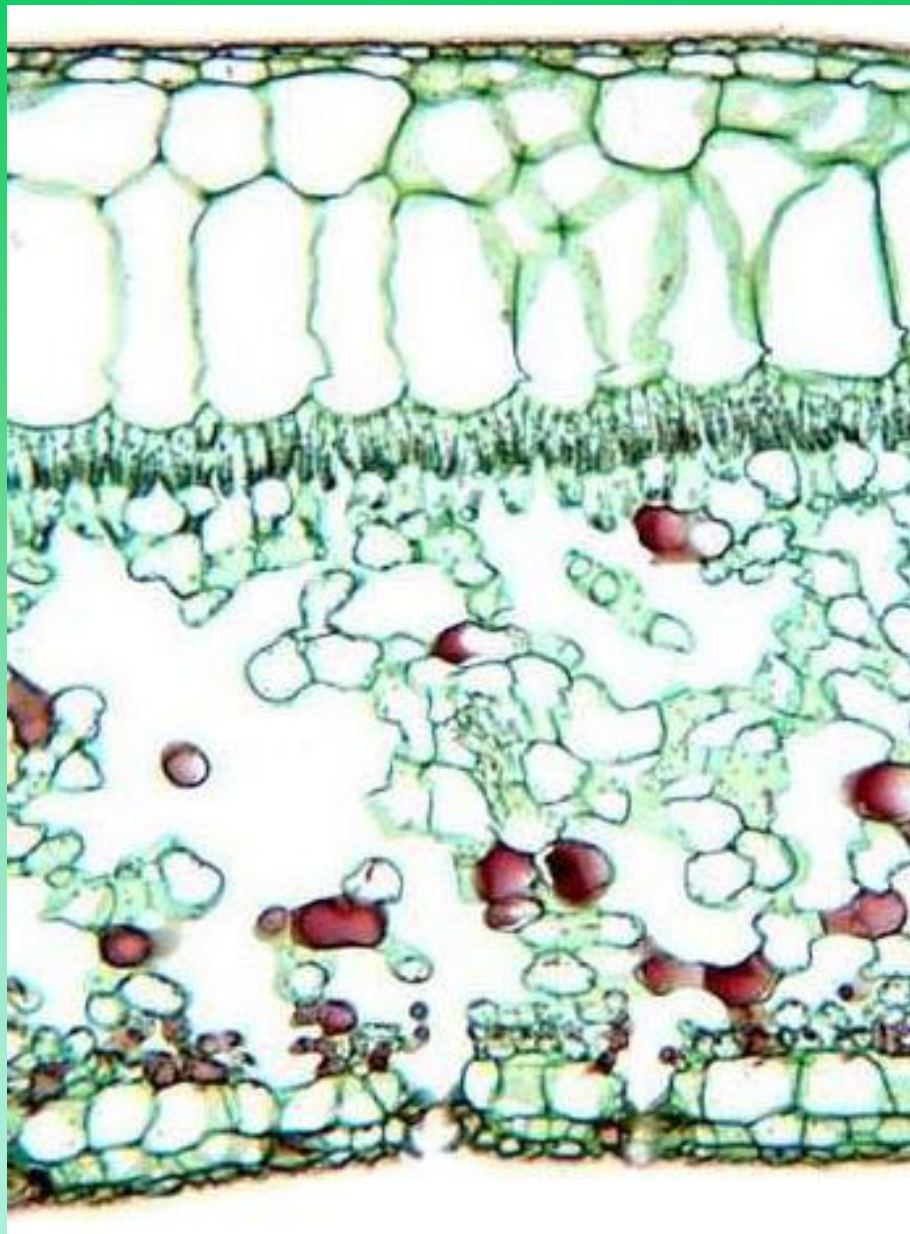
Bundle sheath extension

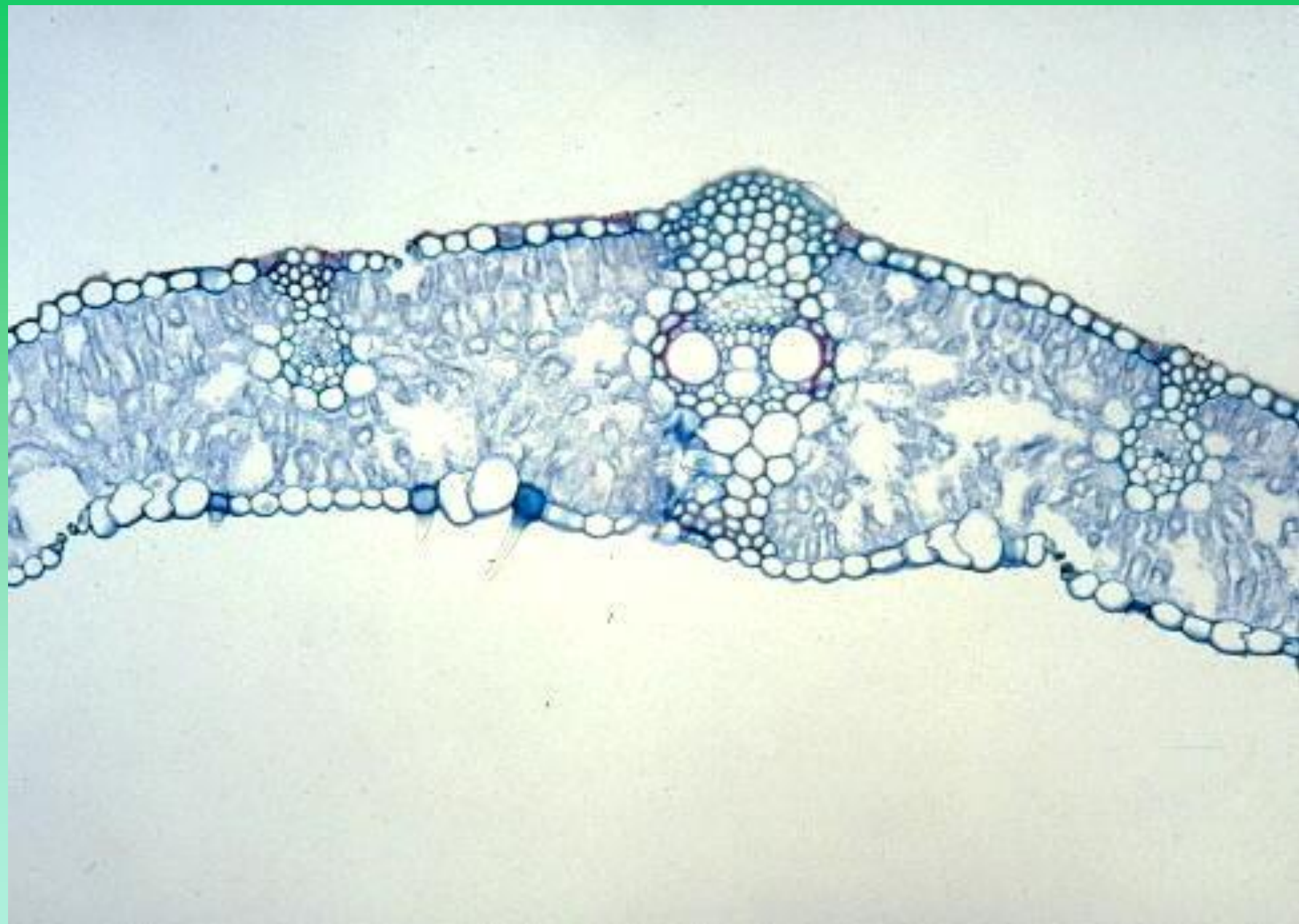


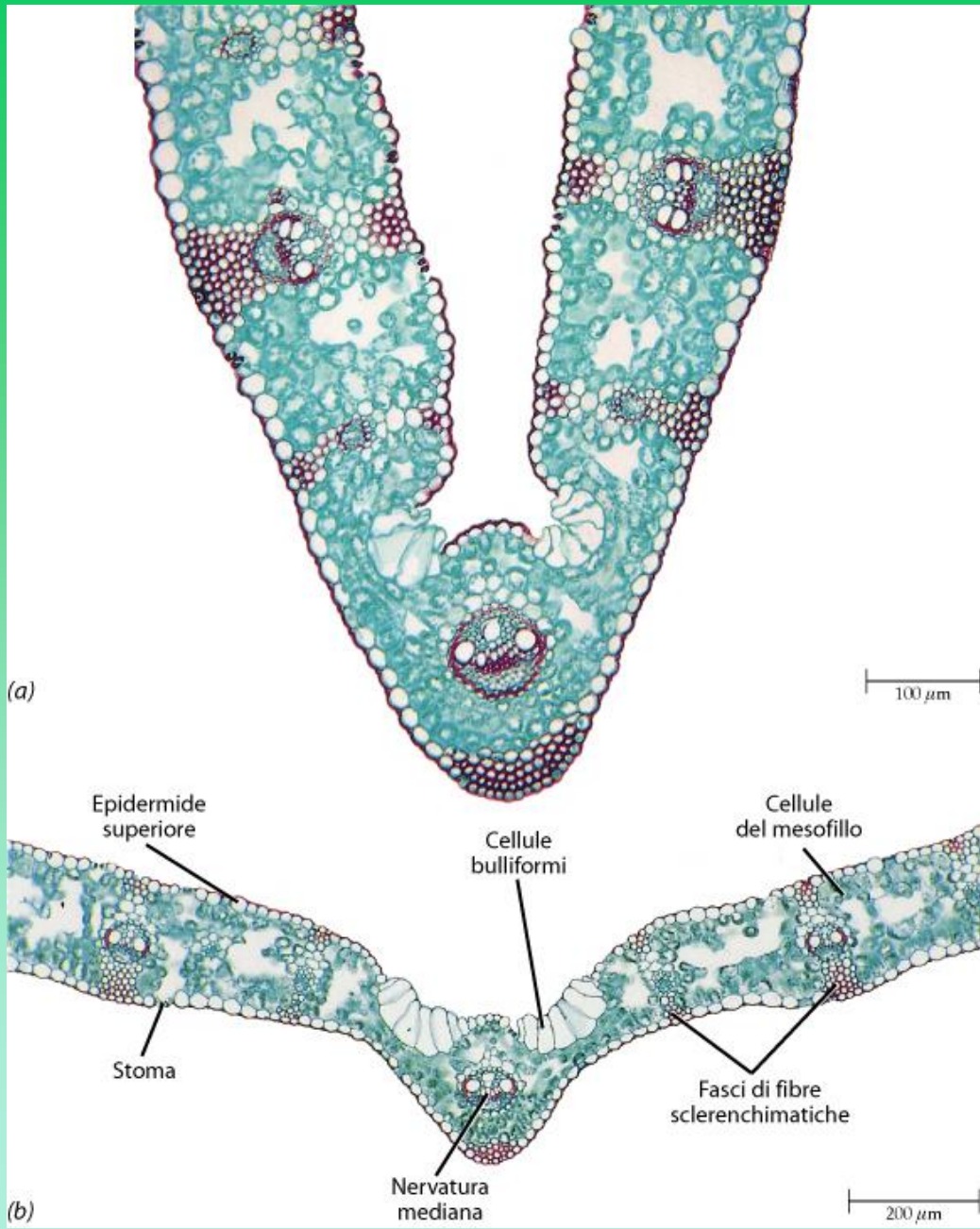
(b)

(a)

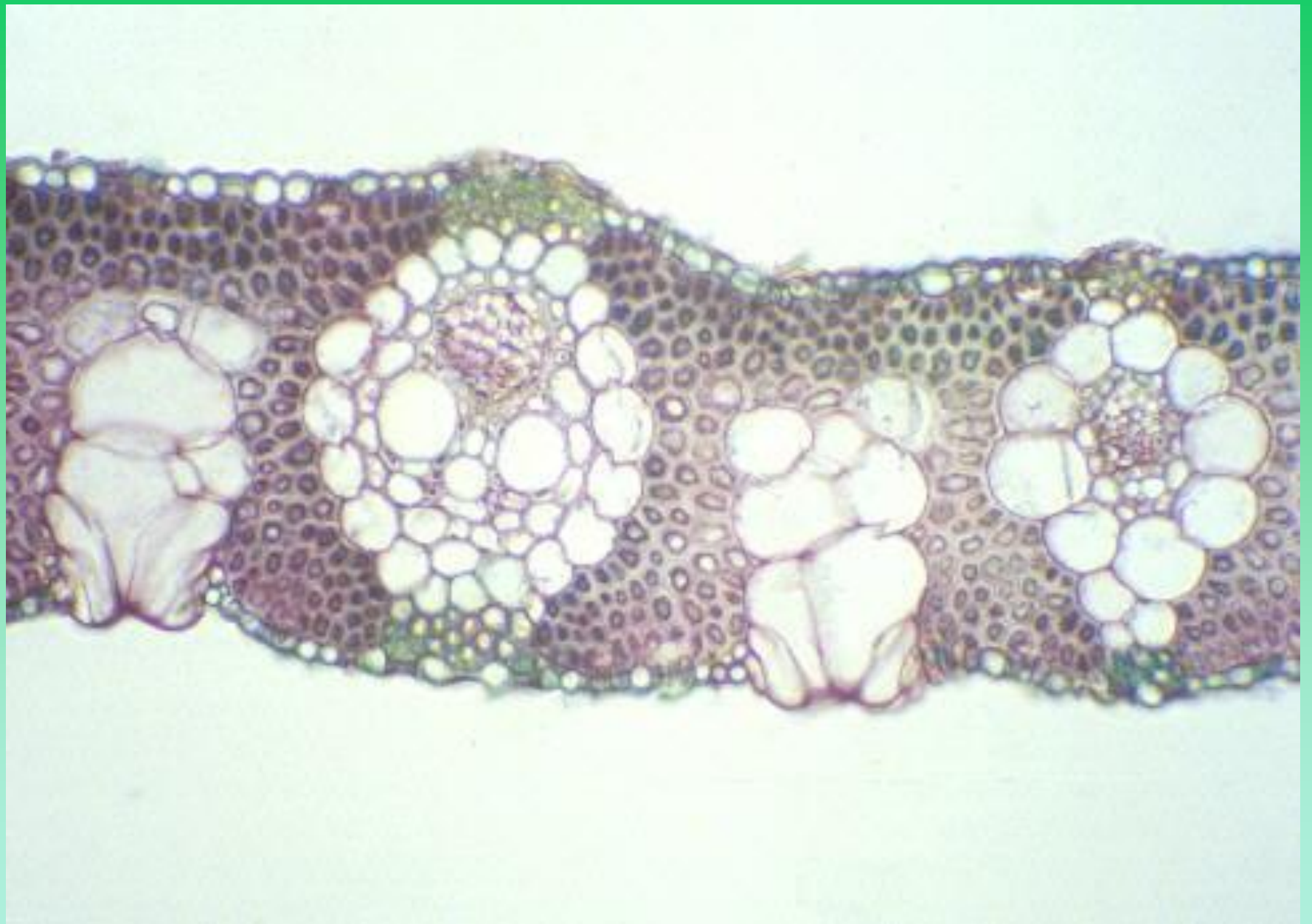






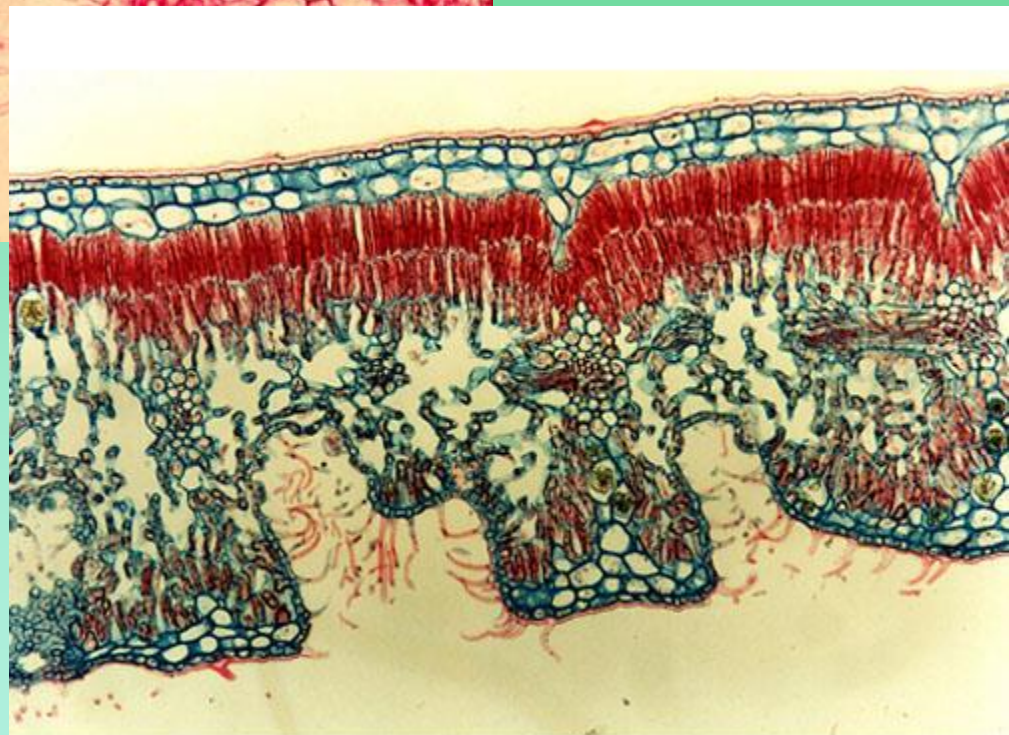
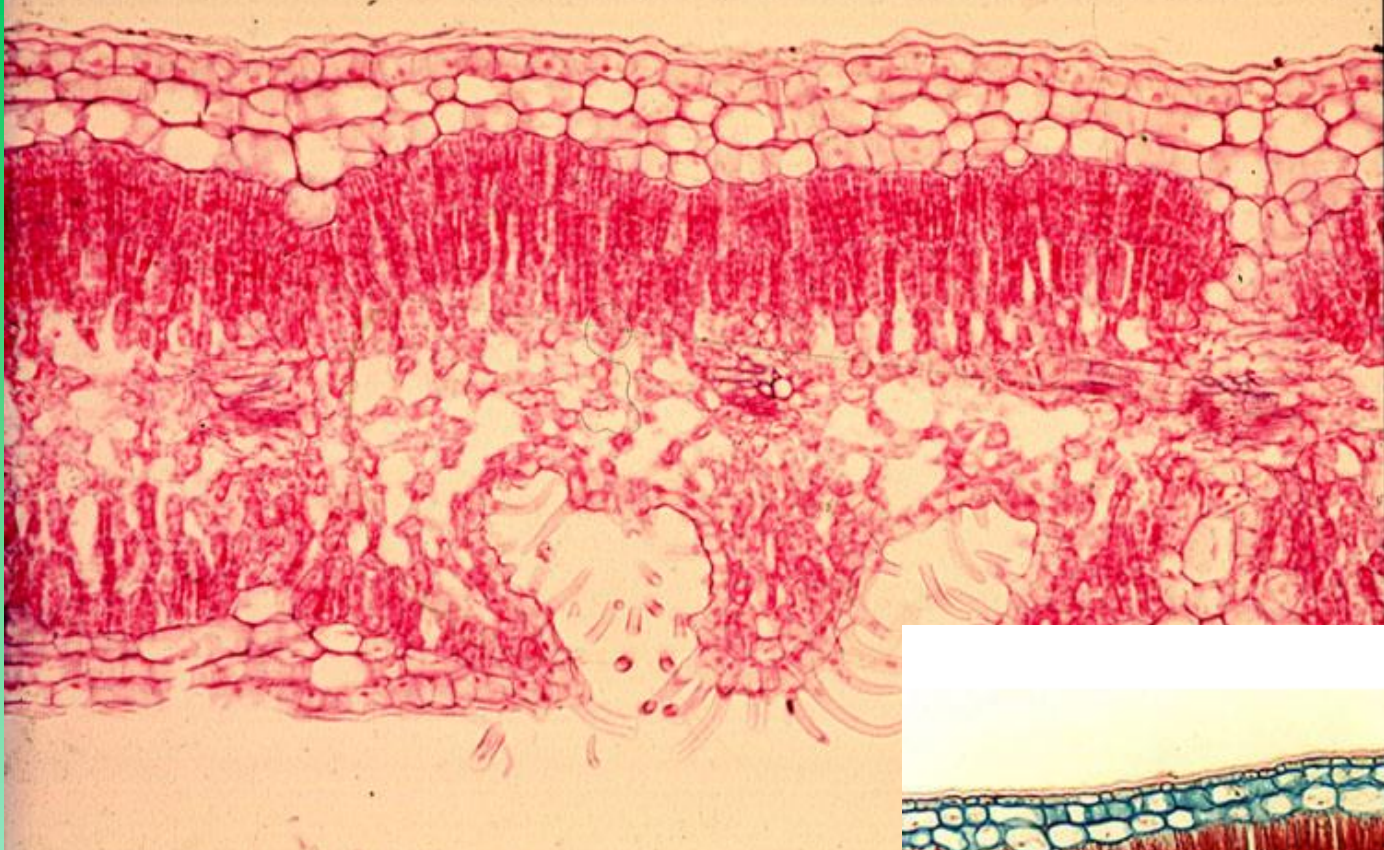


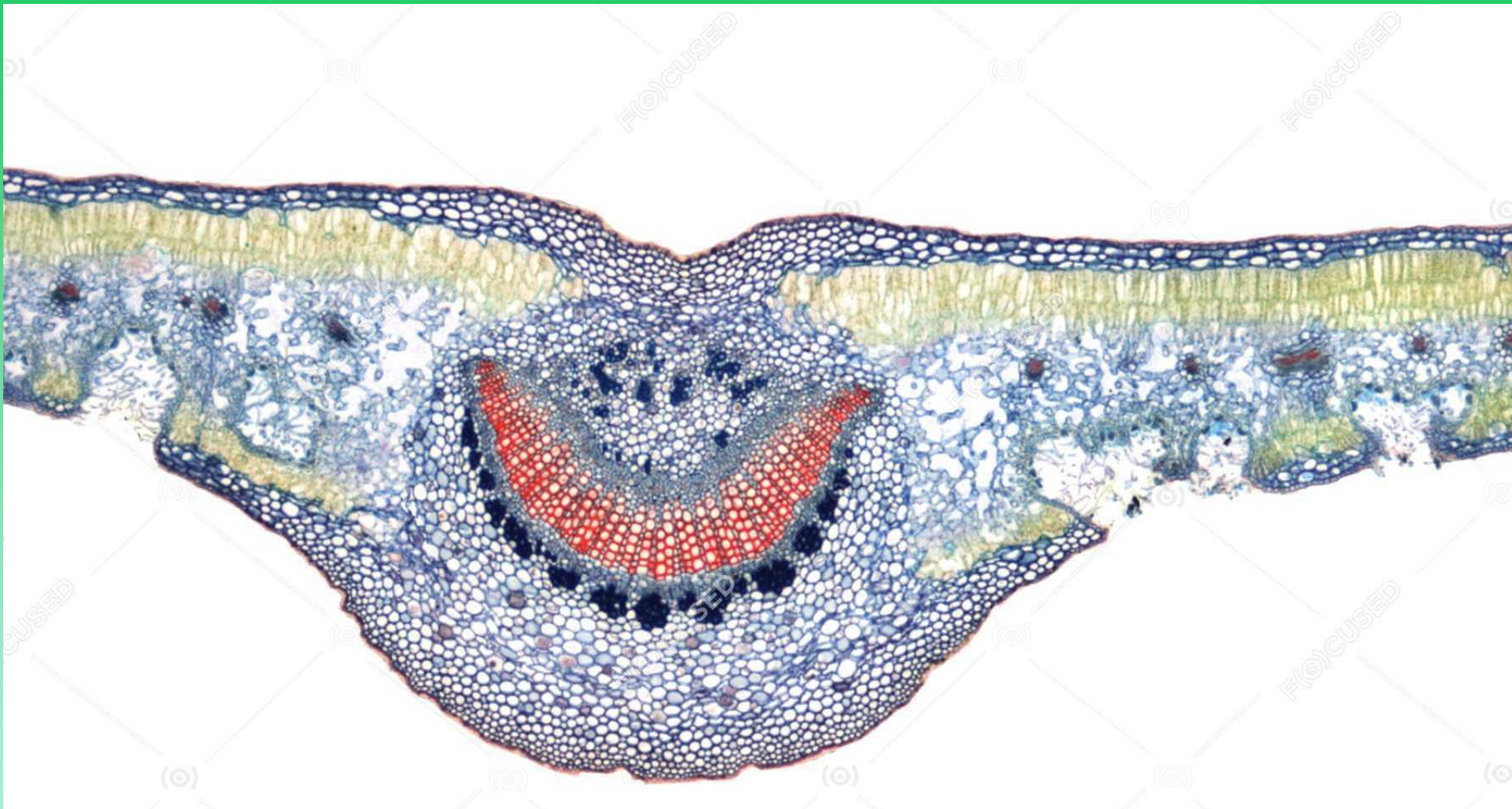


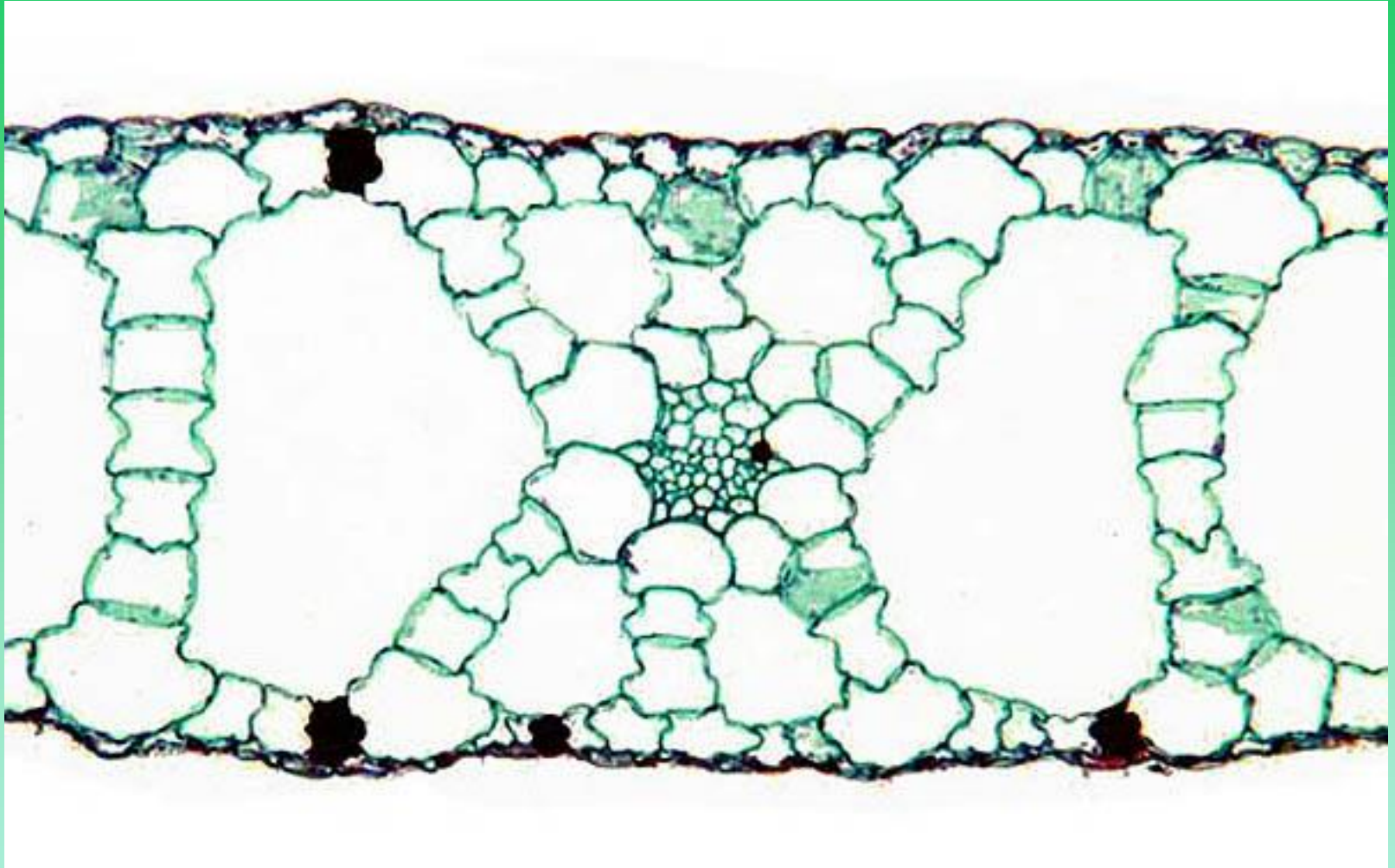




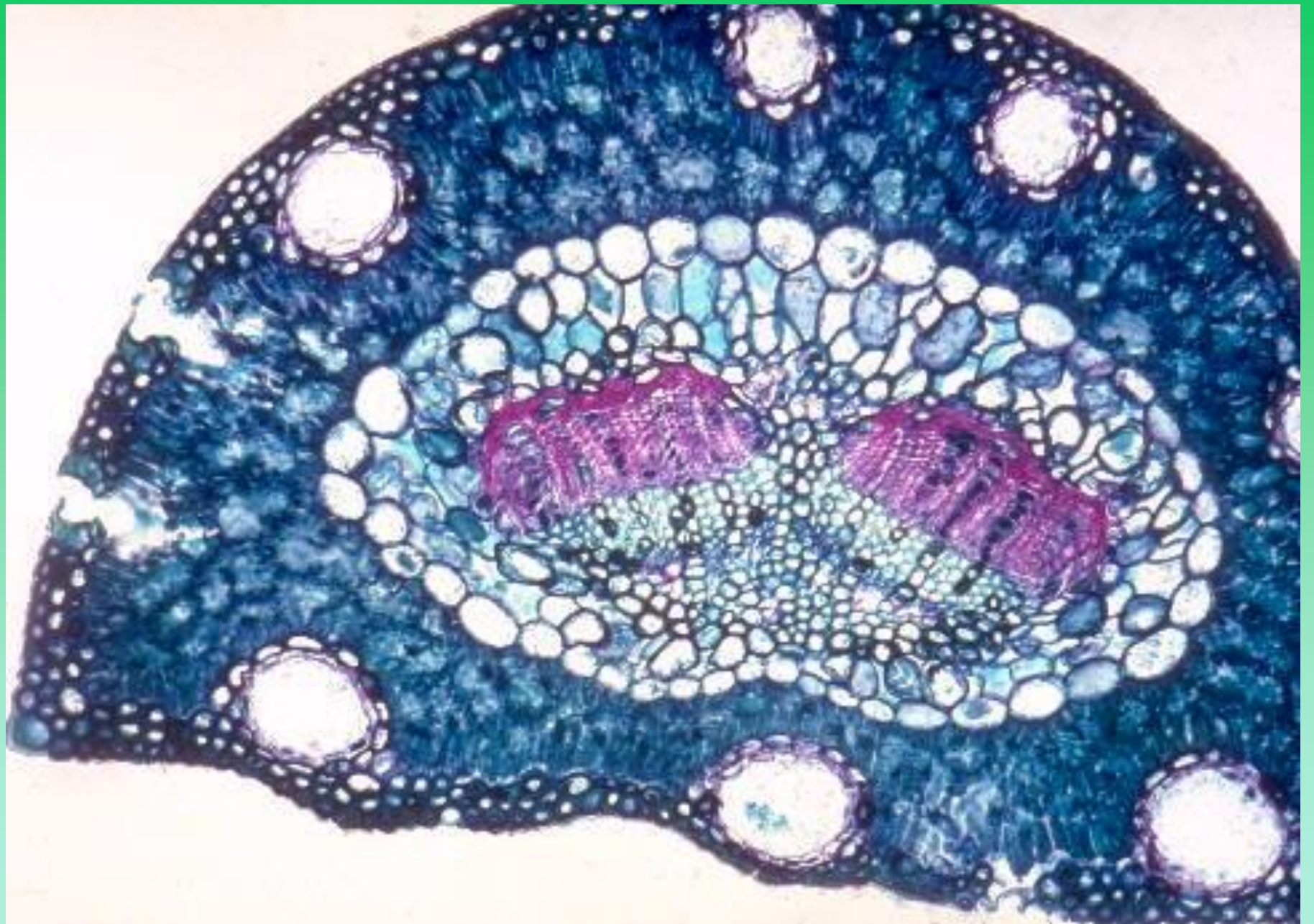


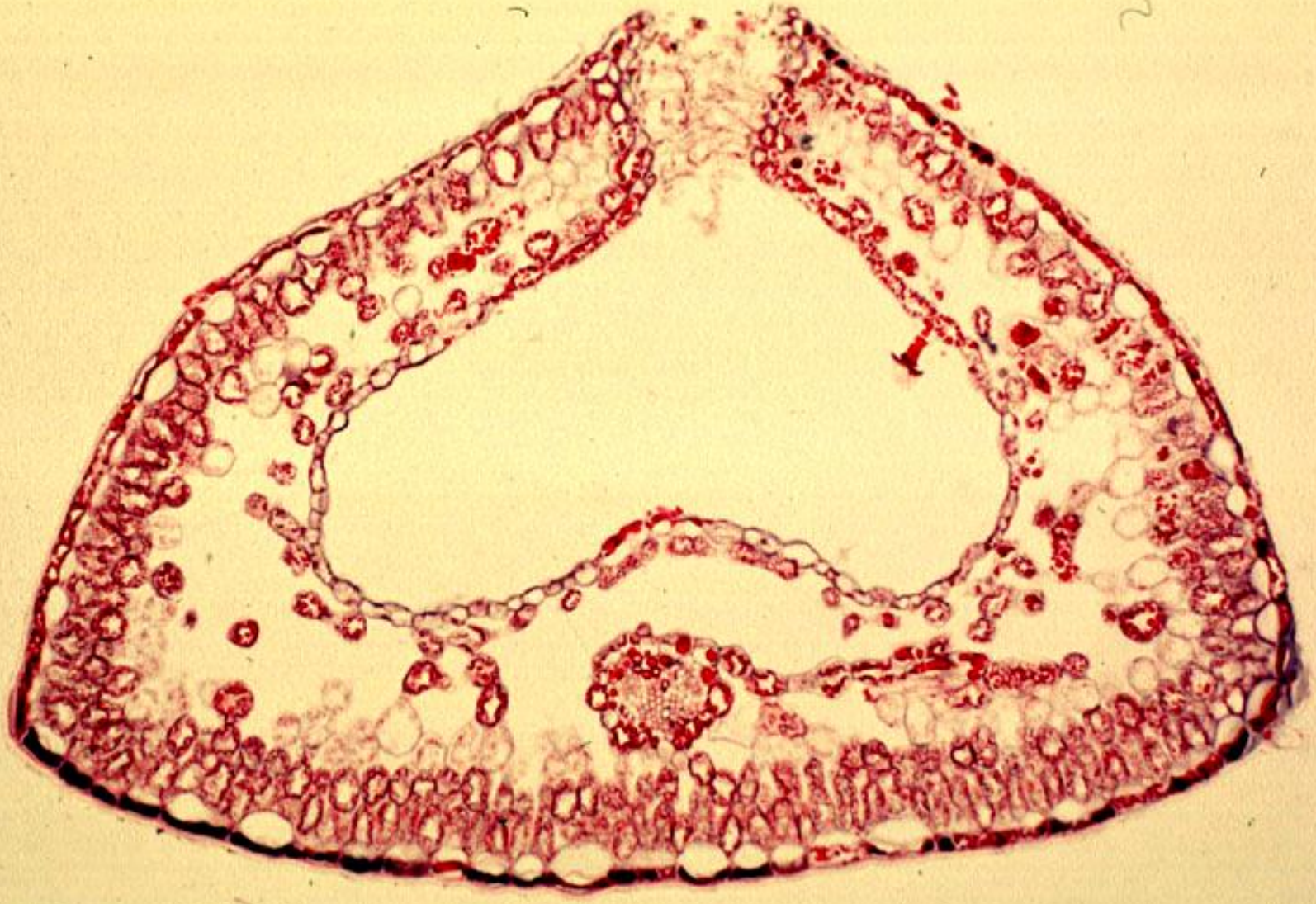


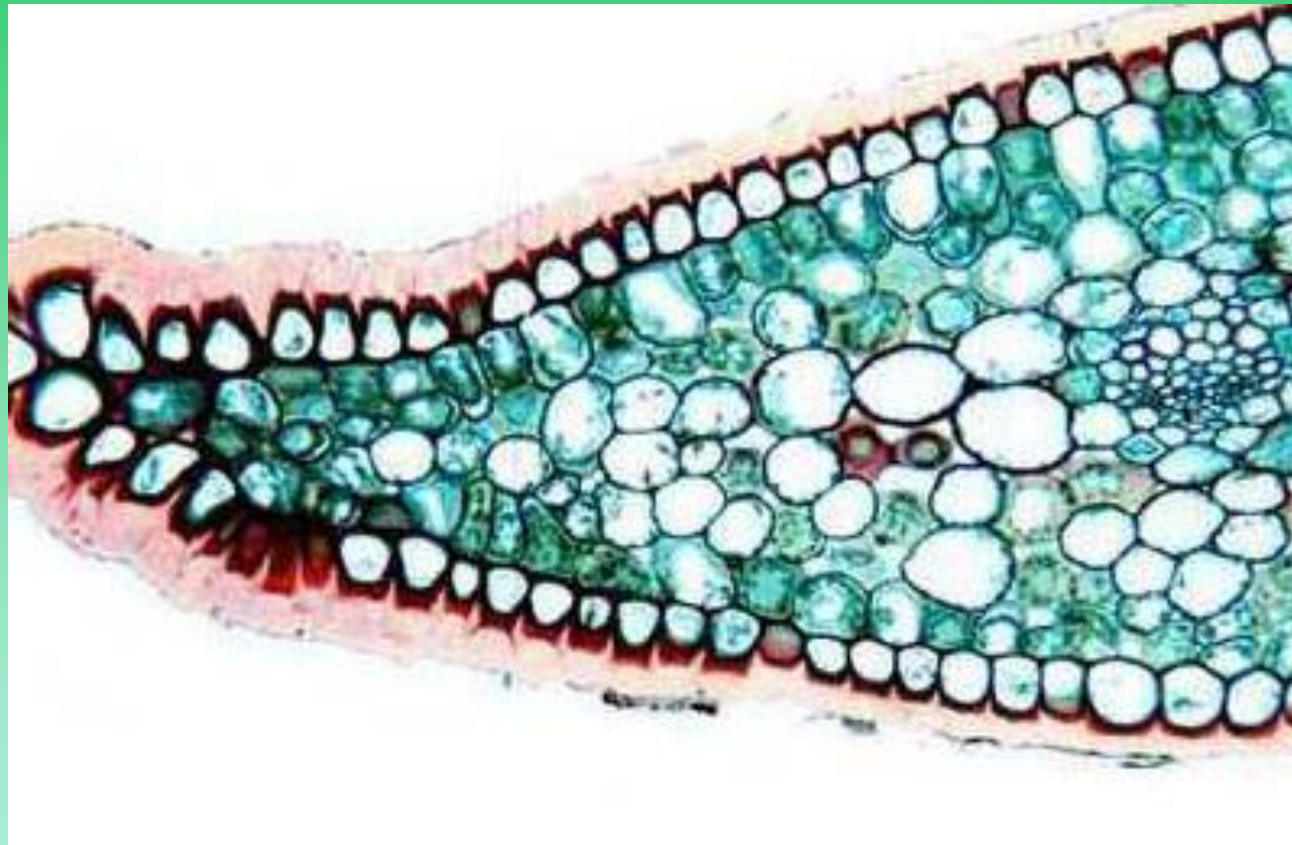




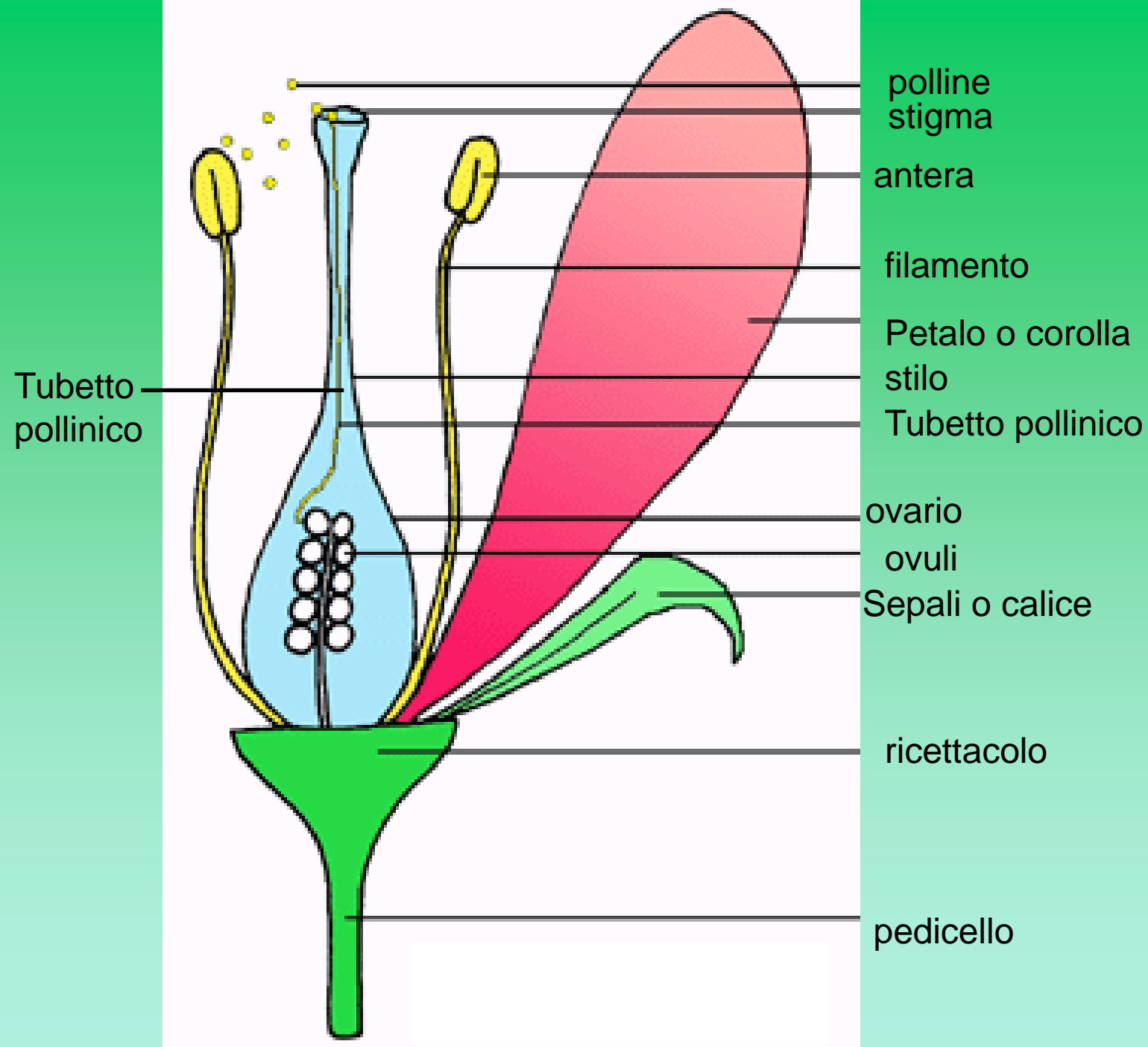


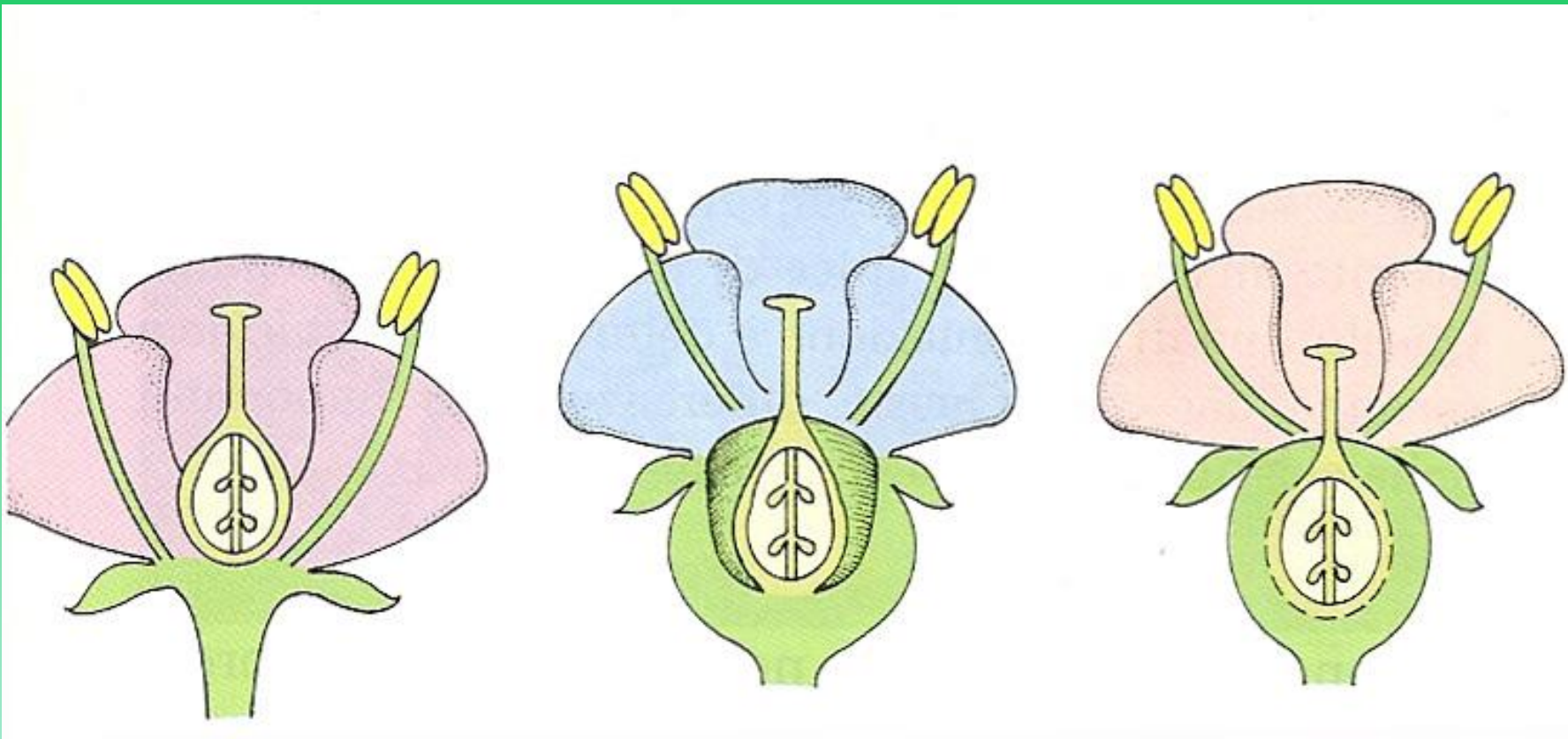


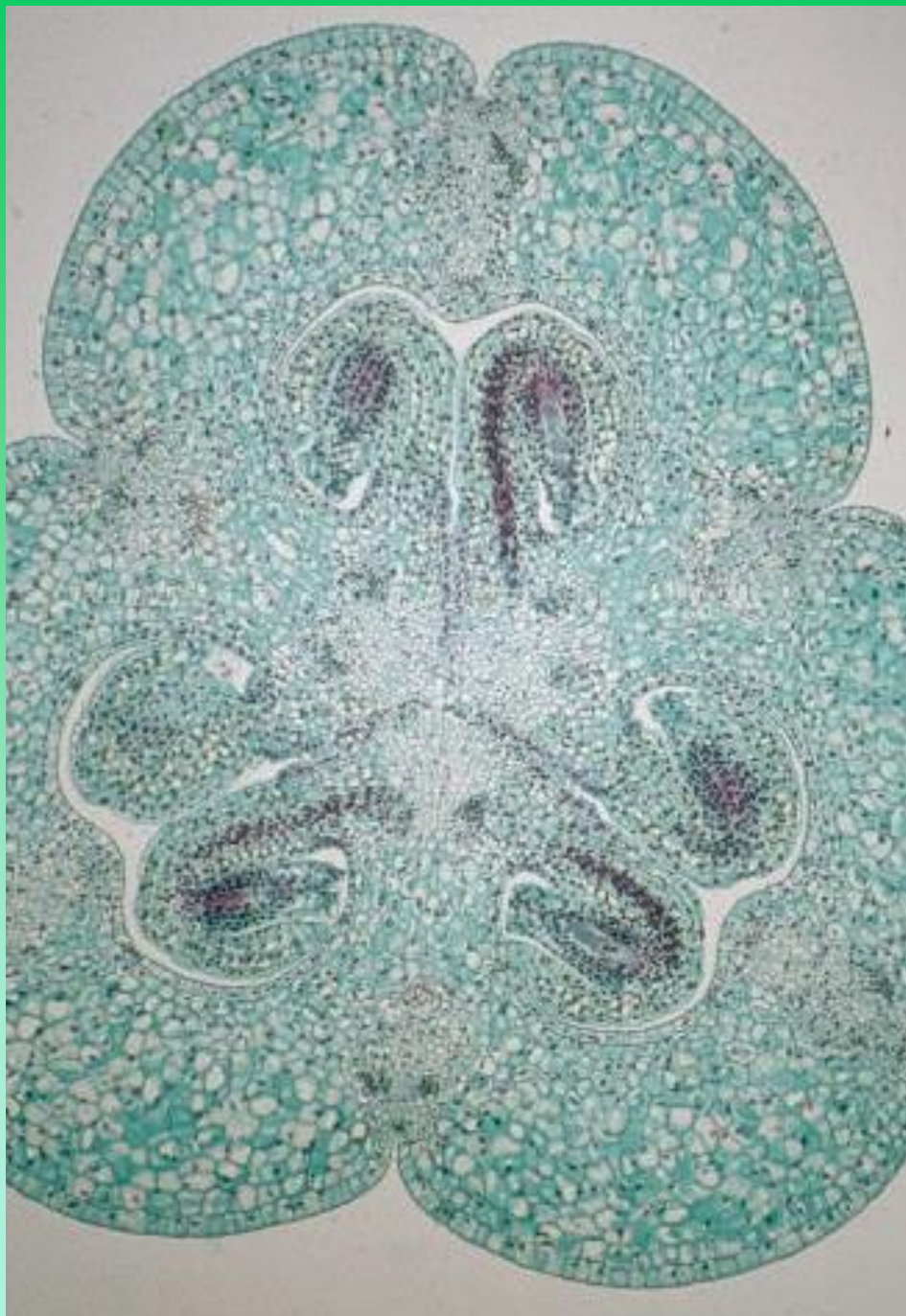


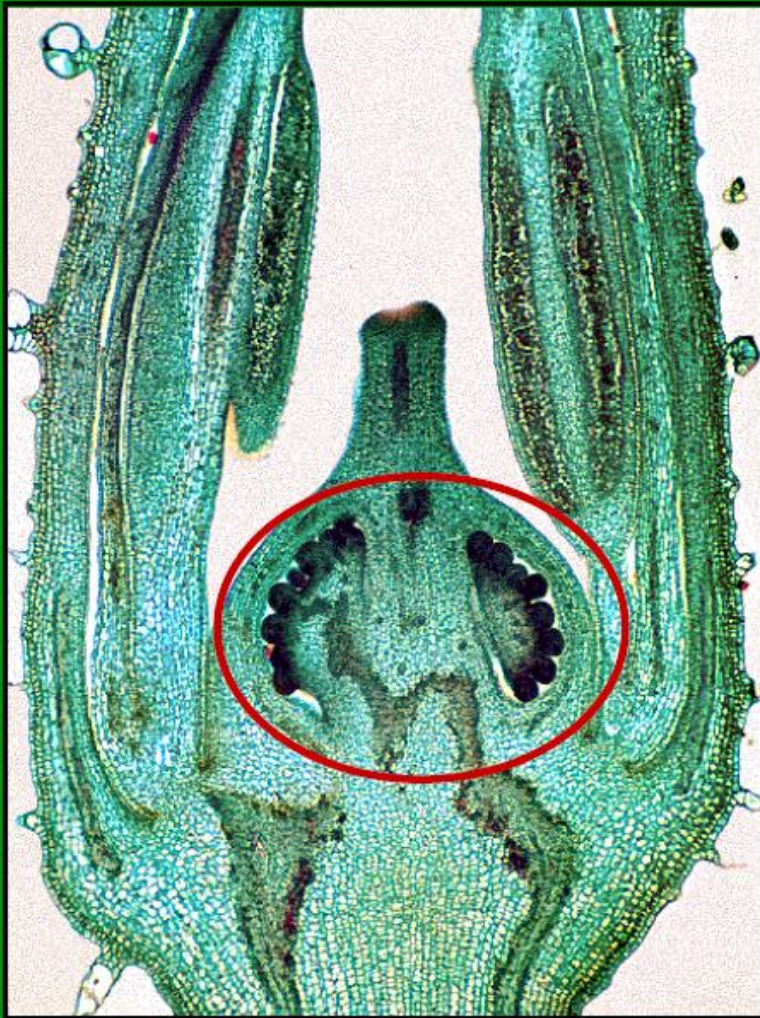


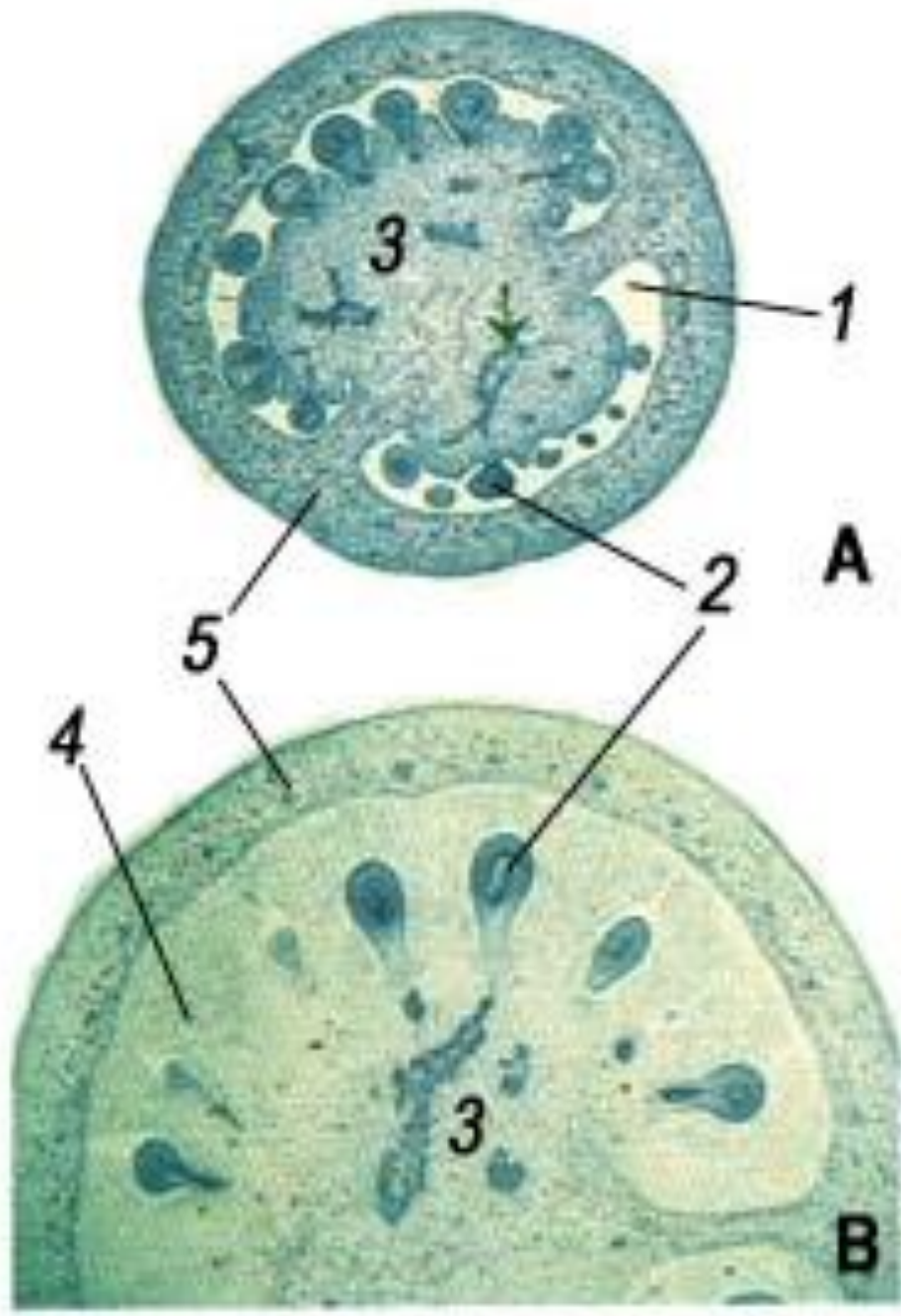


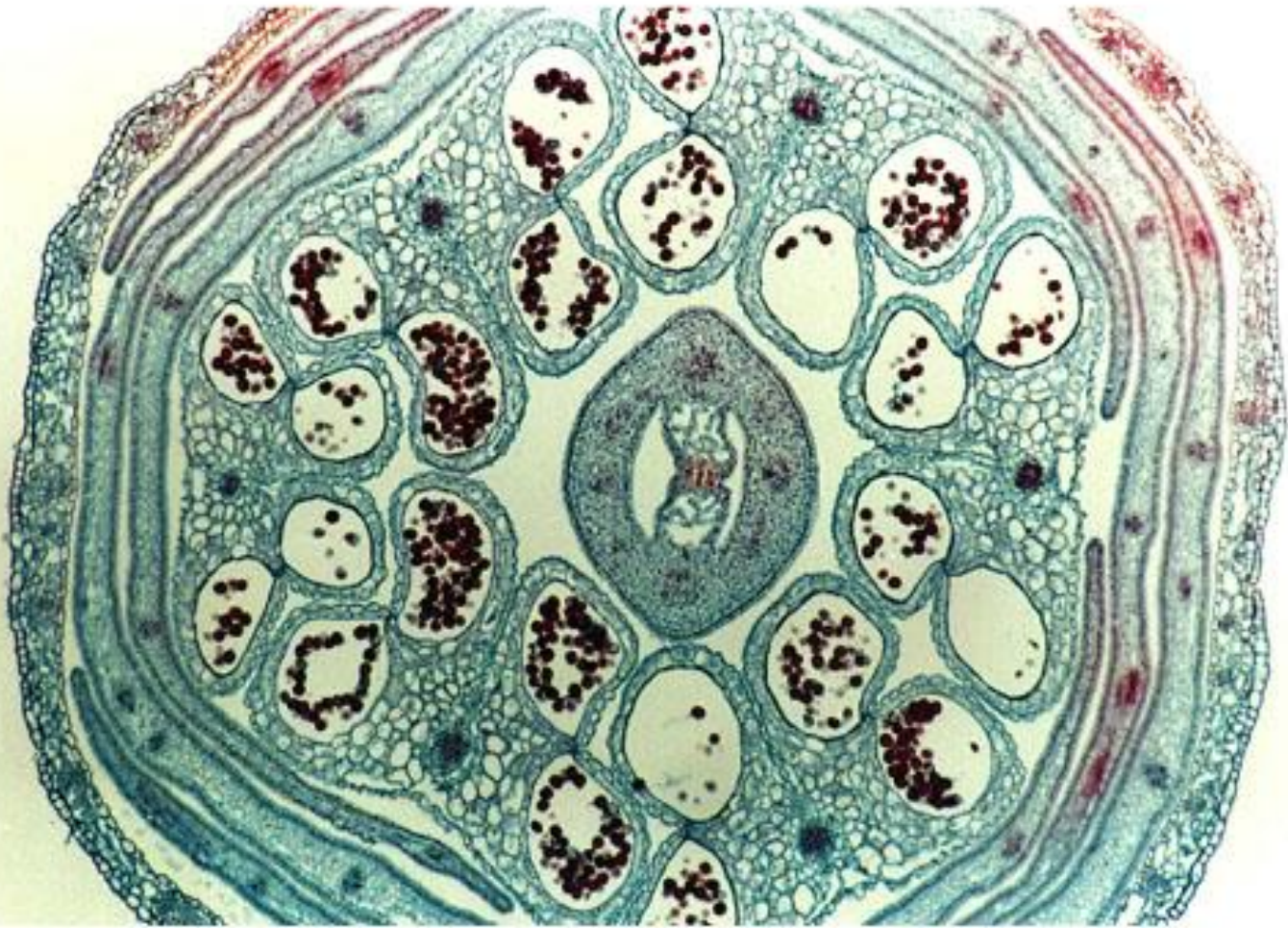




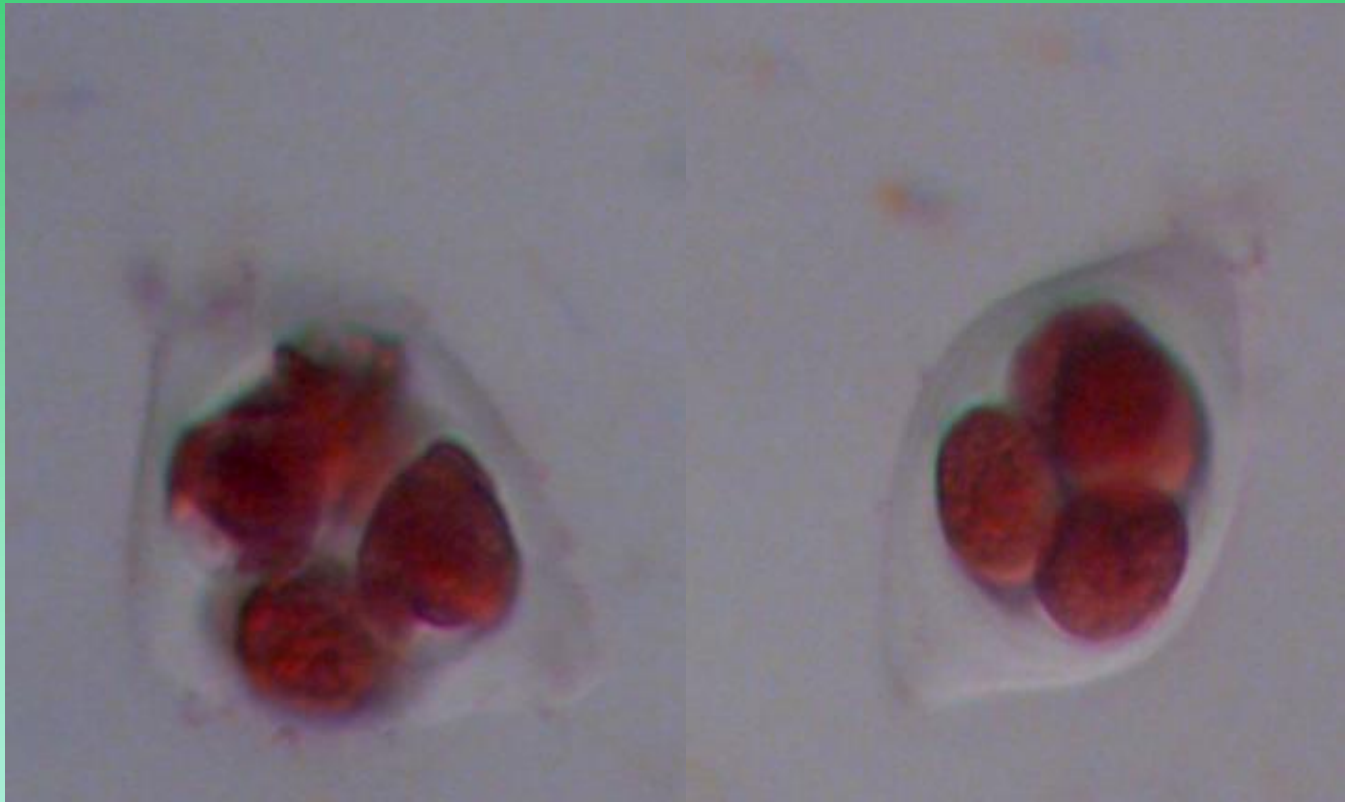








# Tetrate di microspore







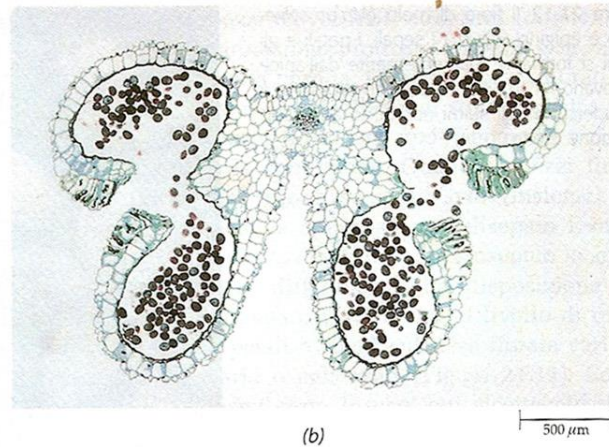
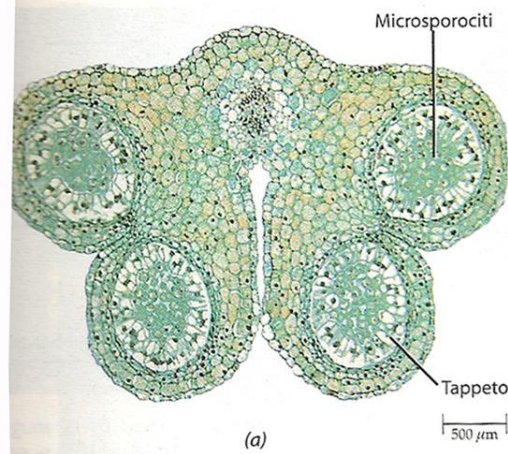
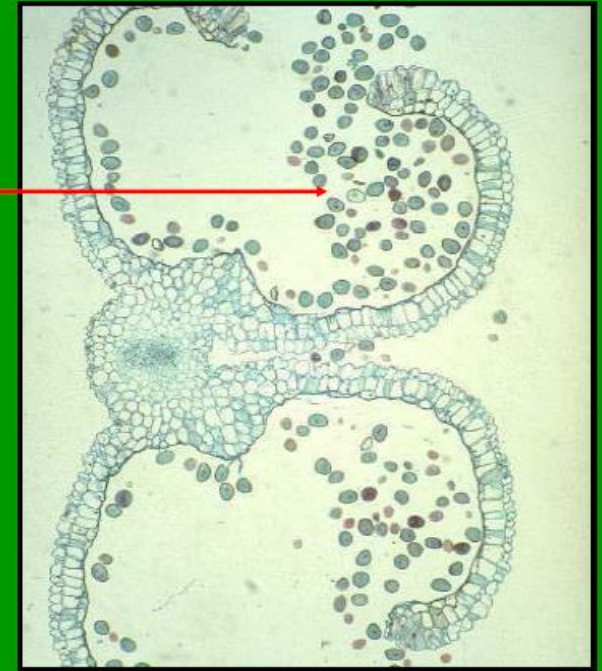
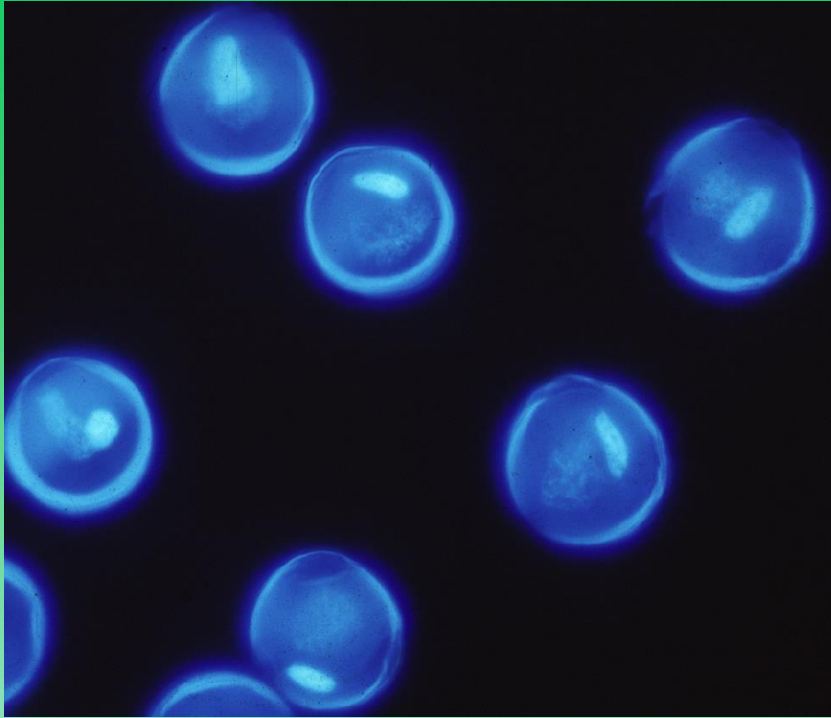


Figura 21.14 Due sezioni trasversali di antere di *Lilium*. (a) Antera immatura in cui sono visibili le quattro sacche polliniche che contengono i microsporociti circondati dal tappeto. (b) Antera matura che

contiene i granuli pollinici. I setti tra le sacche polliniche adiacenti si disgregano prima della deiscenza come illustrato nella fotografia.

Granuli Pollinici

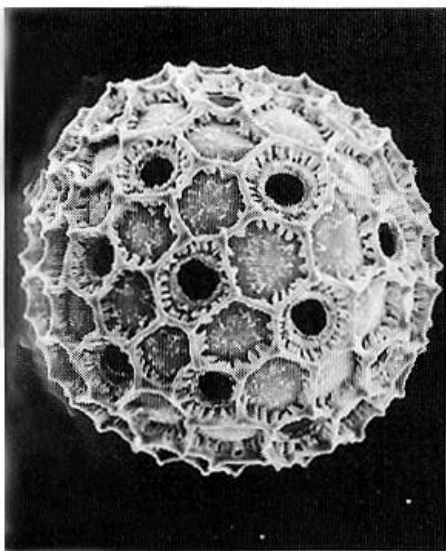




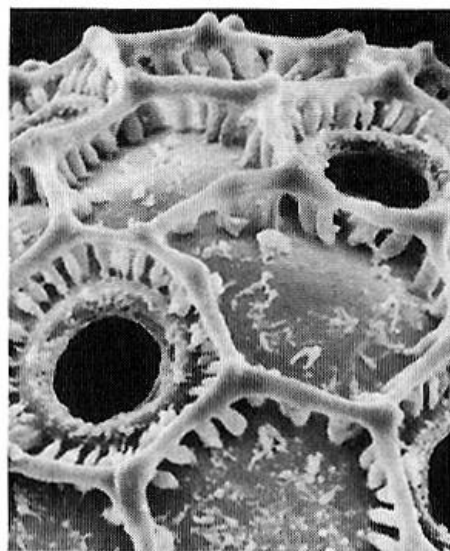
**Fluorescenza dopo  
trattamento con DAPI (4', 6  
diamidino-2-  
phenylindole)**



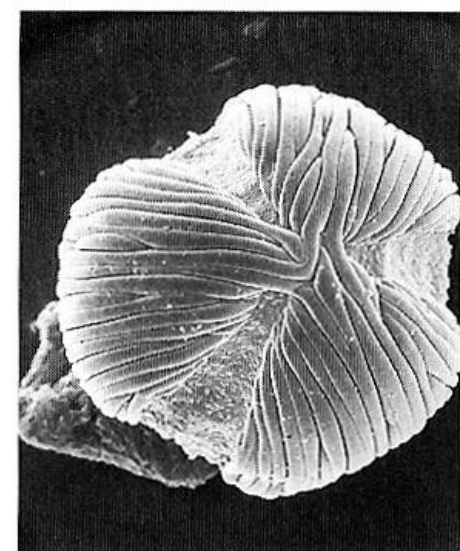
**Orceina acetica**



(a)



(b)



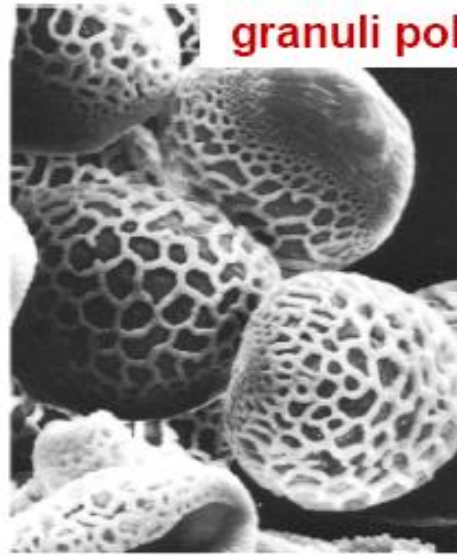
(c)

Figura 9.15 - (a) Granuli di polline di *Cobaea*, in cui le sculture della parete formano delle specie di cellette esagonali. I "fori" sono pori germinativi, da cui emergerà il tubetto pollinico dopo l'adesione allo stigma del fiore ( $\times 2000$ ). (Per concessione di Alan Prather, University of Texas). (b) Il polline di *Lycium* presenta un singolo lungo solco da cui emerge il tubetto pollinico ( $\times 4000$ ). (c) Il polline di *Macrolobium* ha tre solchi germinativi ( $\times 4000$ ) (b, c, per concessione di Beryl Simpson, University of Texas).

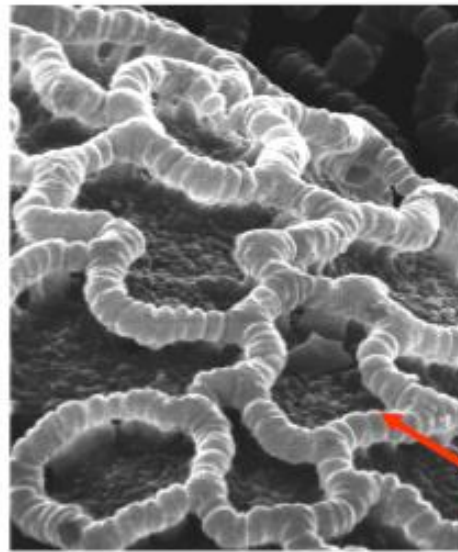
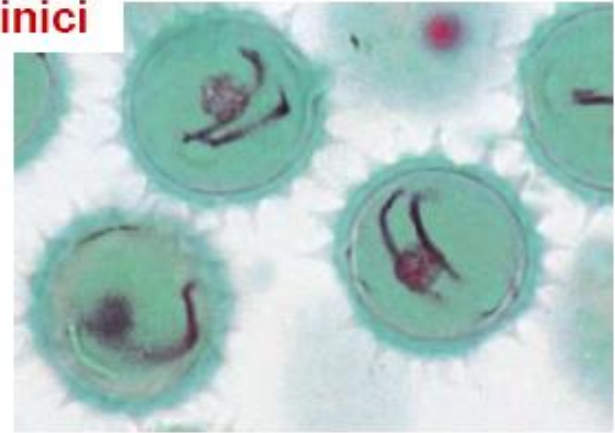
## granuli pollinici



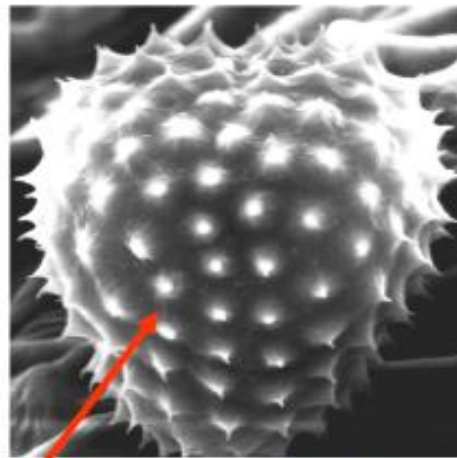
(a)



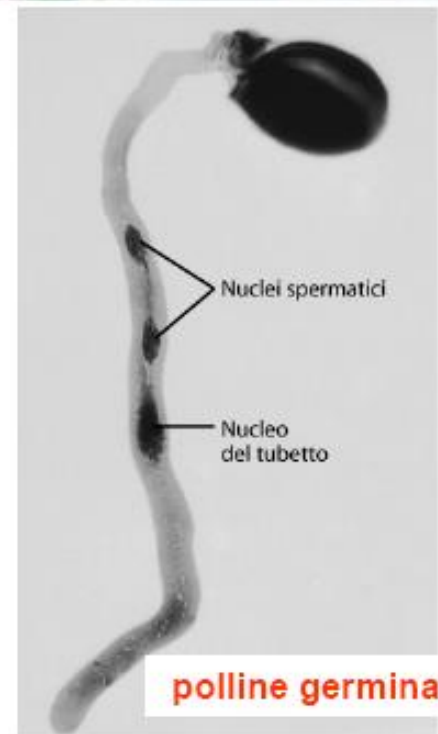
(b)



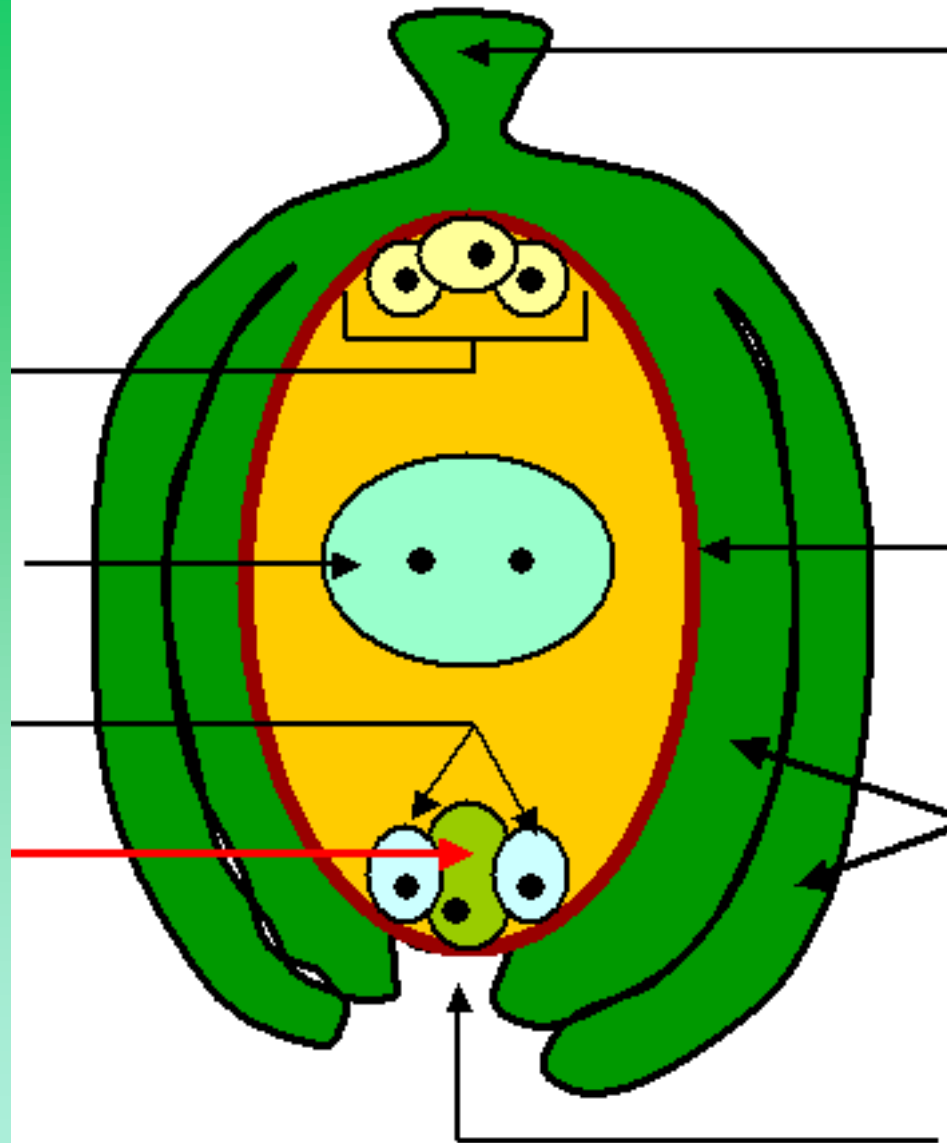
(c)

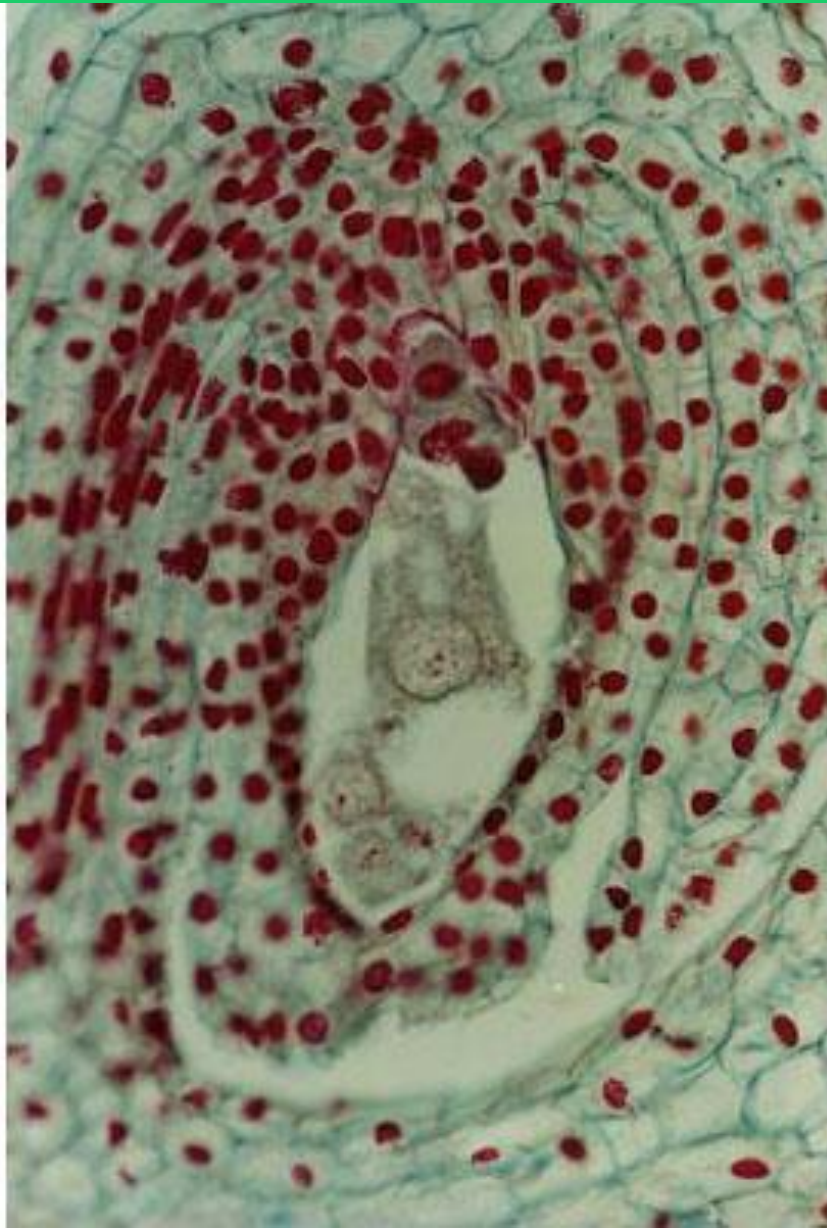


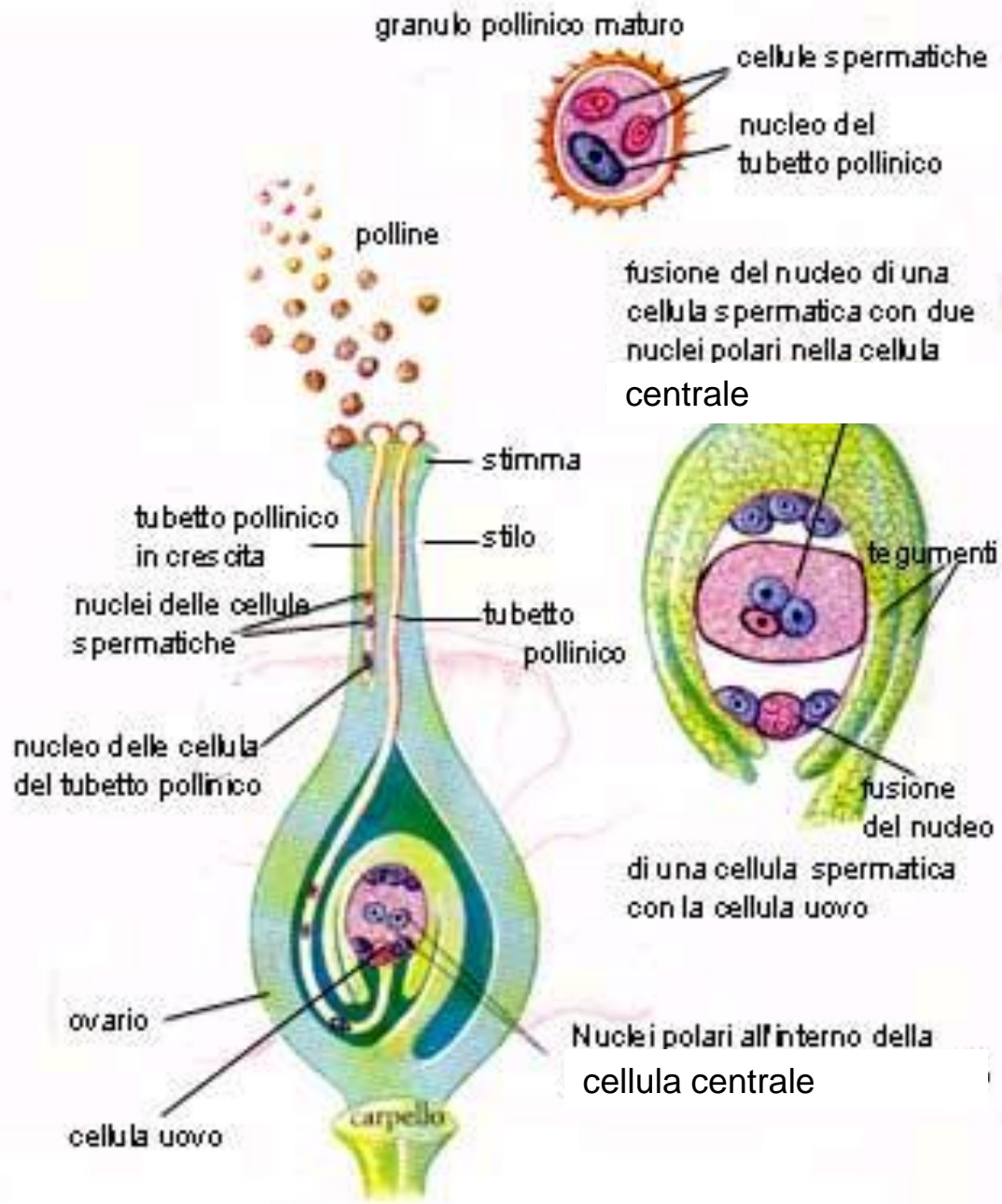
**esina (sporopollenina)**  
**Intina (cellulosa e pectine)**

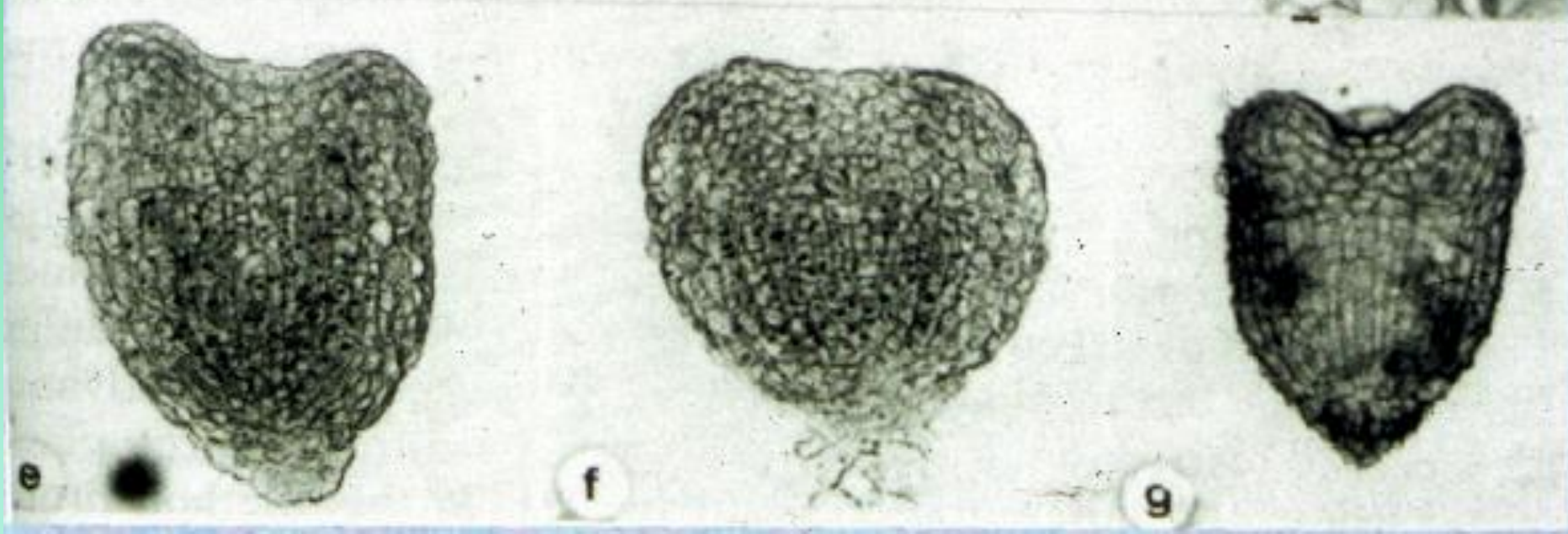
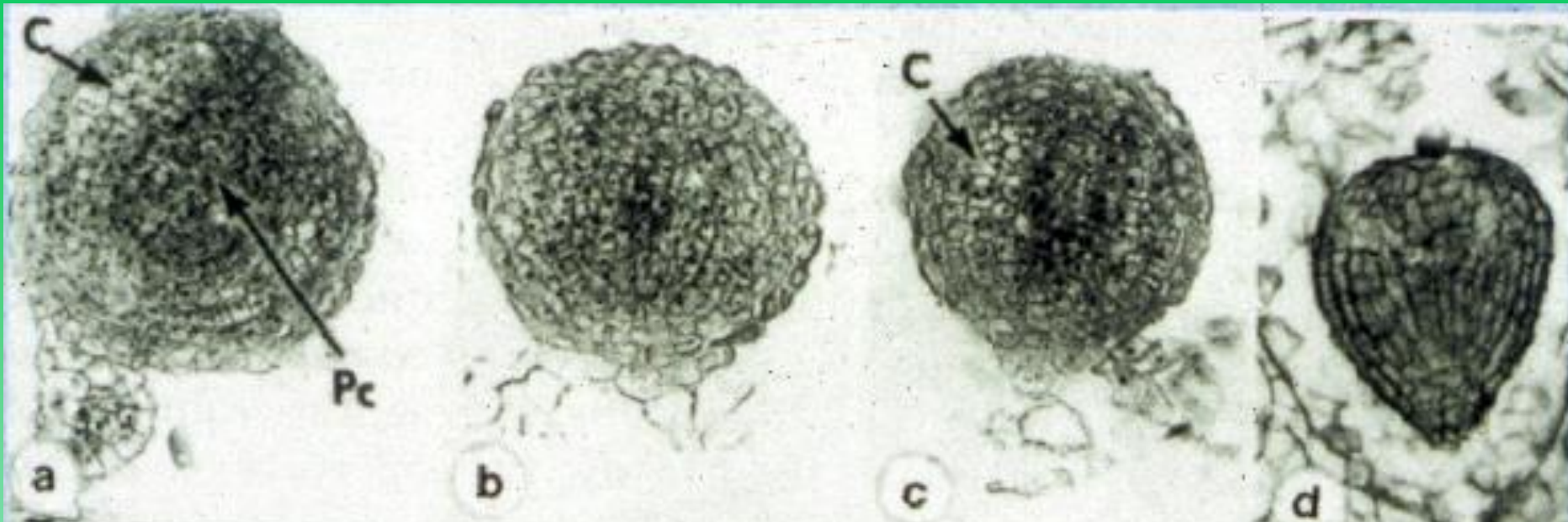


**polline germinato**

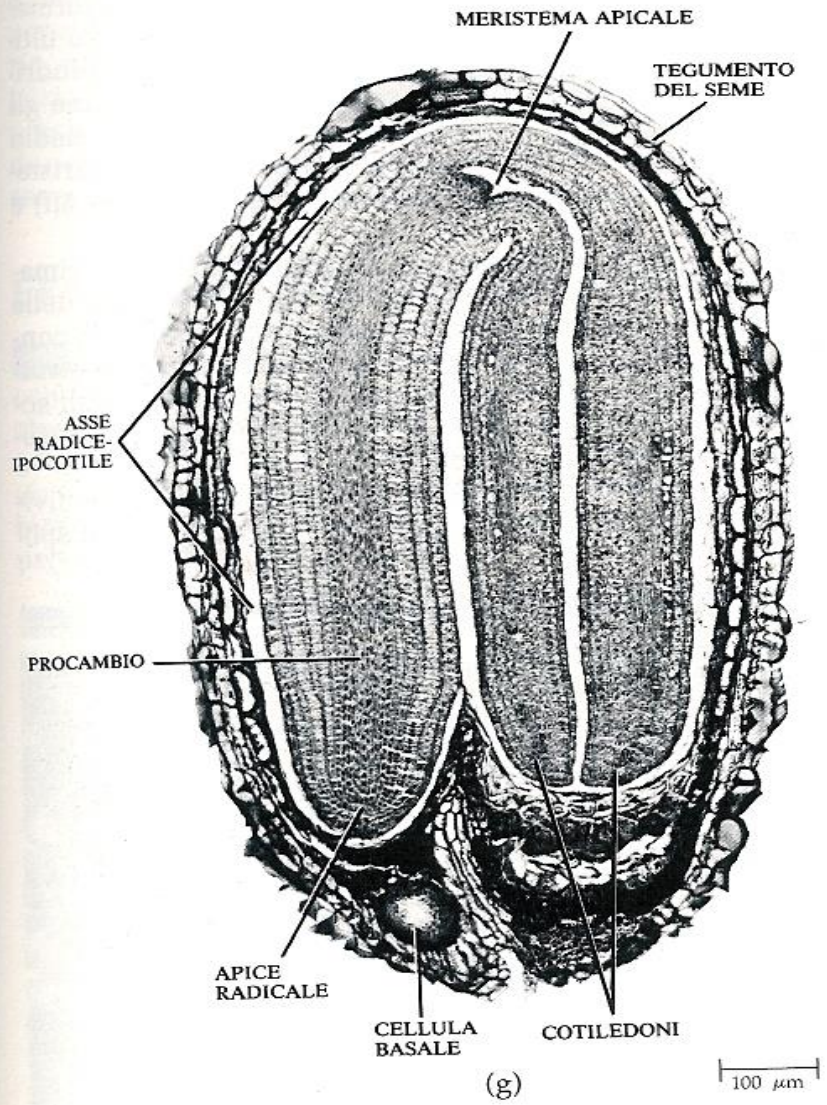


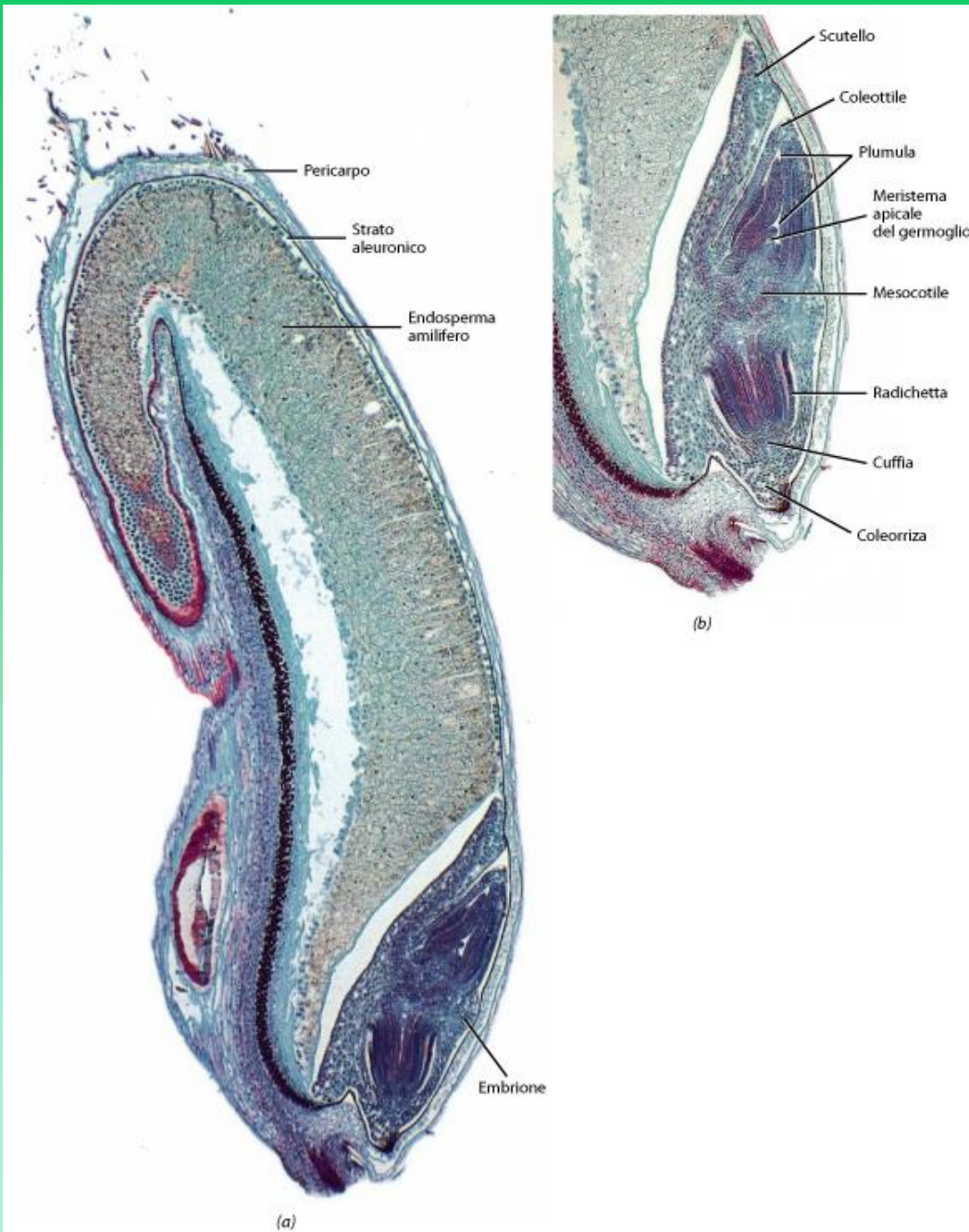


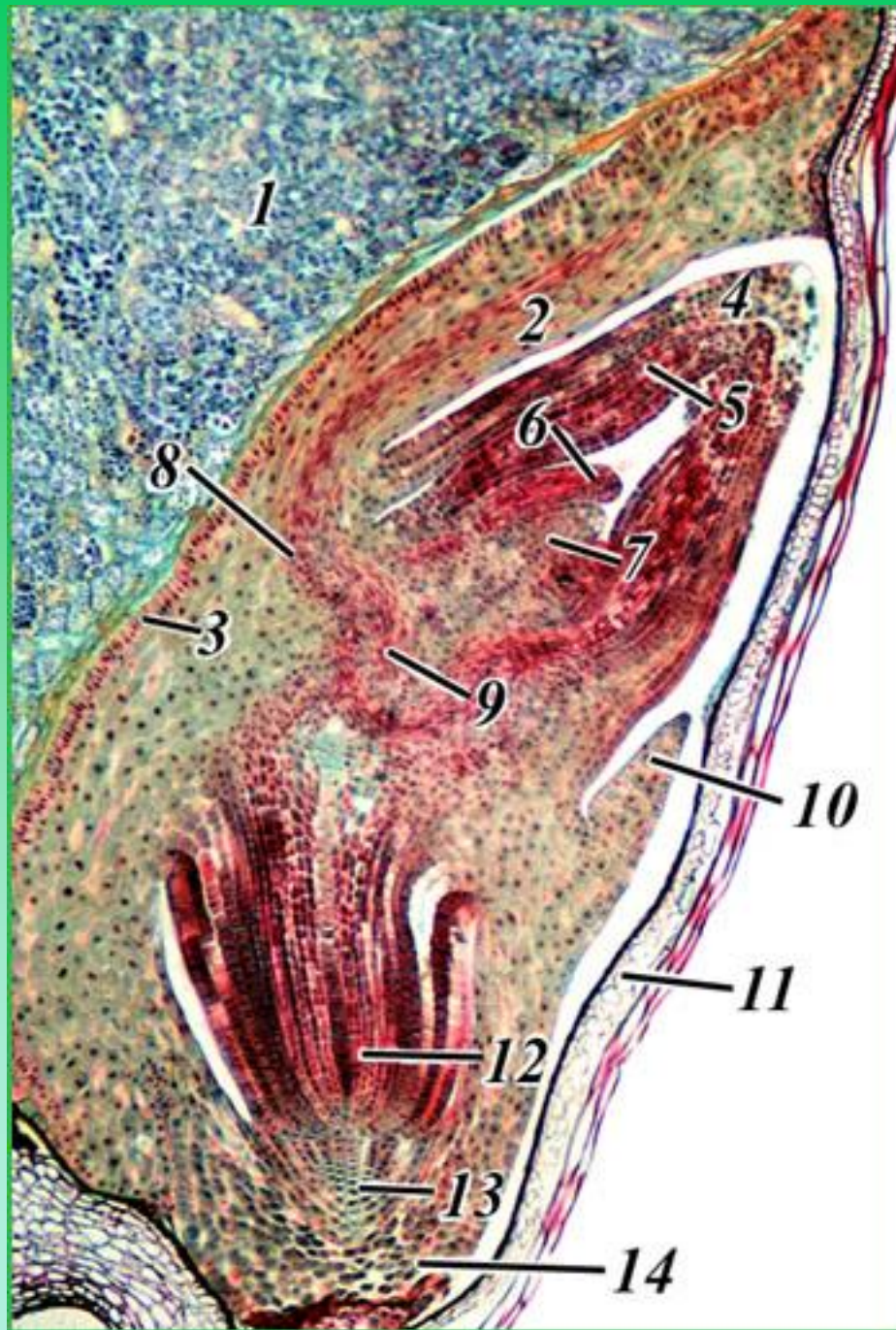




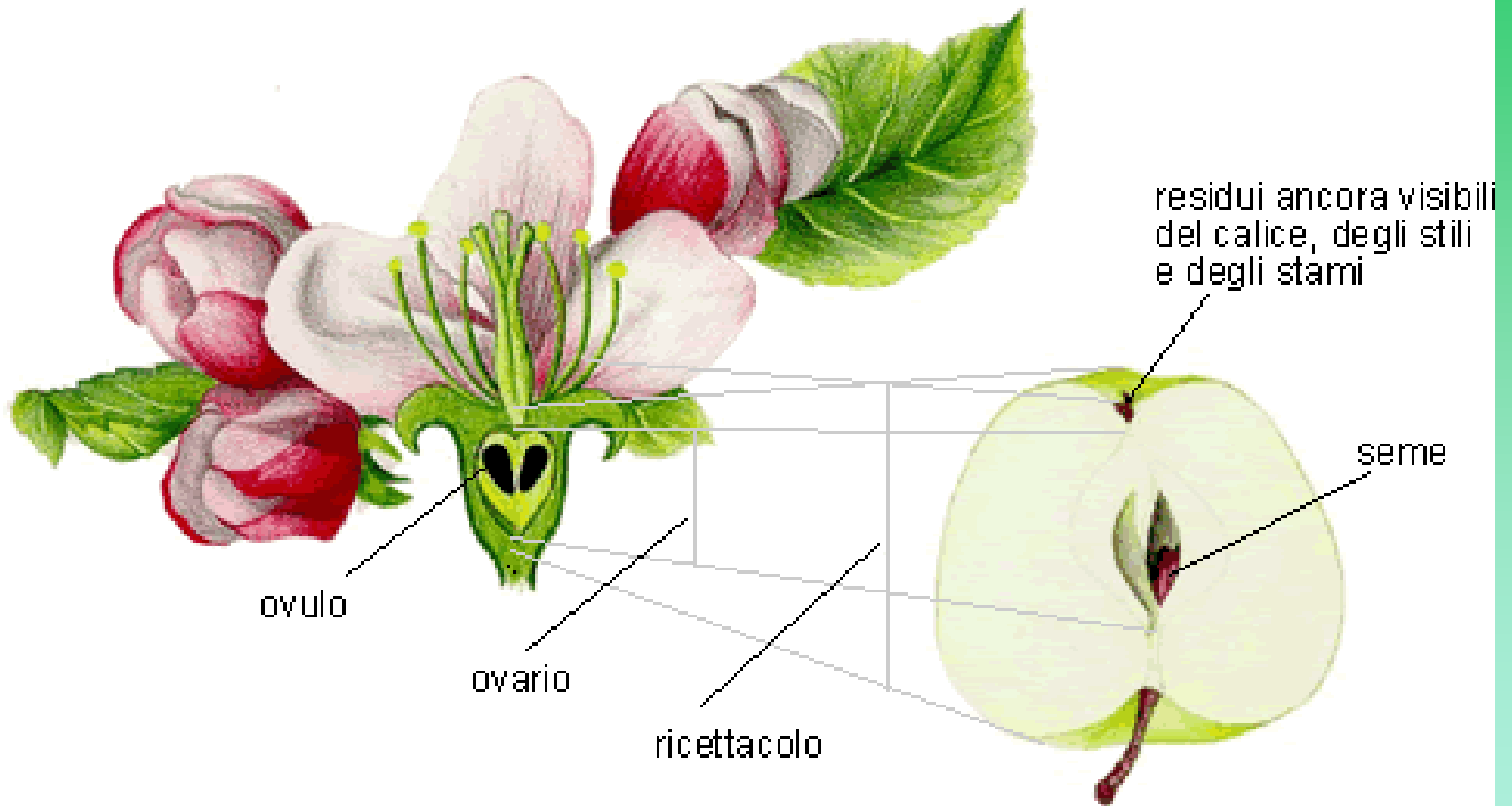








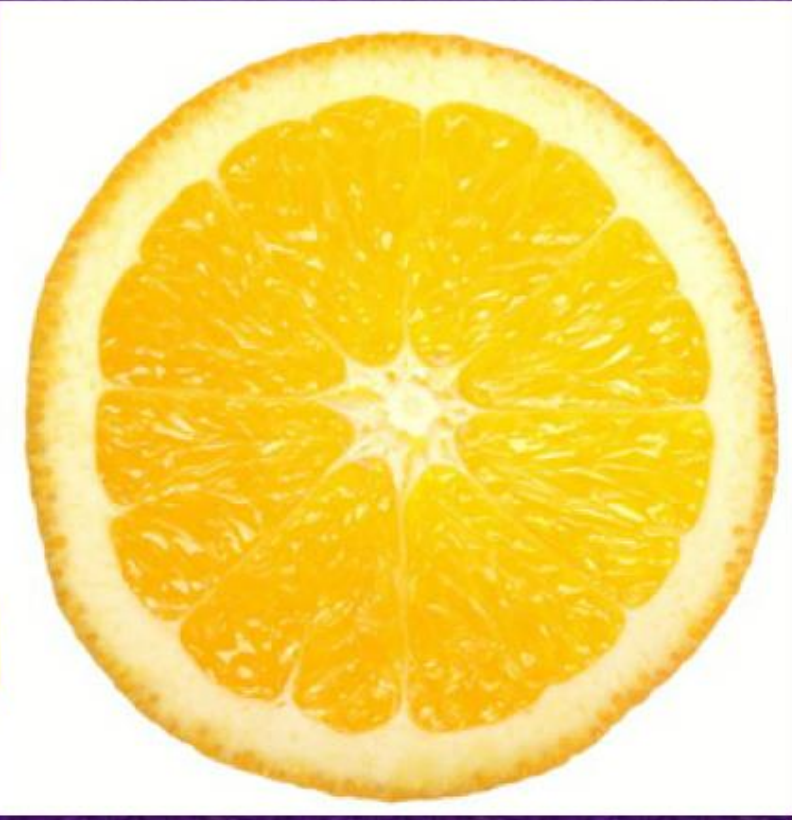
## Falso frutto



Un esempio di falso **frutto**: la bacca (pomo) del melo

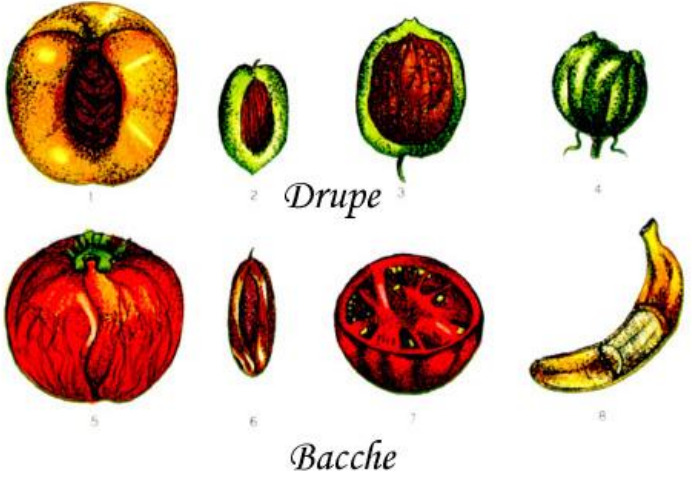


# Esperidio



E' una bacca pluricarpellare, con pericarpo distinto in 3 strati; uno superficiale (esocarpo ), colorato e ricco di ghiandole contenenti **oli essenziali**; uno intermedio (mesocarpo ) di colore chiaro e consistenza spugnosa; uno interno (endocarpo ) costituito dalle logge ovariche (spicchi ), rivestite da una membrana e formate da cellule vescicolose piene di succo, che circondano i semi.

*Frutti carnososi*



*Drupe*

*Bacche*



*Le noci*



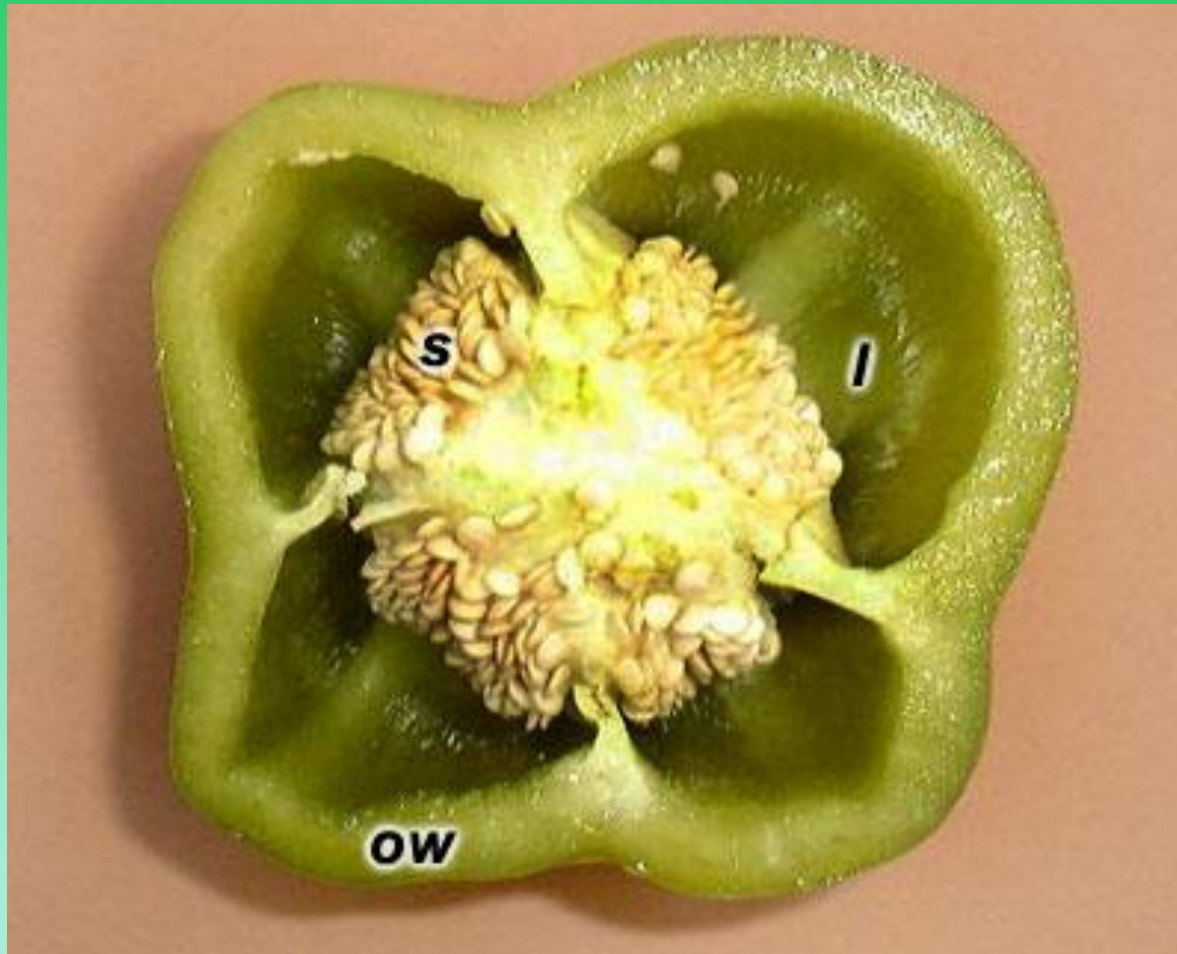
# peponide



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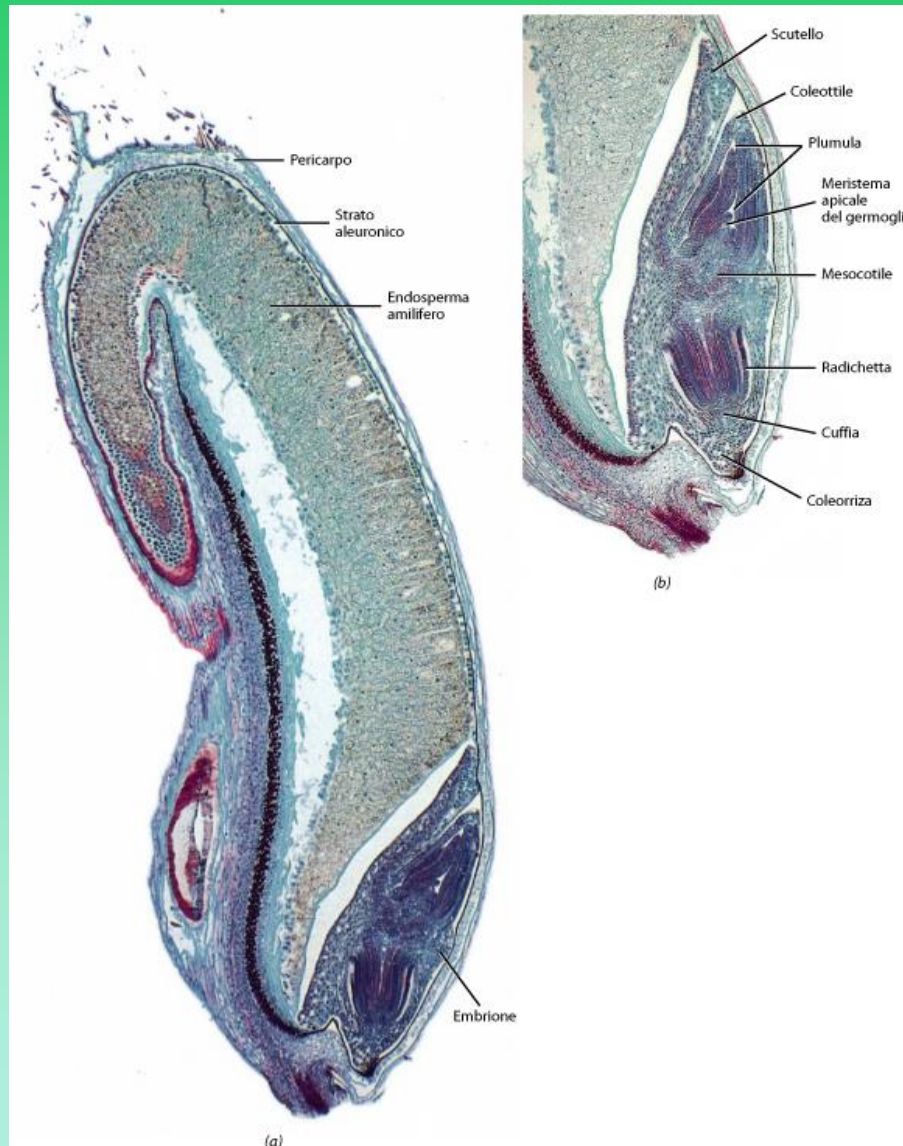


# La cariosside nella spiga



- A maturazione completata

# La cariosside è un frutto-seme



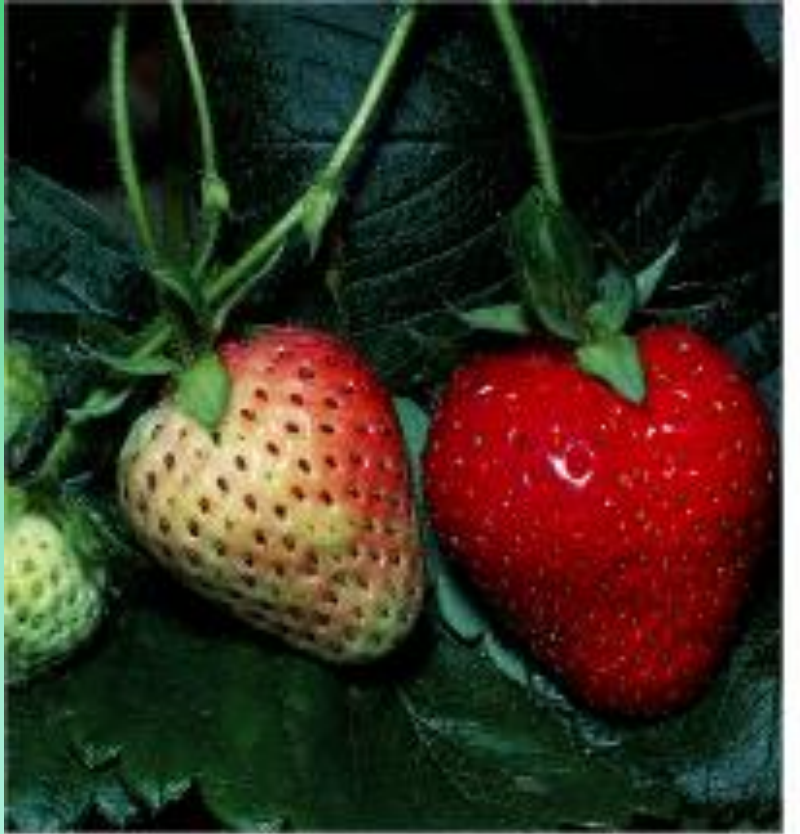
# Infruttescenza

Insieme di più frutti, di solito piccoli.

**frutti multiplo:** (sorosio dell'ananas o gelso)



La fragola è un frutto aggregato (la parte edule è il ricettacolo, i veri frutti sono gli acheni)



(a)

Falso frutto



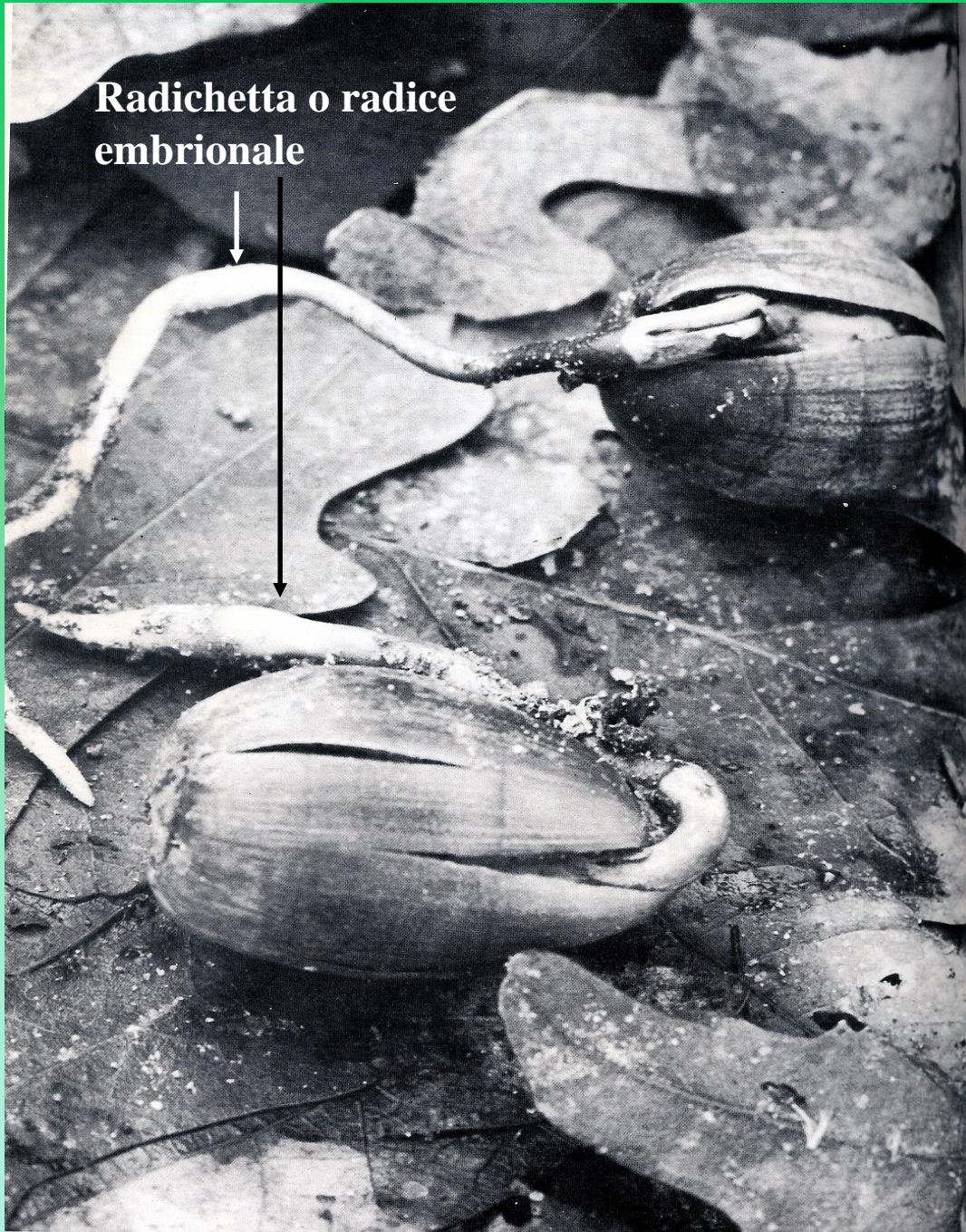
frutti aggregati: derivano dallo sviluppo di più pistilli posti sullo stesso ricettacolo



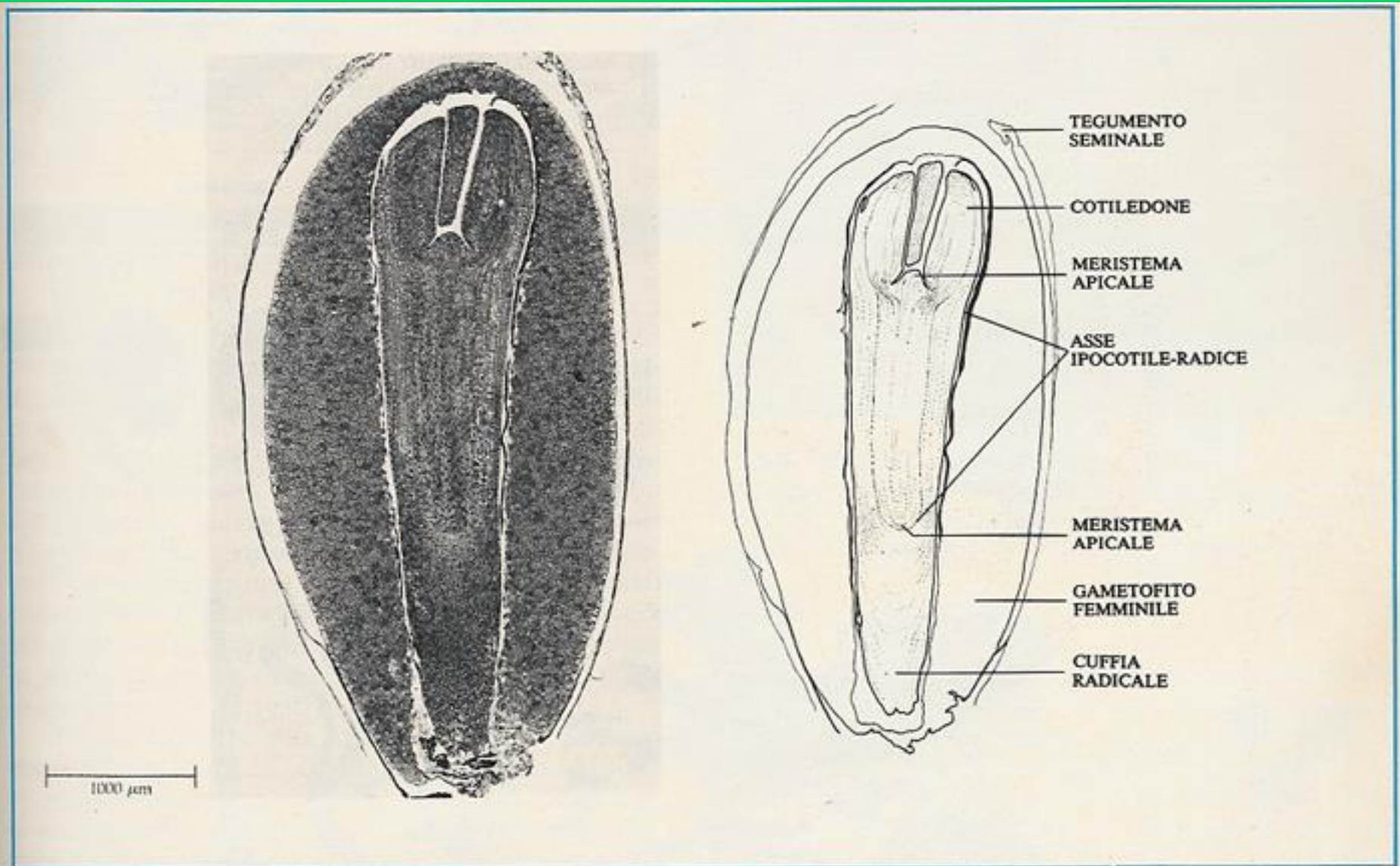
*Frutti secchi indeiscenti*



**Radichetta o radice  
embrionale**







**Figura 18.** Pinus. Sezione longitudinale del seme.

