UNIVERSITÀ DEGLI STUDI DI PADOVA

DAFNAE
Department of Agronomy Food Natural resources Animals Environment

Laurea in Scienze e Tecnologie Viticole Enologiche

Corso di Genetica e Miglioramento genetico

A. A. 2021-2022

Prof.ssa Serena Varotto

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Libro di testo Hartl-Jones

UNIVERSITÀ DEGLI STUDI DI PADOVA

DAFNAE
Department of Agronomy Food Natural resources Animals Environment

48 ore di lezione
Modalità duale
Lunedi 14.00 – 17.00
Giovedi 9.00-11.00

I parte: genetica molecolare
Prova scritta durante il corso valida sino alla sessione invernale d'esame 2021-2022

II parte: ereditarietà e miglioramento genetico
Prova orale

E' possibile sostenere l'esame intero orale

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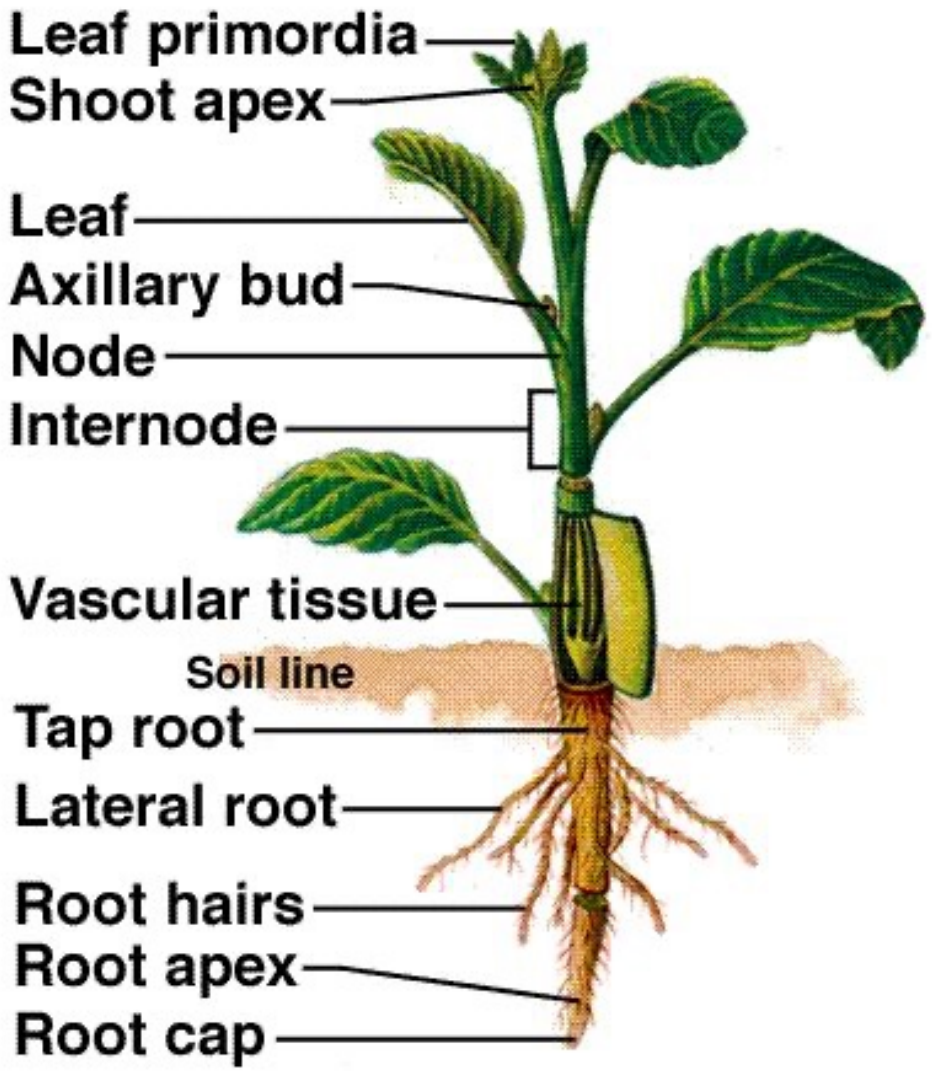
Lezione I: il ciclo vitale delle piante

Tissues and Organs of a Herbaceous Plant



A

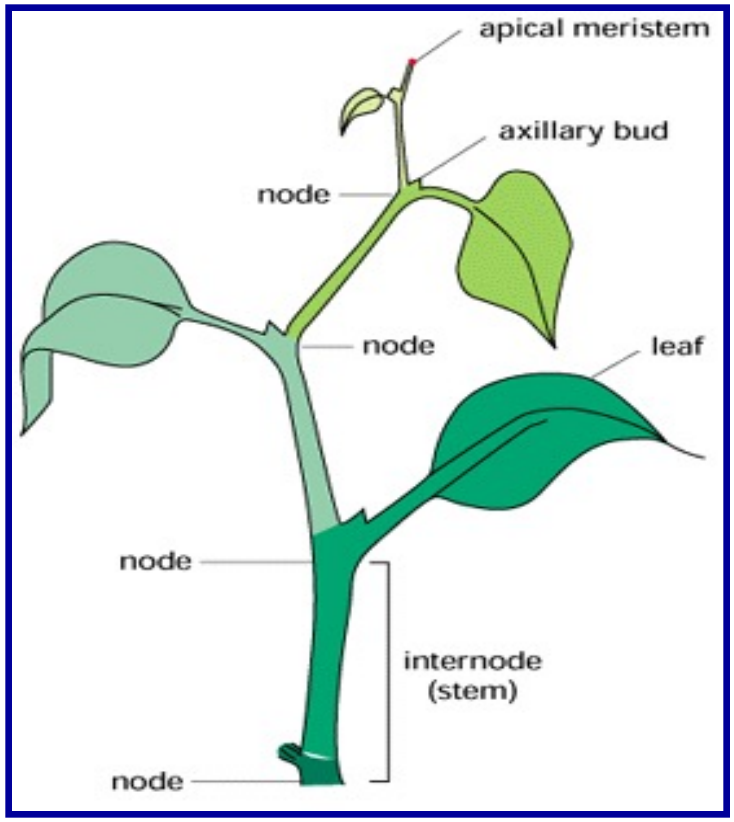
Mouse

Arabidopsis

B

PLANT ARCHITECTURE

- Struttura modulare
- Assenza di organi pre-formati nell'embrione
- Necessità di adattarsi alle variazioni dell'ambiente esterno
- Capacità di crescita continua grazie alla presenza di cellule indifferenziate che compongono il meristema.

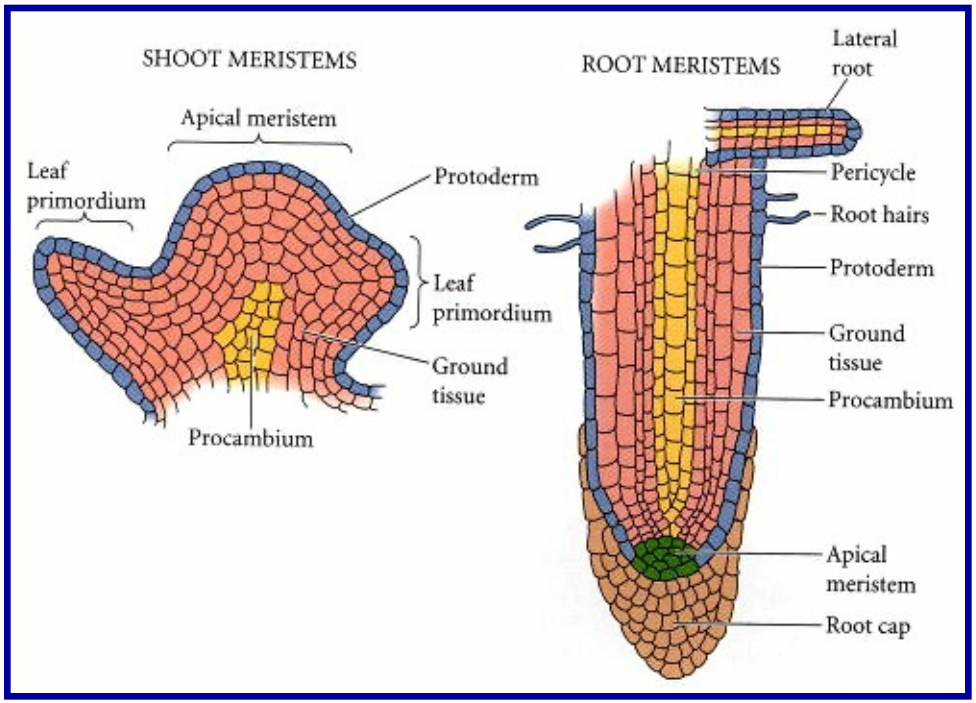


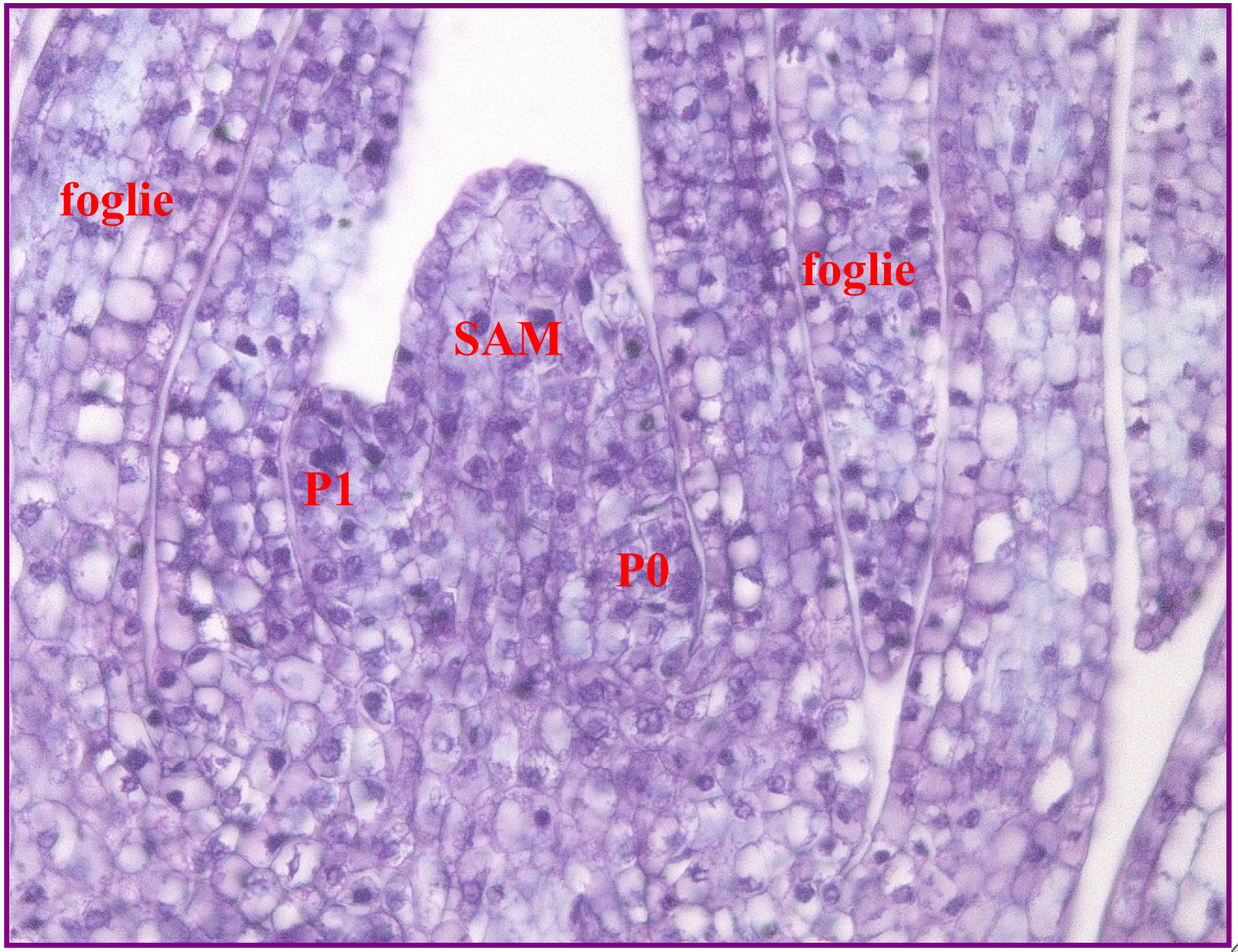
MERISTEMI

- L'attività del SAM e del RAM è determinata durante l'embriogenesi e assicura la crescita e la differenziazione degli organi alla pianta.

- Le cellule meristematiche hanno due funzioni principali: mantenere l'attività del meristema e differenziare i tessuti e gli organi della pianta.

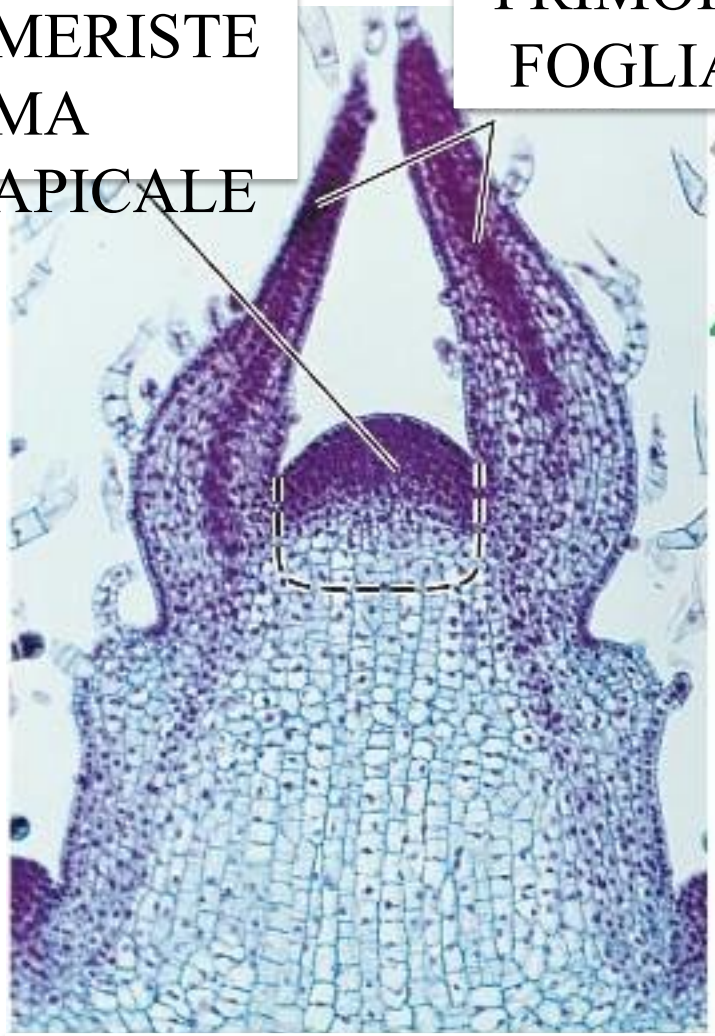
- Durante la fase vegetativa il meristema apicale ha una crescita indeterminata, mentre durante la fase riproduttiva produce l'infiorescenza caratterizzata da sviluppo determinato.



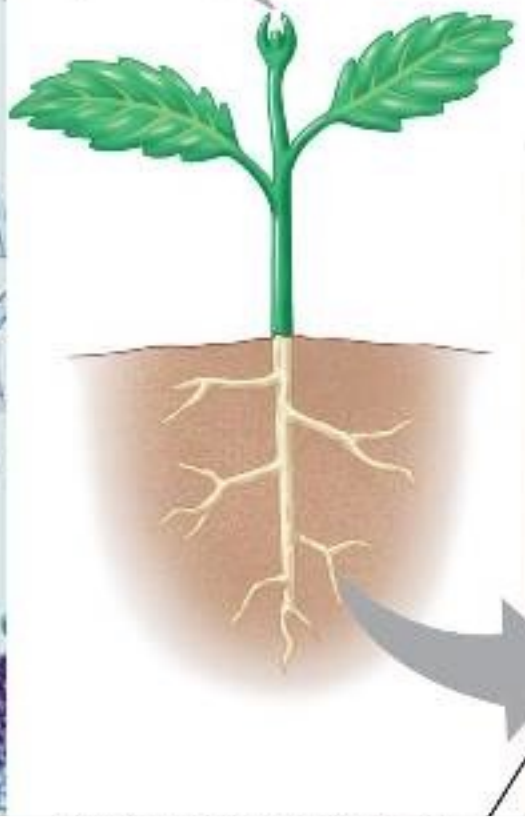

foglie
foglie
SAM
P1
P0

MERISTEMA APICALE

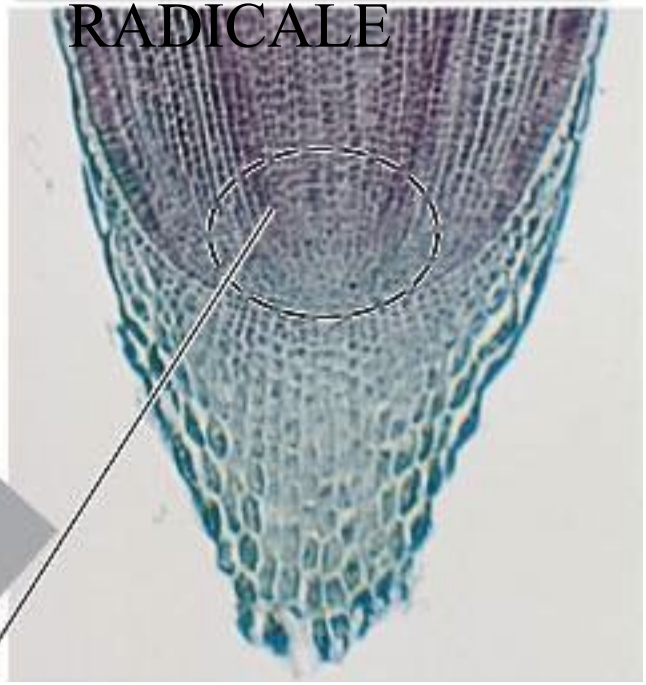
PRIMORDI FOGLIARI



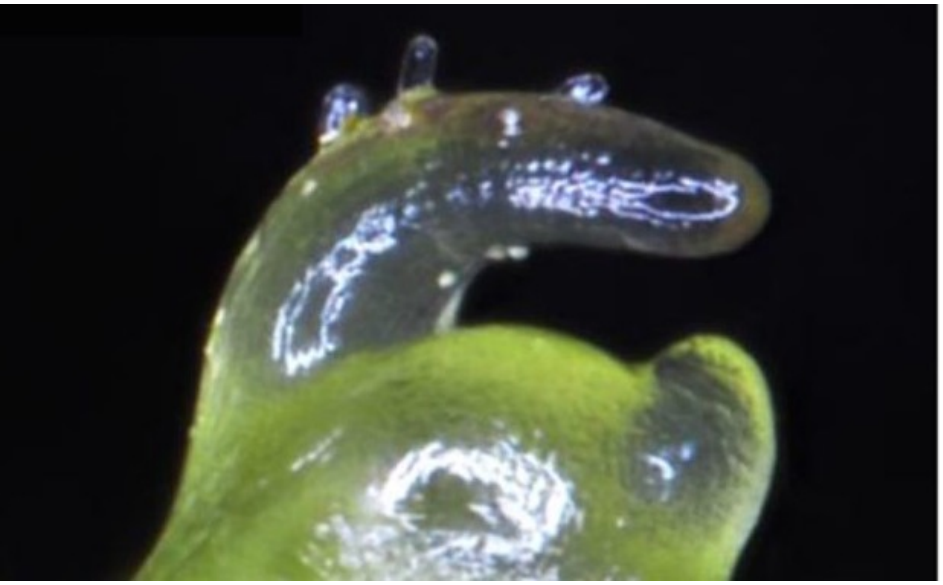
MERISTEMA APICALE

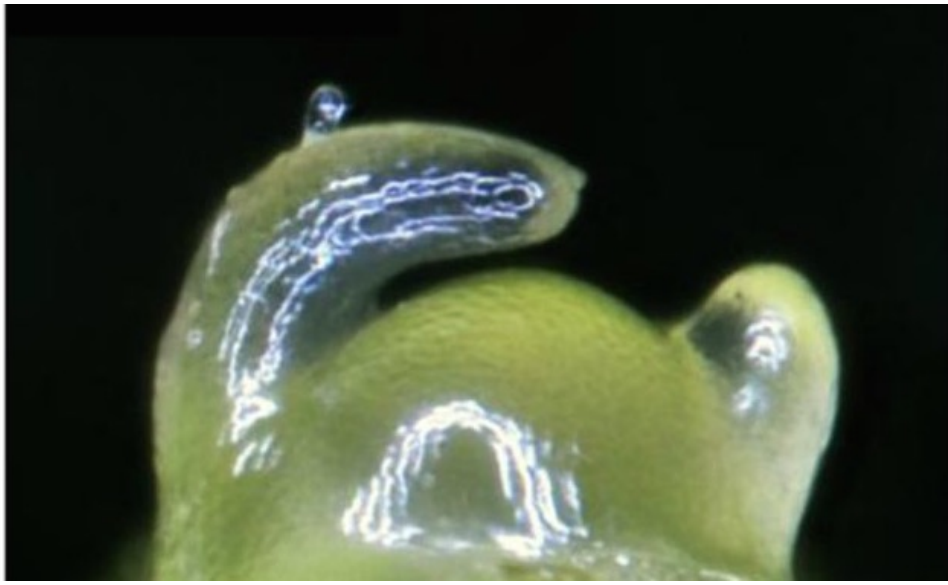


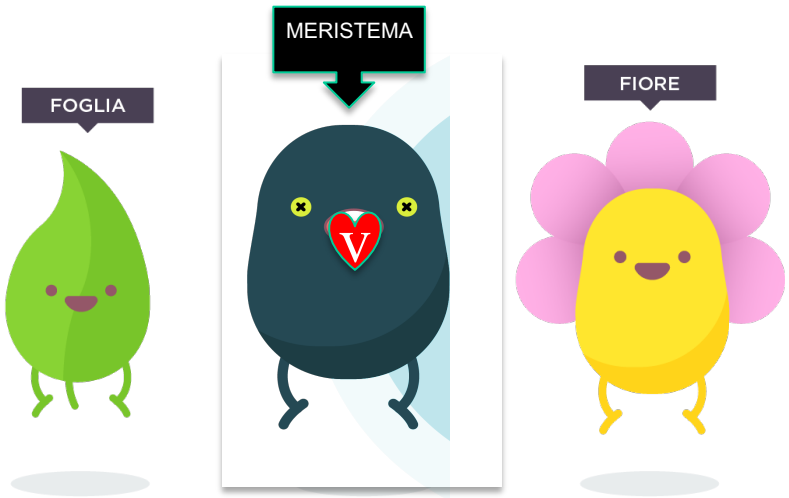
MERISTEMA RADICALE

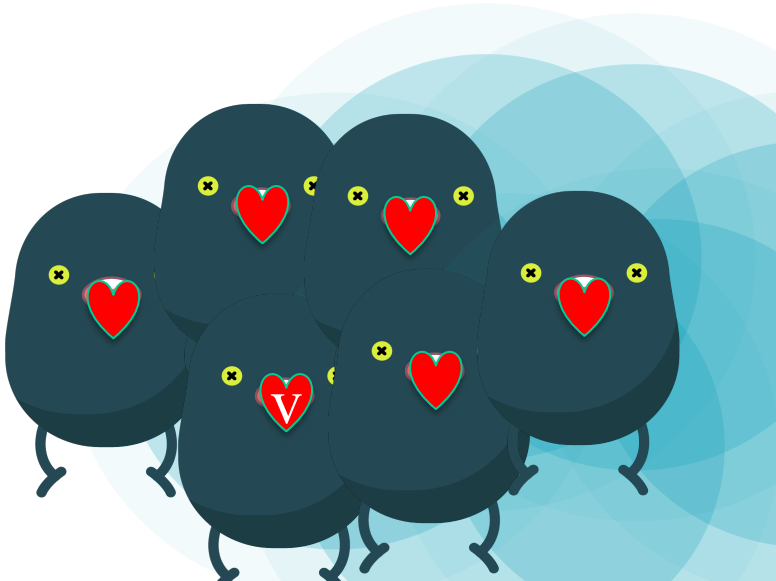


Meristemi

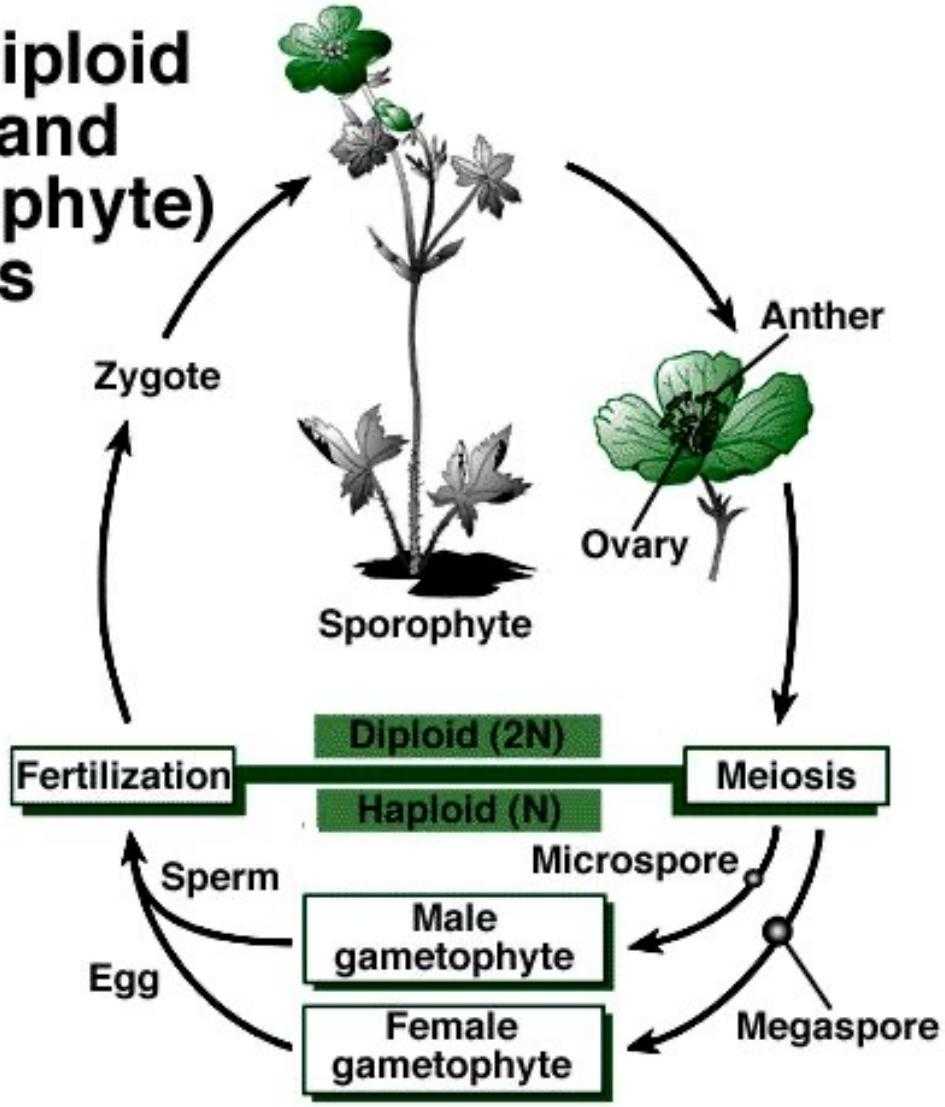




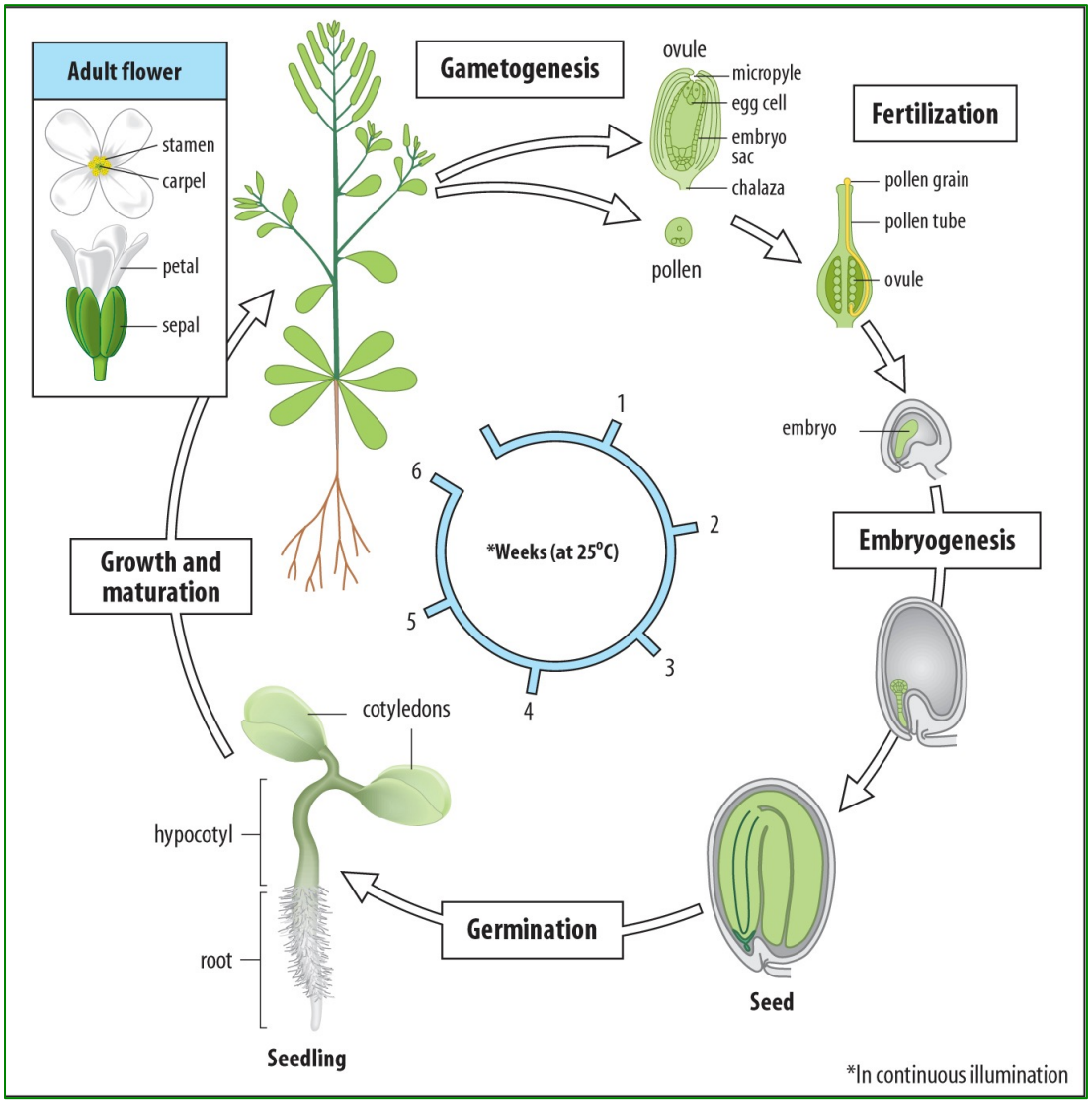




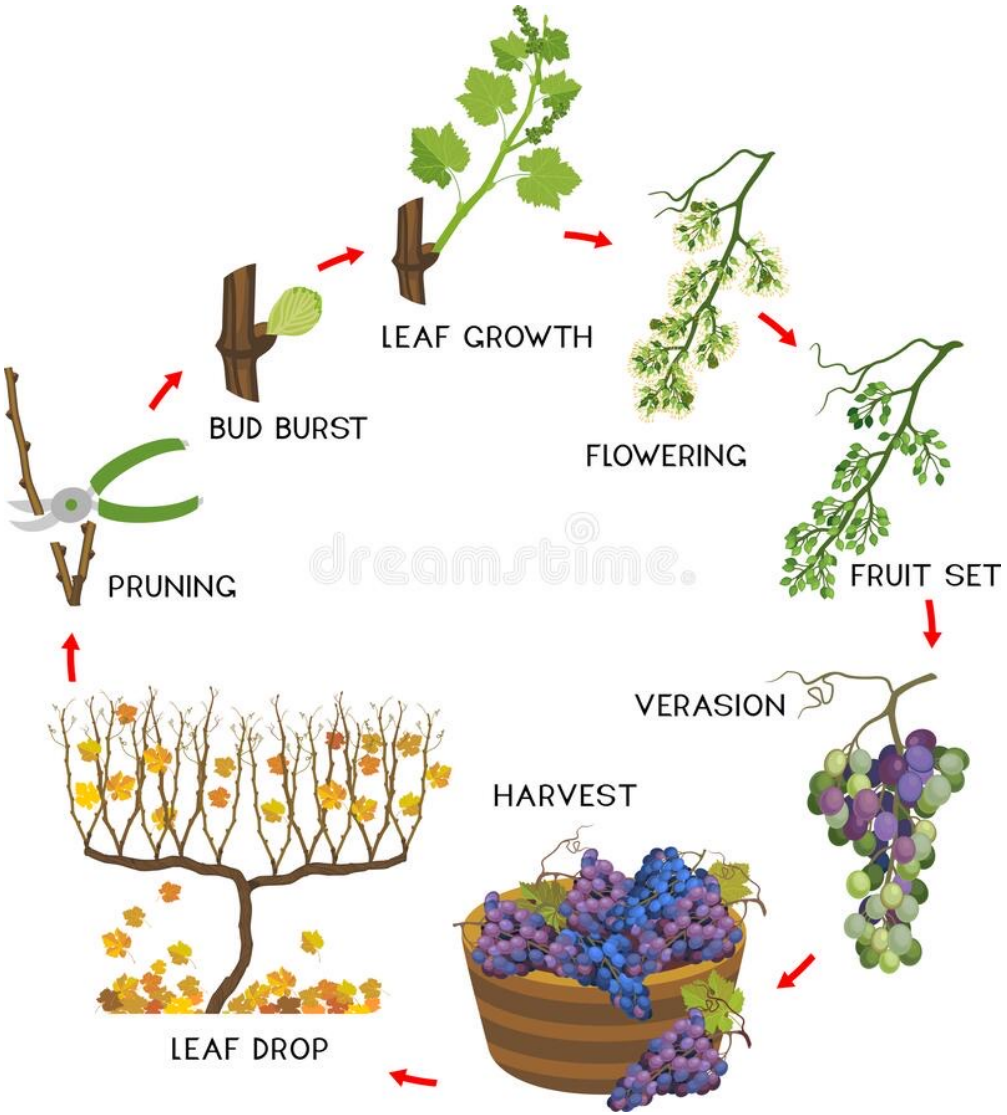
Alternation of Diploid (sporophyte) and Haploid (gametophyte) Generations



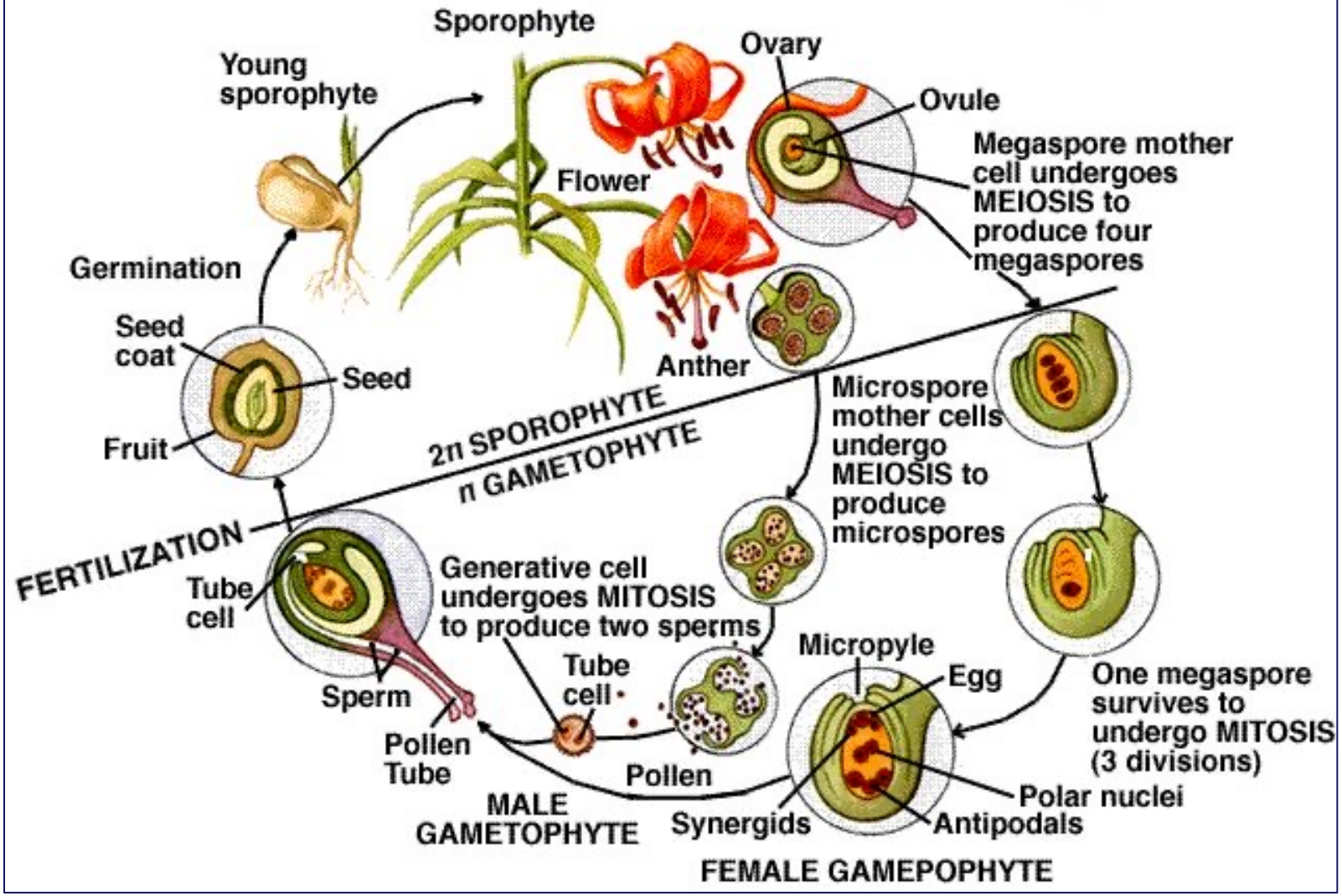
I gameti derivano dalle cellule somatiche



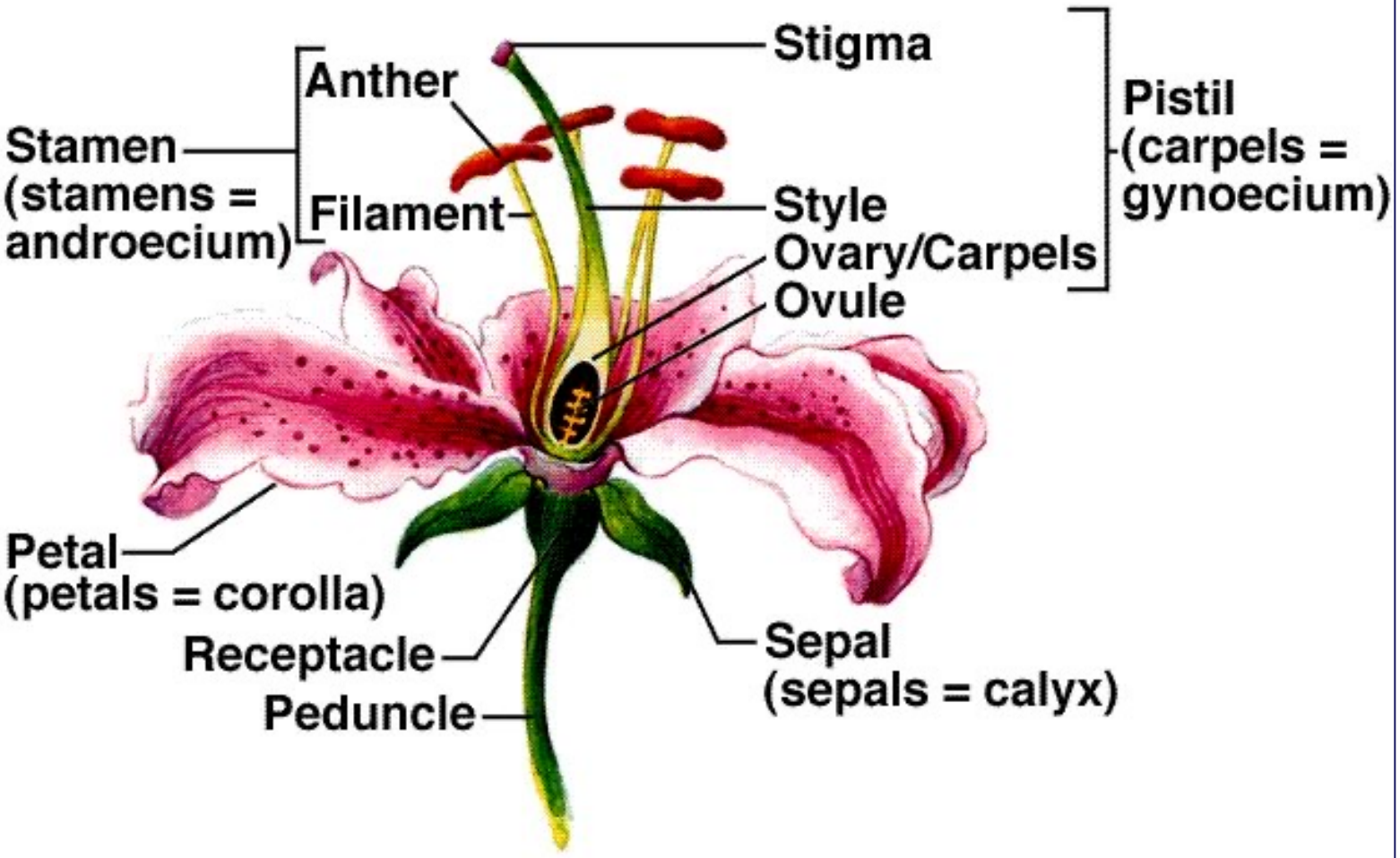
Ciclo vitale della vite

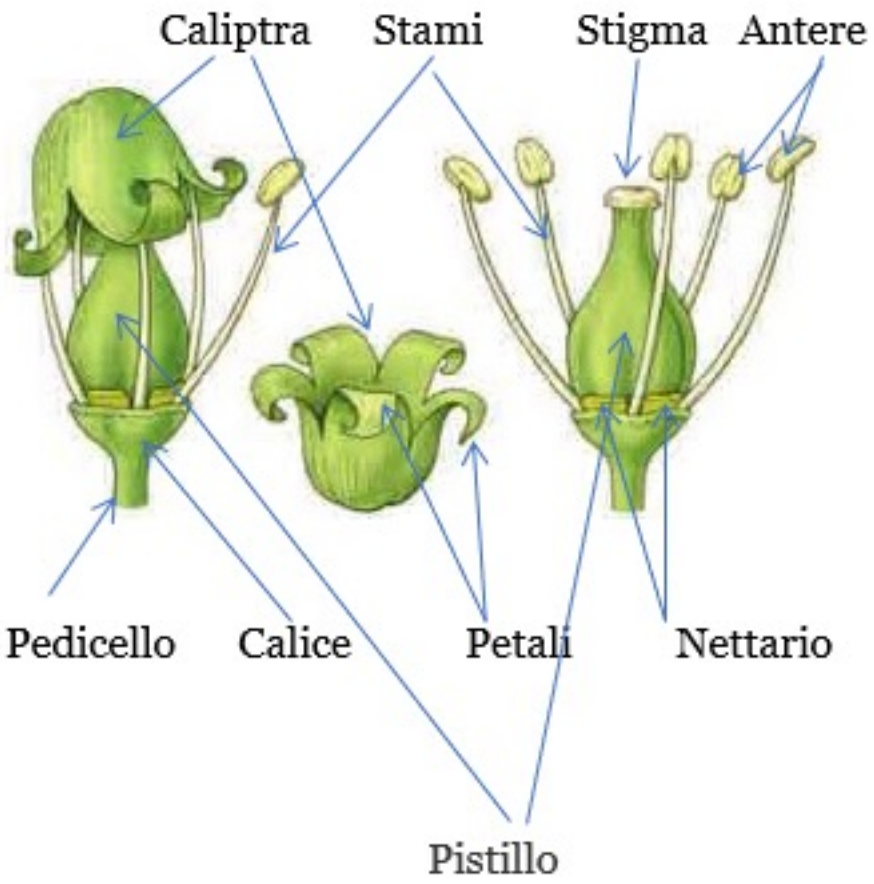


Generalized Life Cycle of Flowering Plants

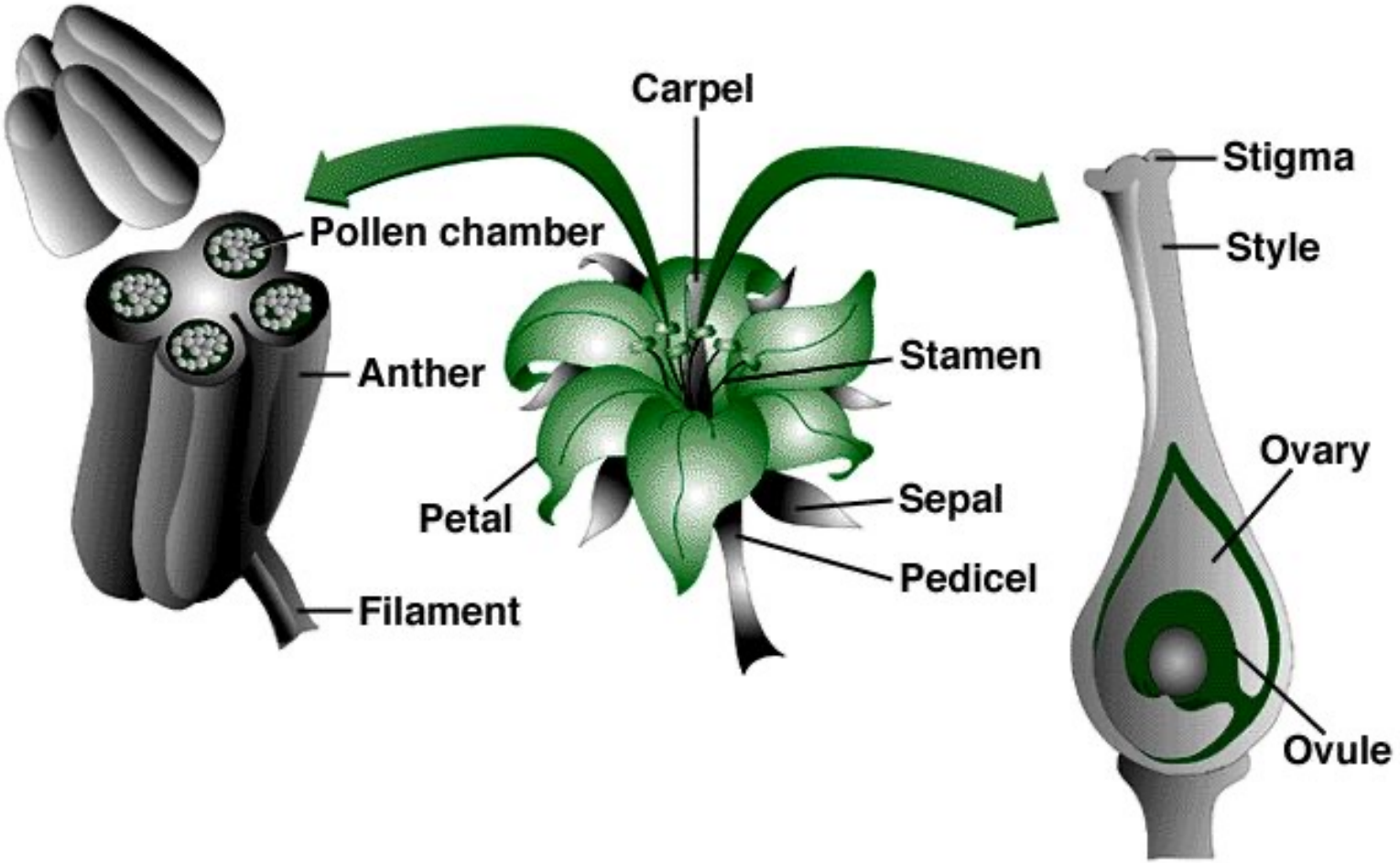


Parts of a Flower

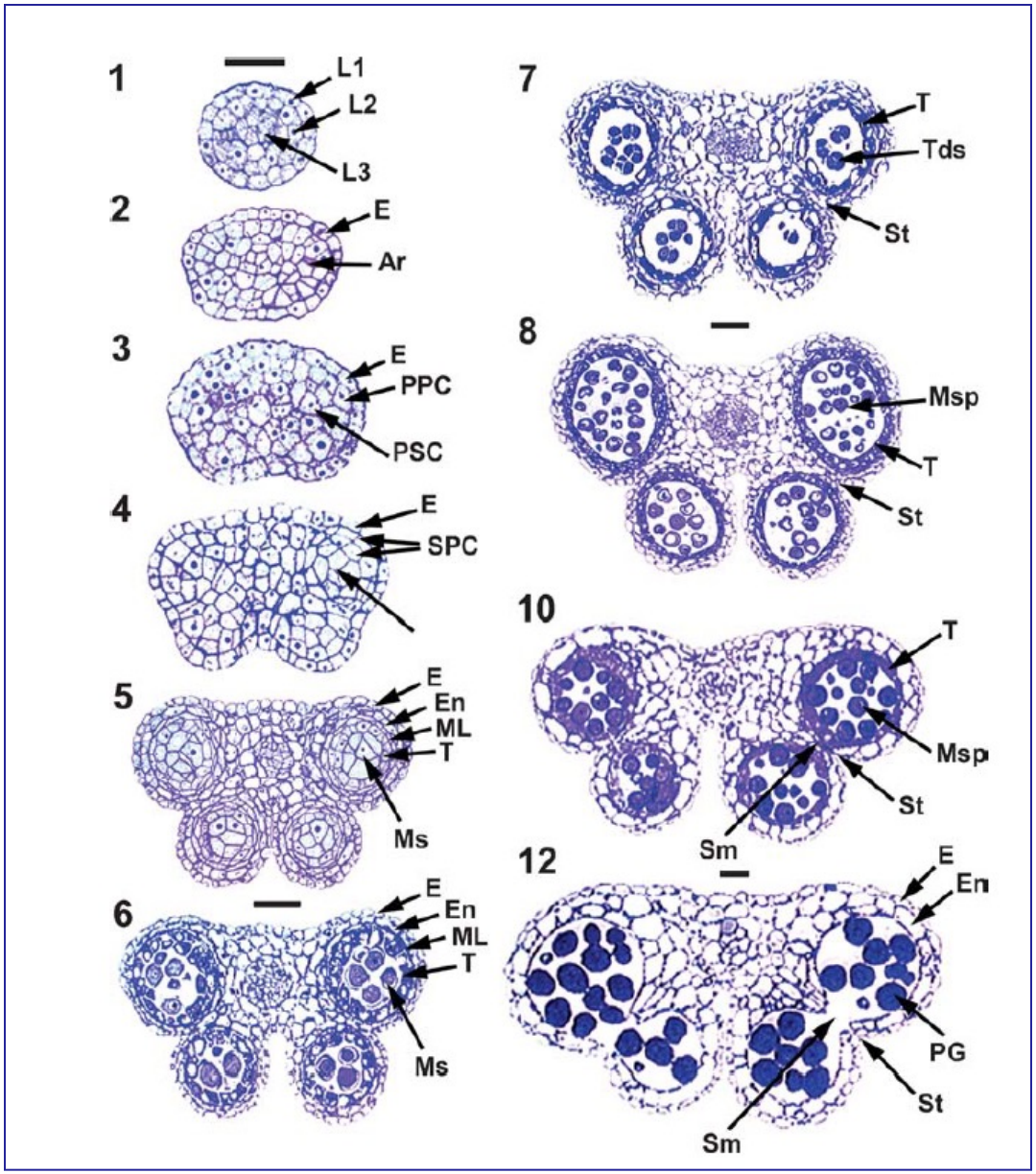



Caliptra
Stami
Stigma
Antere
Pedicello
Calice
Petali
Nettario
Pistillo

Flower Structure



I 12 stadi di sviluppo durante la maturazione delle antere



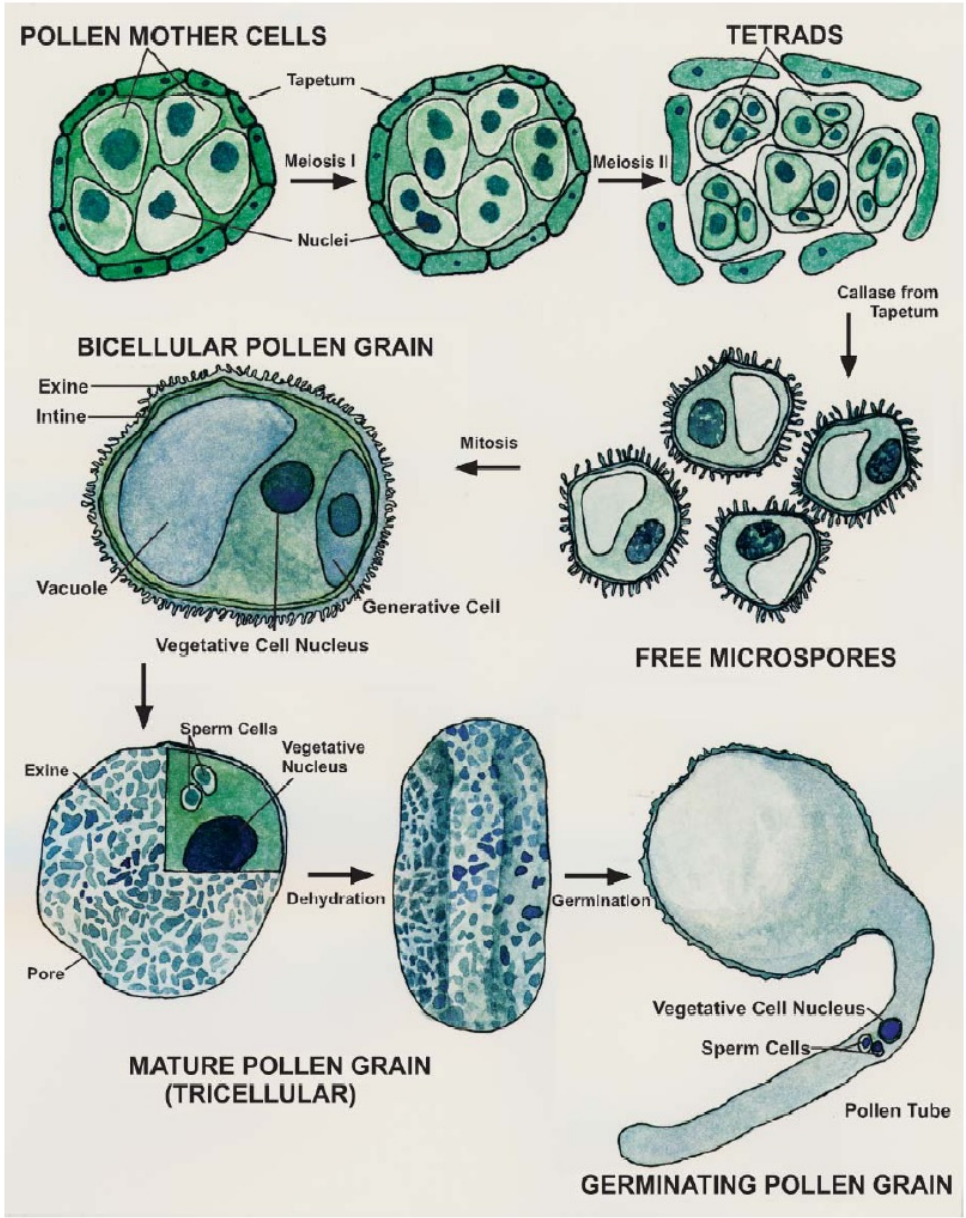
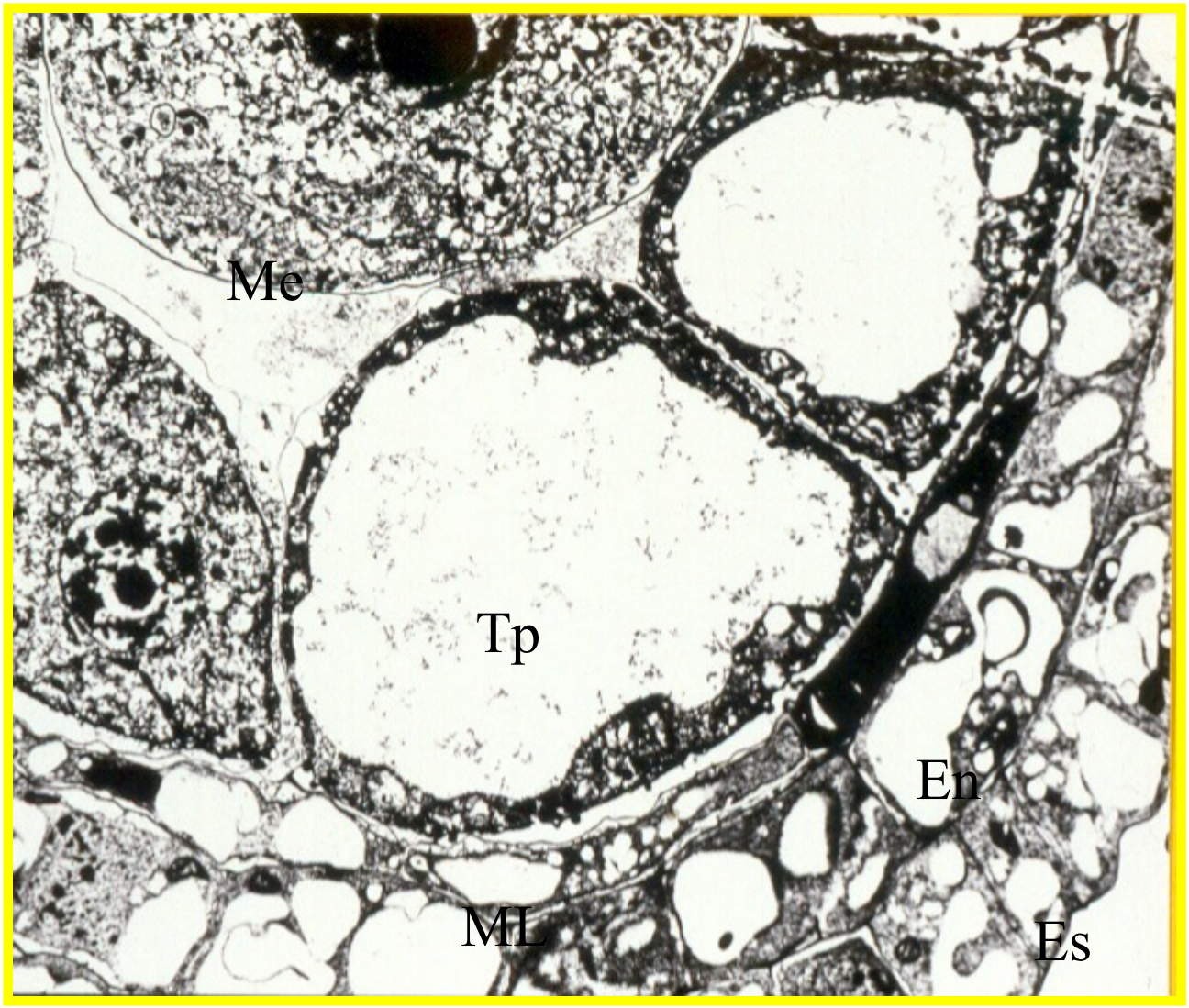
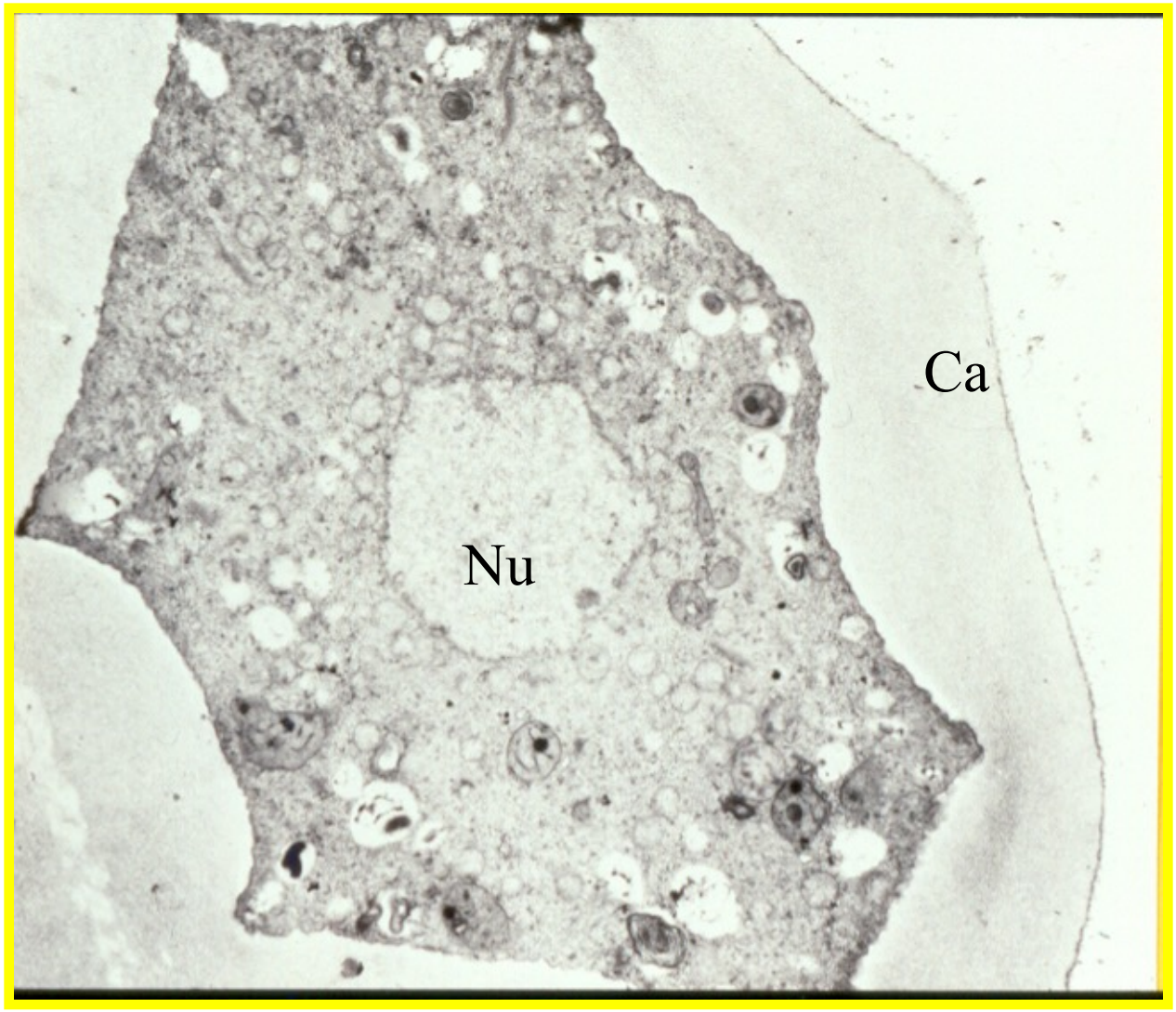


Figure 1. Scheme of Microsporogenesis.

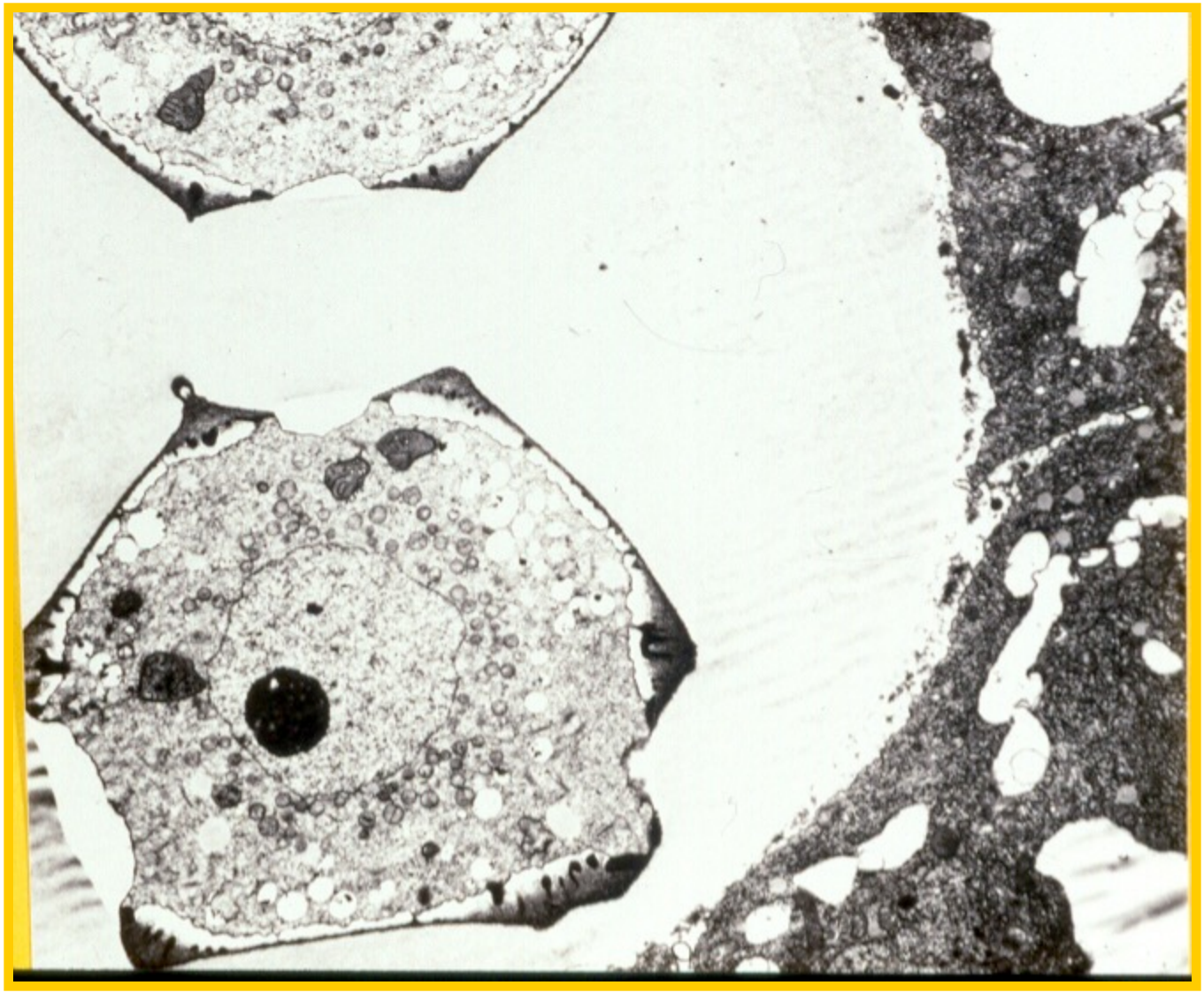
Meiociti



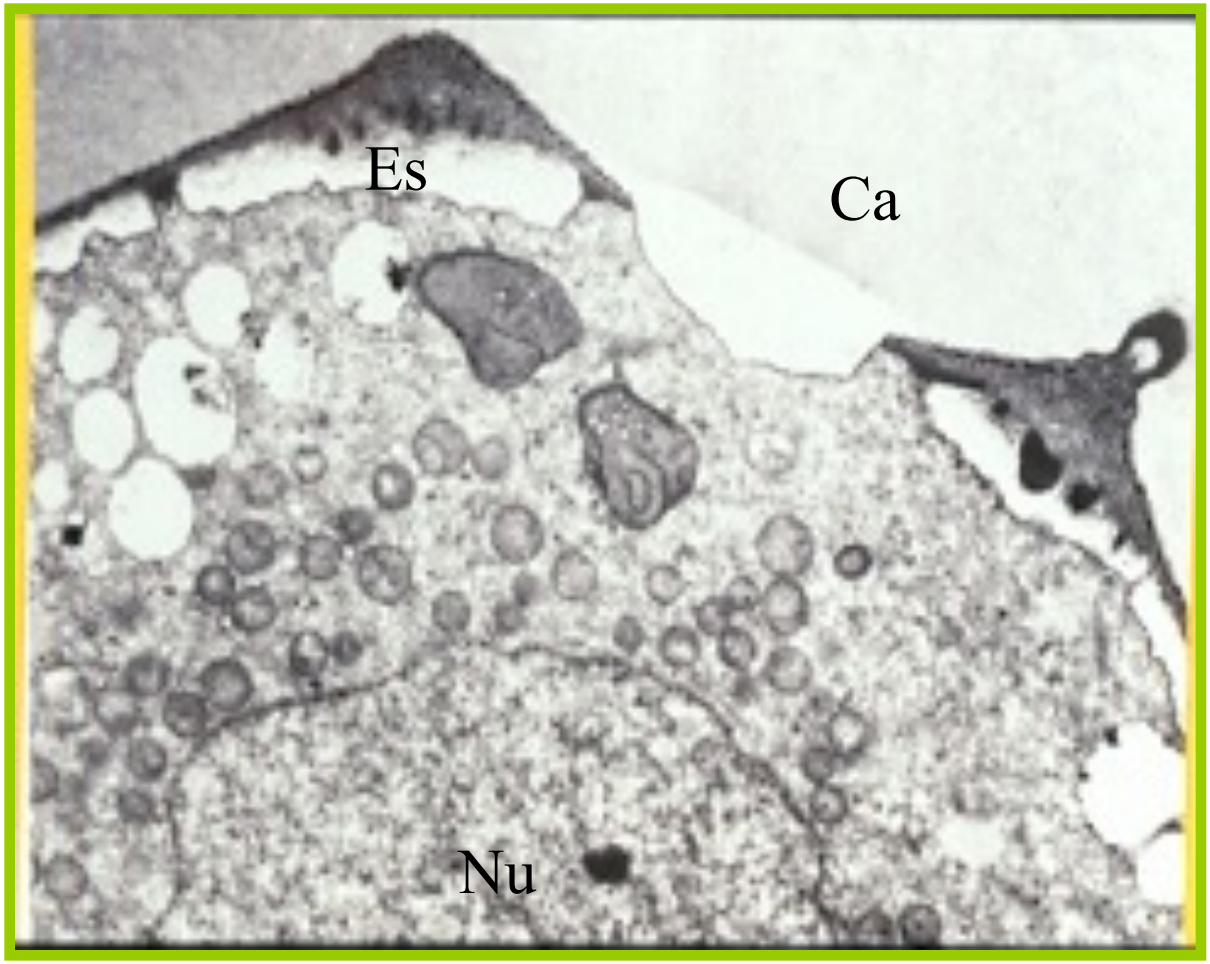
Tetrade



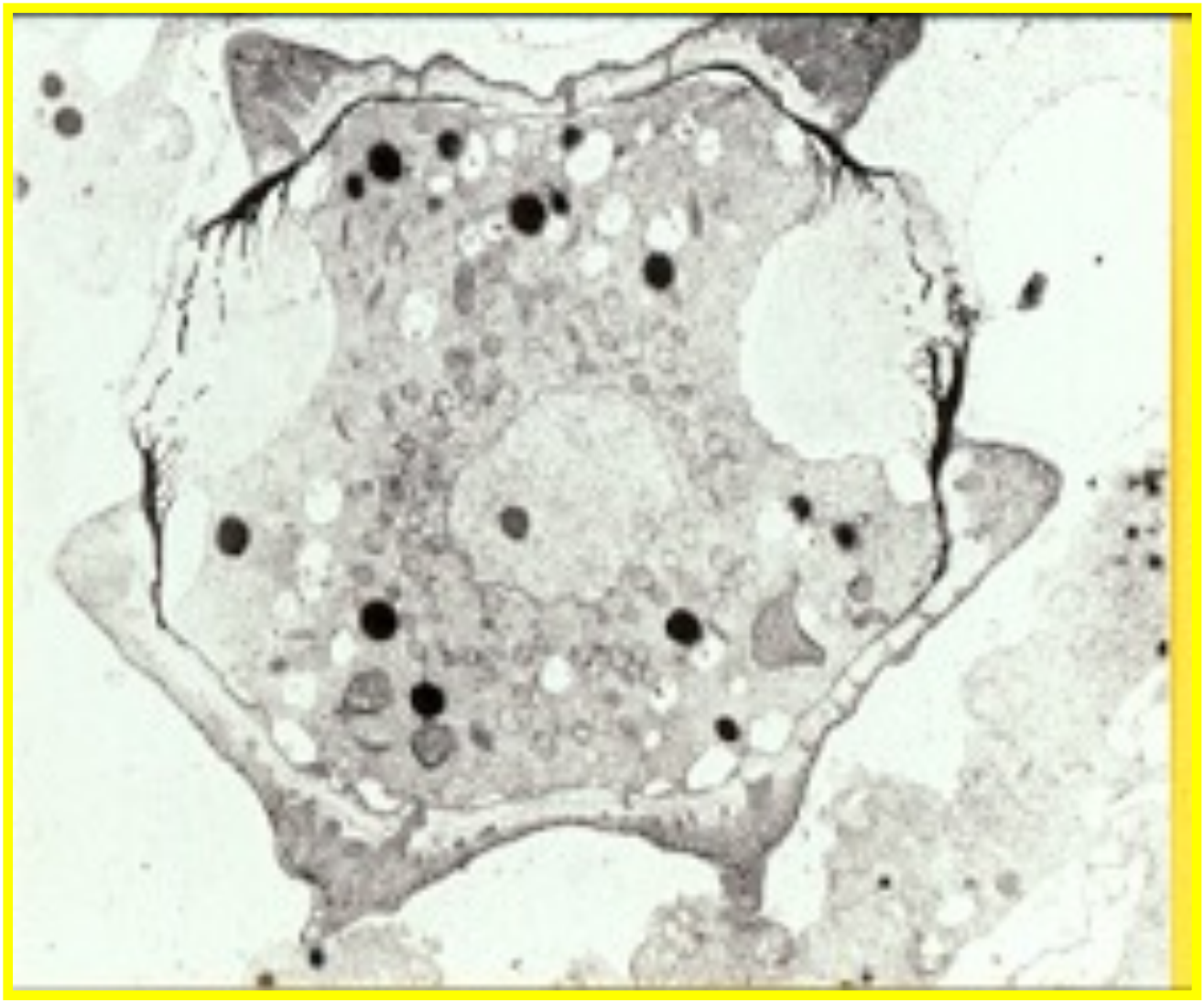
Formazione dell’esina



Giovane microspora

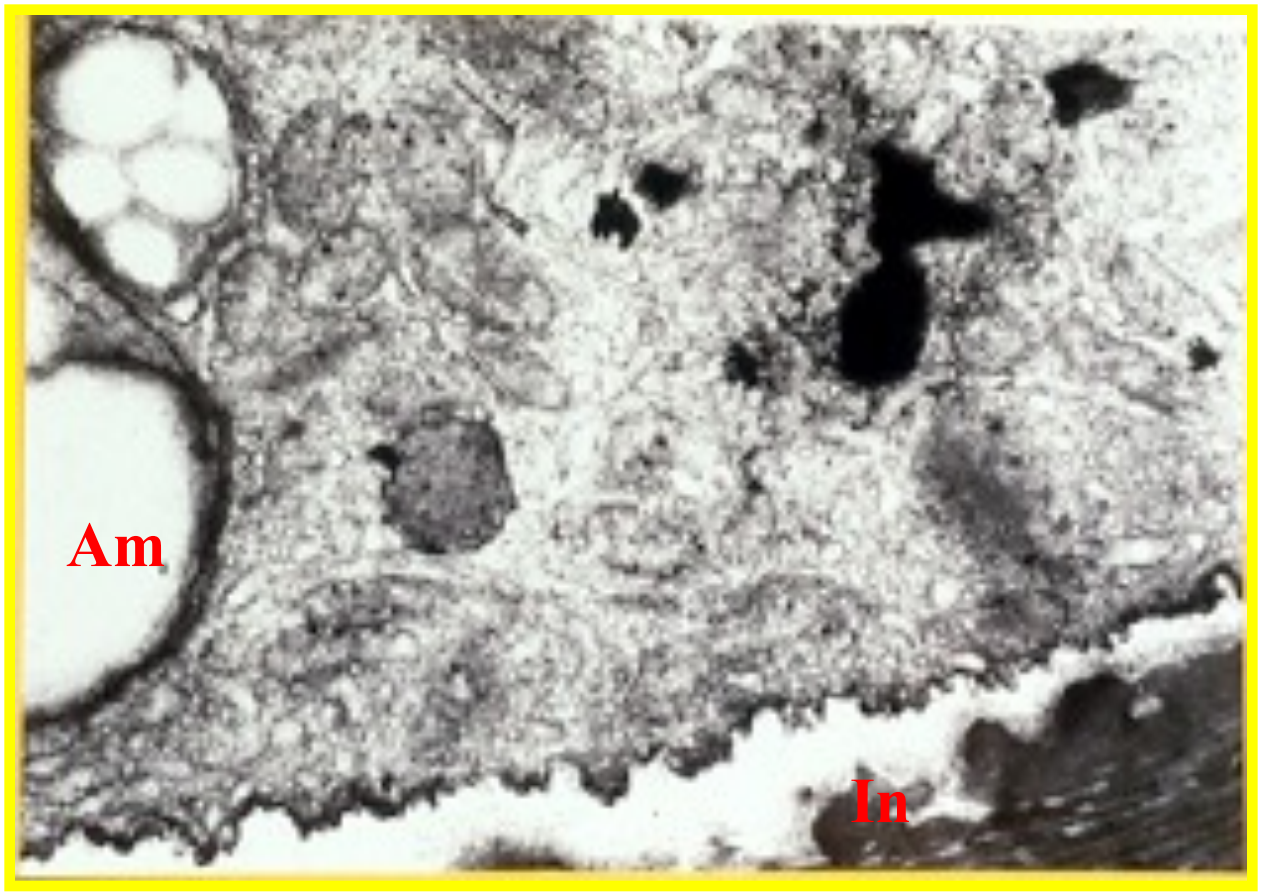


Formazione dei colpi



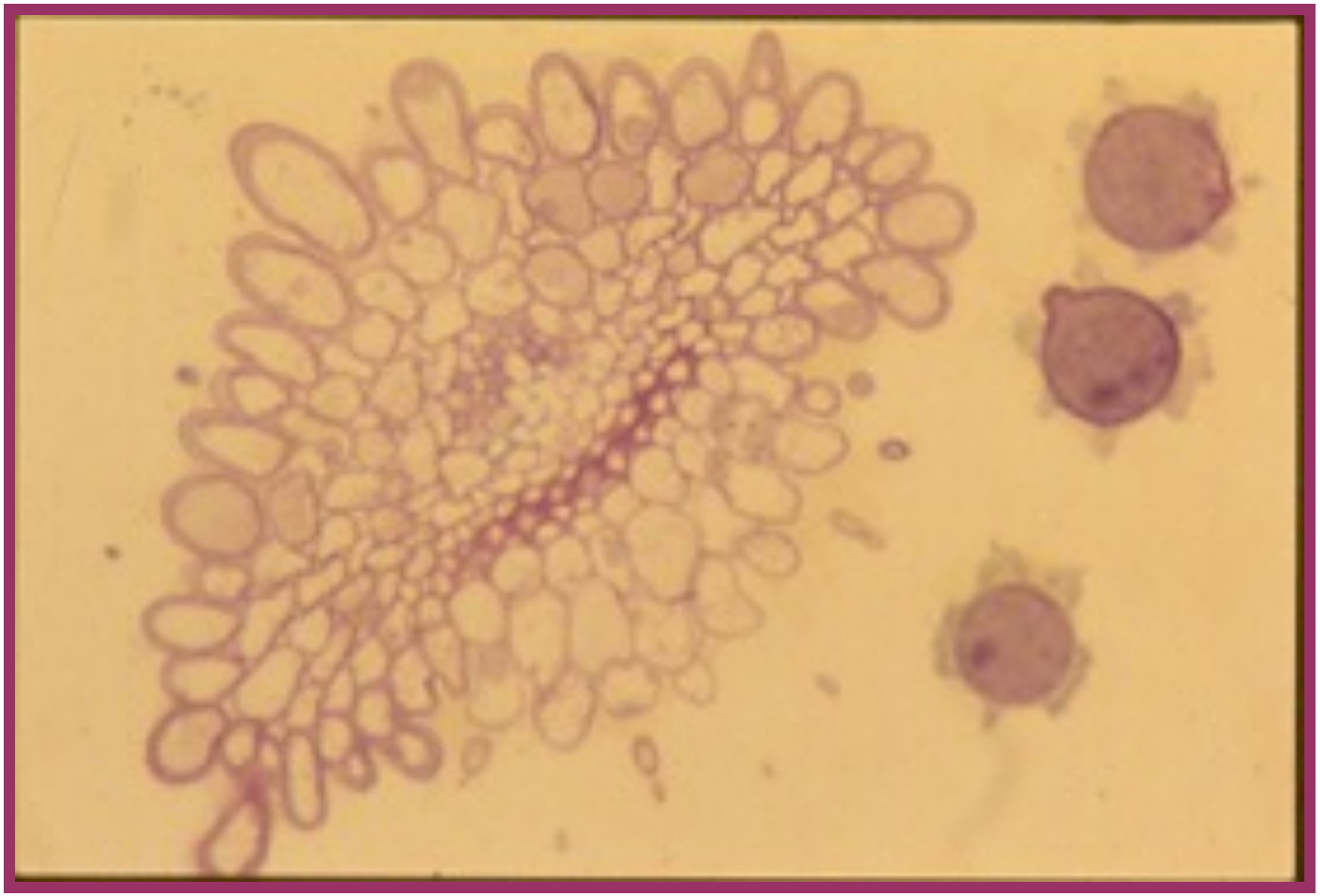
Degenerazione del tappeto

La formazione dell'intina nel polline



Deiescenza dell’antera

Polline trinucleato sullo stimma



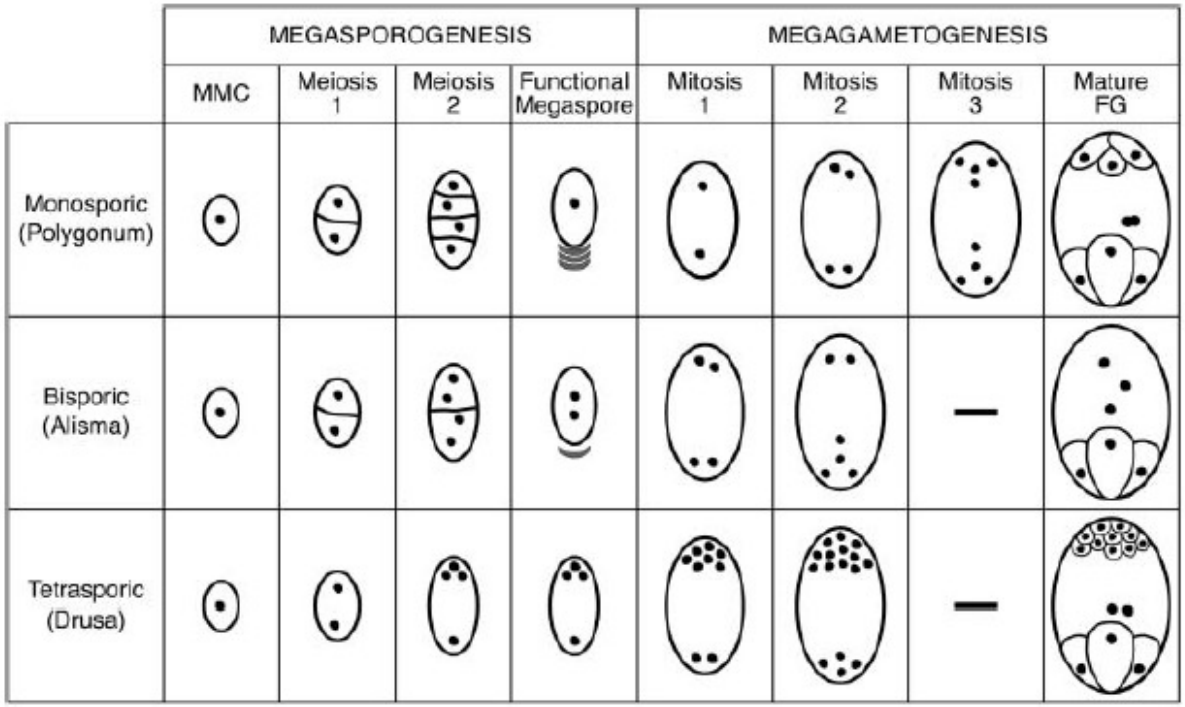


Figure 2. Patterns of Female Gametophyte Development Exhibited by Angiosperms.

Genera exhibiting these patterns are indicated in parentheses. More comprehensive descriptions of the variation among angiosperms can be found in several reviews (Maheshwari, 1950; Willemse and van Went, 1984; Haig, 1990; Huang and Russell, 1992; Russell, 2001). In this figure, the chalazal end of the female gametophyte is up and the micropylar end is down. FG, female gametophyte.

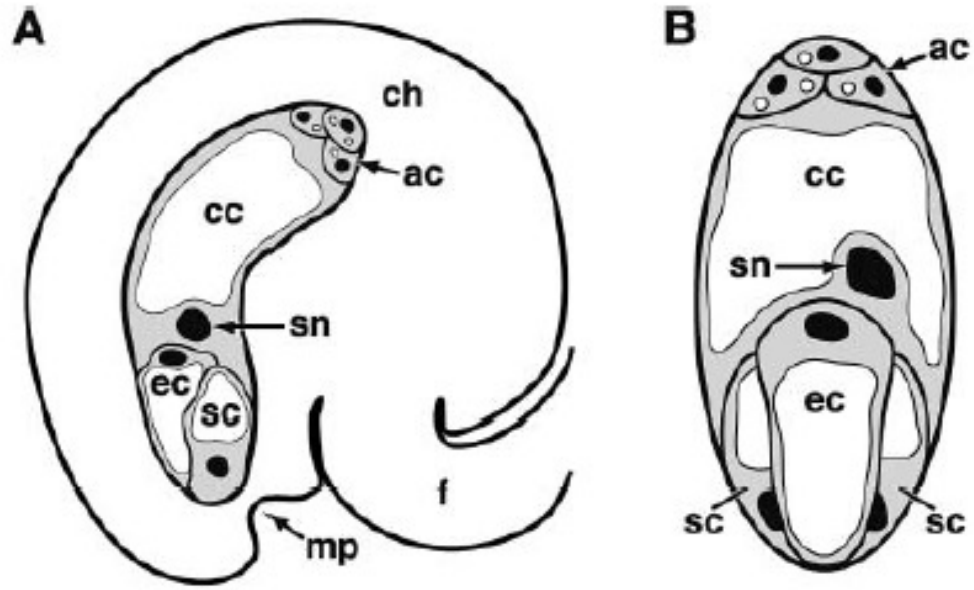
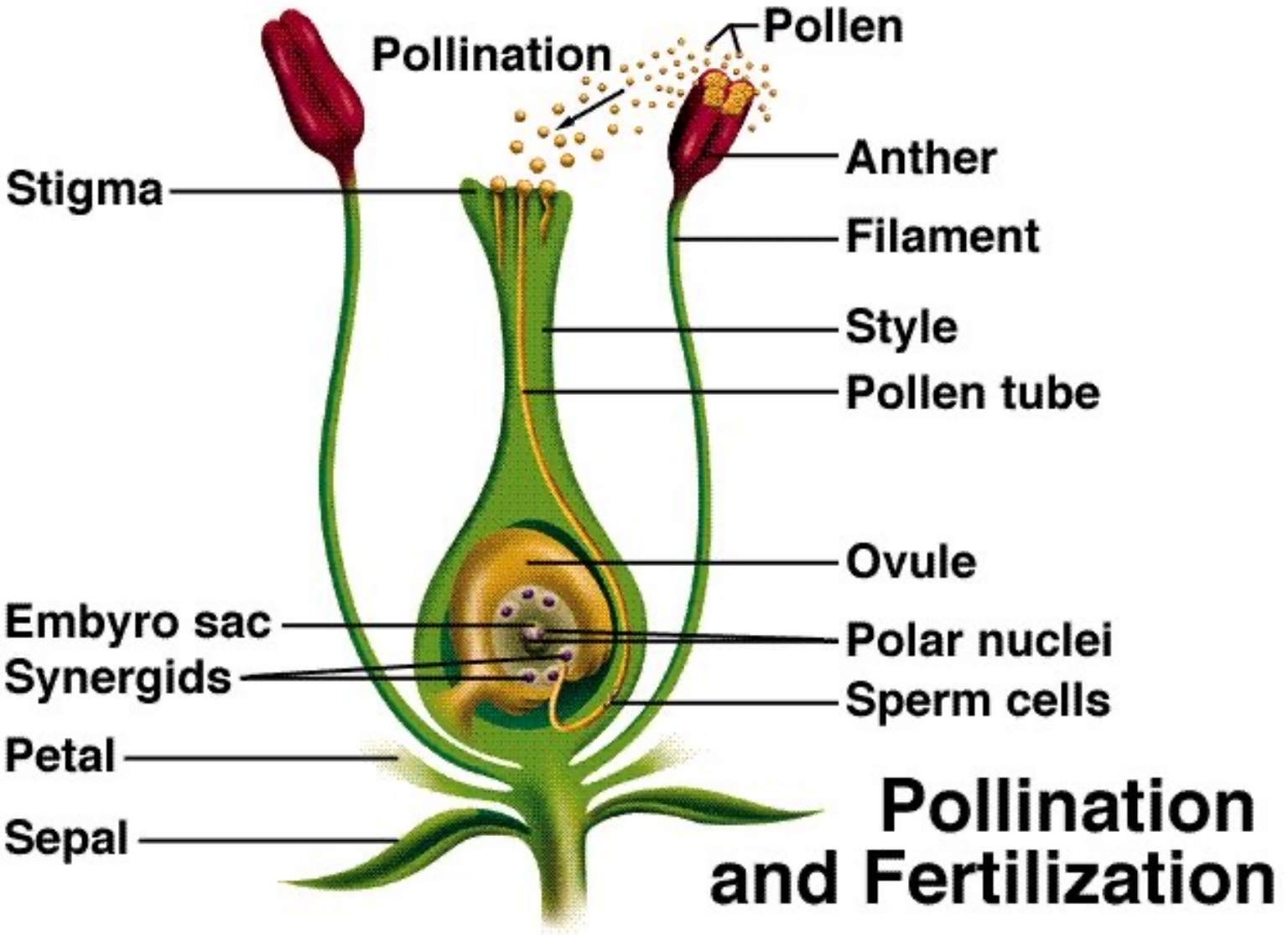


Figure 1. The Arabidopsis Female Gametophyte.

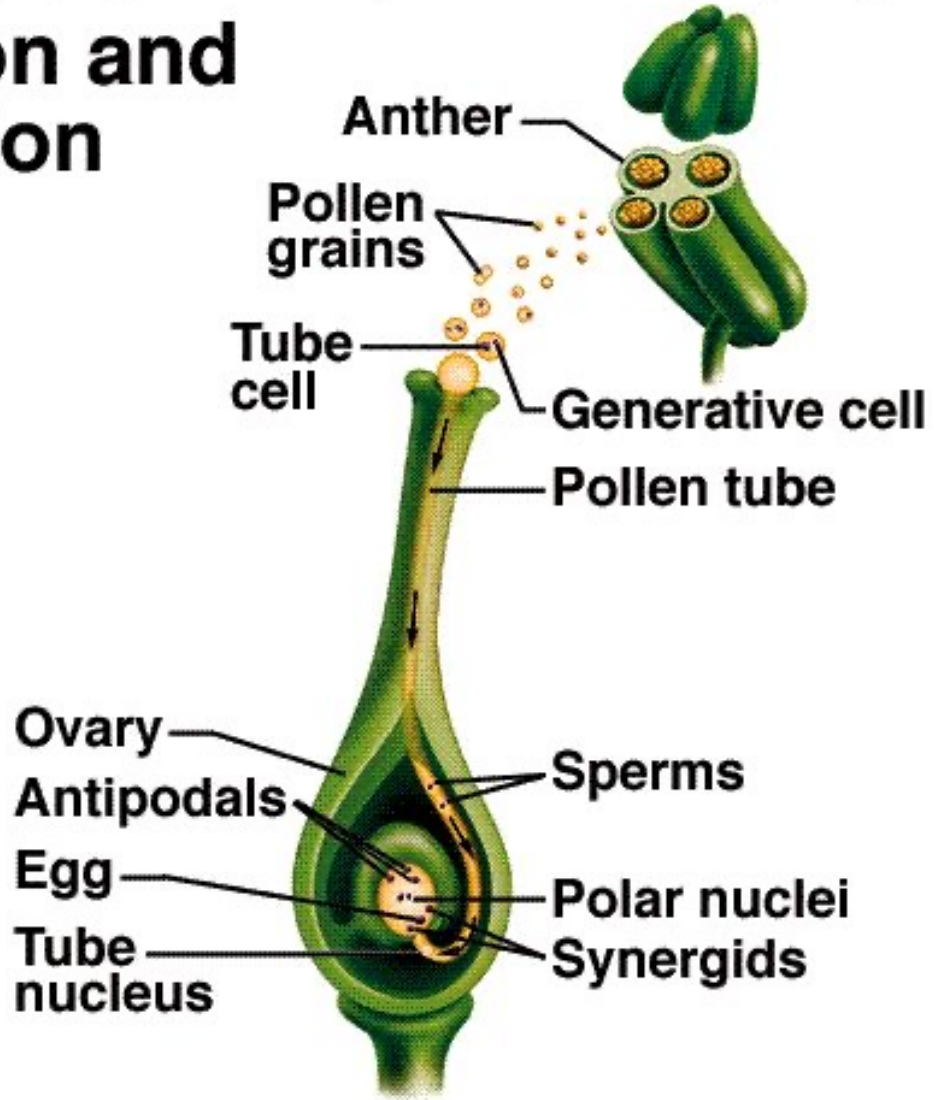
(A) Ovule.

(B) Female gametophyte.

The view in **(B)** is perpendicular to that in **(A)**. The mature female gametophyte in Arabidopsis is ~105 μm long and ~25 μm wide. The gray areas represent cytoplasm, the white areas represent vacuoles, and the black areas represent nuclei. ac, antipodal cells; cc, central cell; ch, chalazal region of the ovule; ec, egg cell; f, funiculus; mp, micropyle; sc, synergid cell; sn, secondary nucleus.

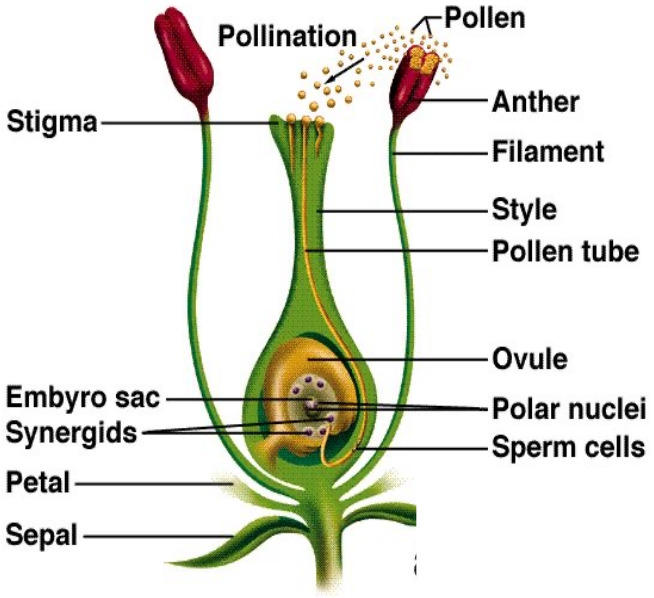


Pollination and Fertilization

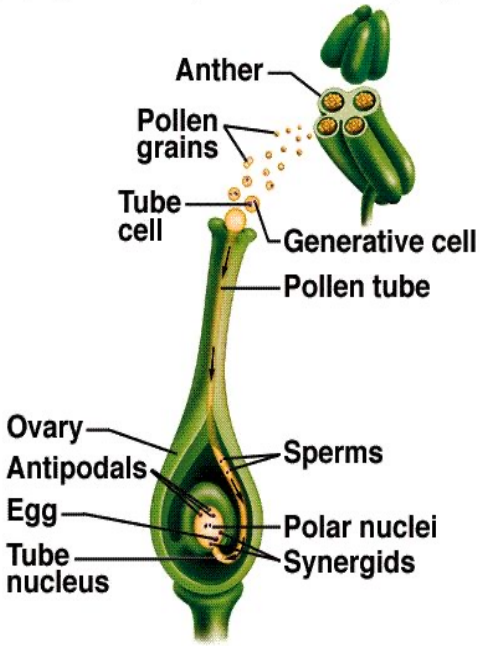


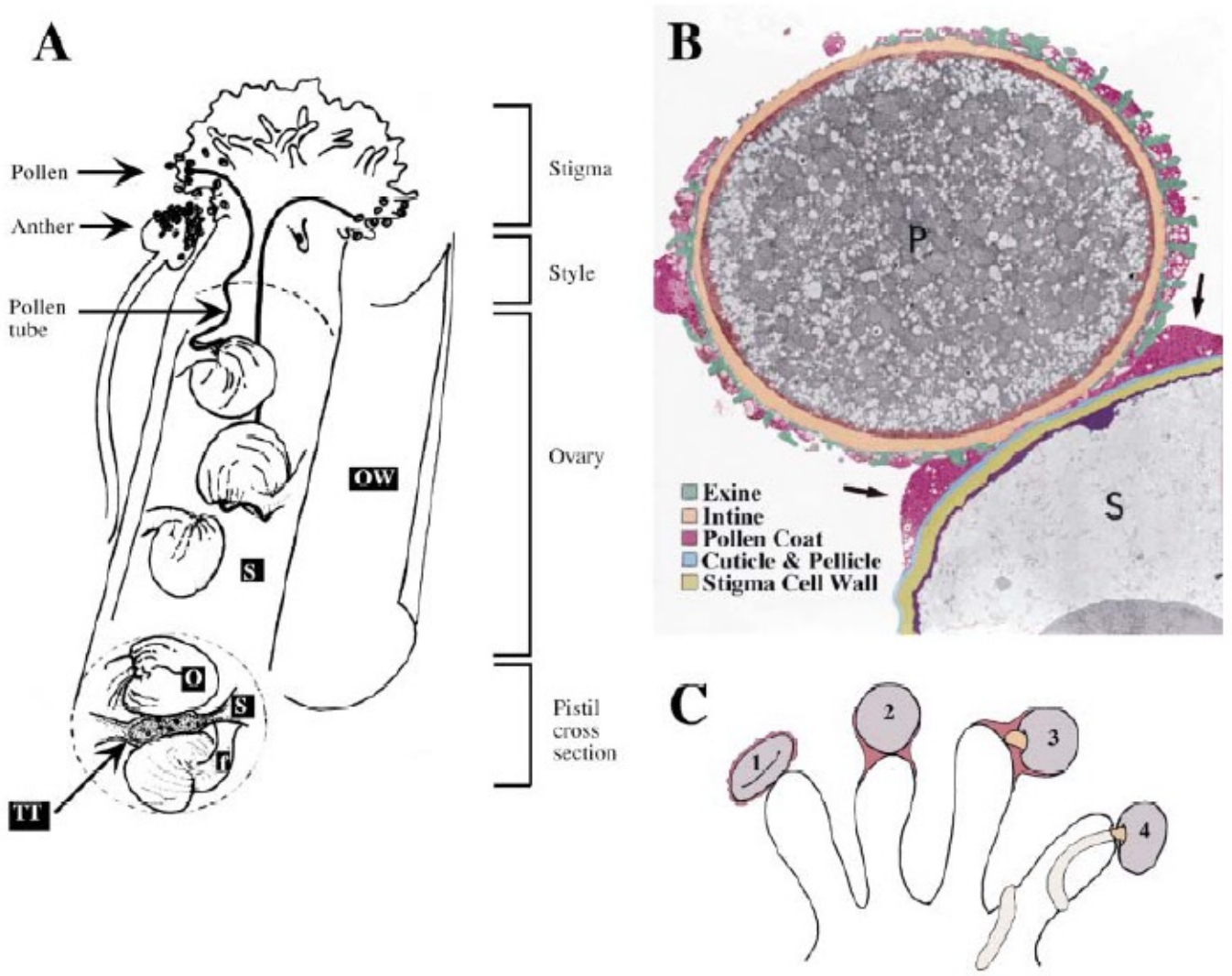
MODALITA' DI RIPRODUZIONE NELLE PIANTE

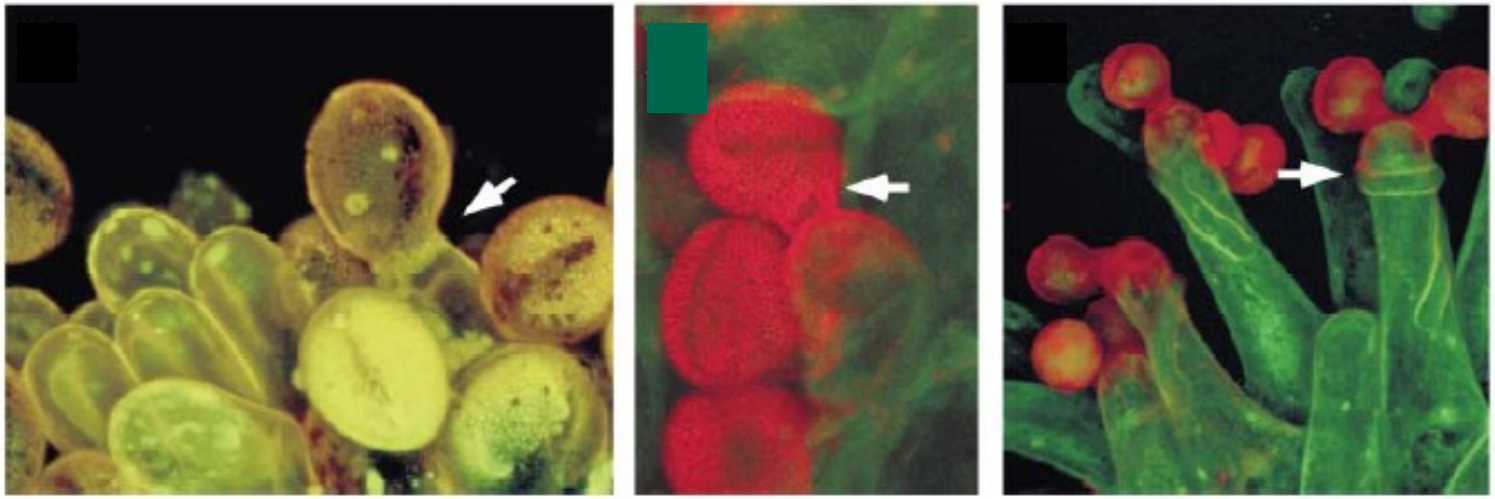
Piante autogame

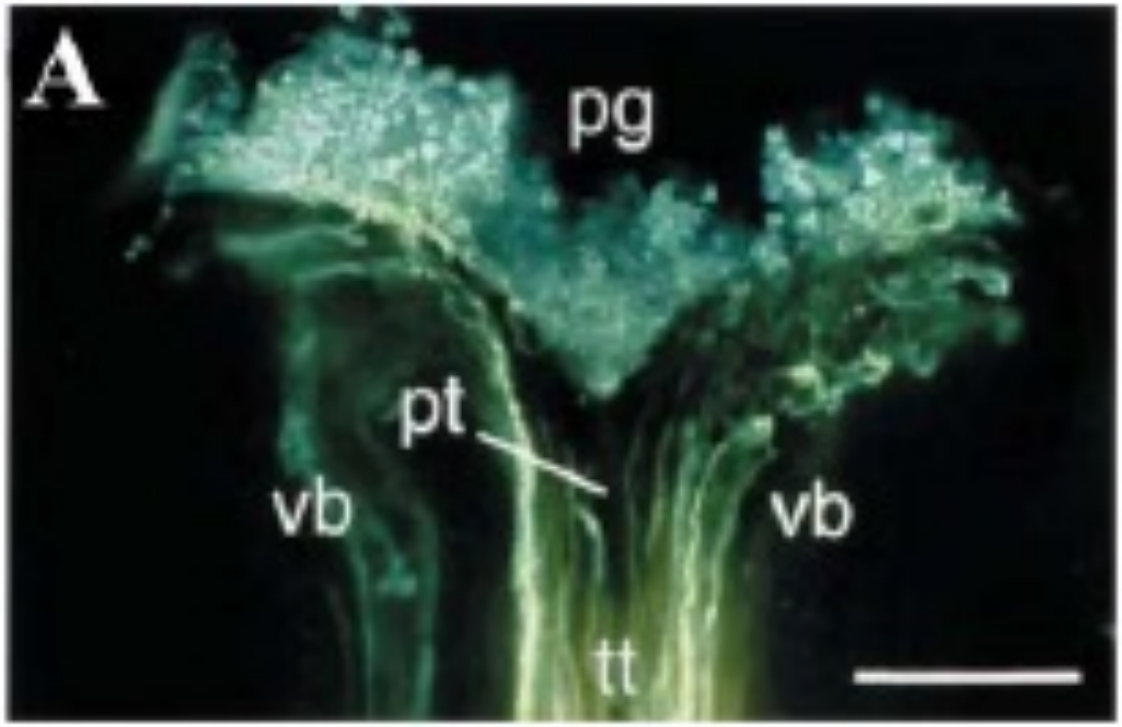


Piante allogame




A
Pollen
Anther
Pollen tube
OW
S
O
S
r
TT
Stigma
Style
Ovary
Pistil cross section
B
P
S
Exine
Intine
Pollen Coat
Cuticle & Pellicle
Stigma Cell Wall
C
1
2
3
4

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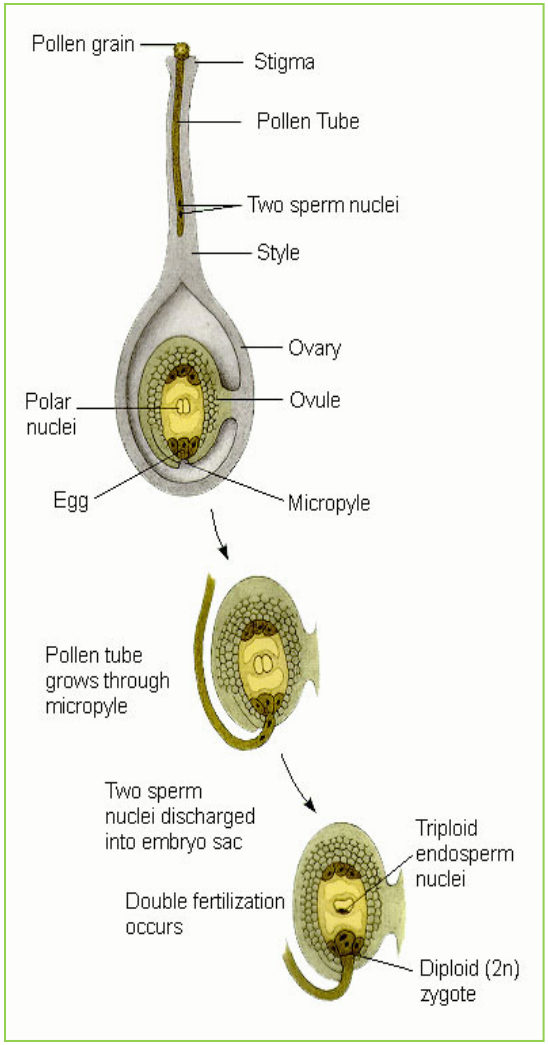
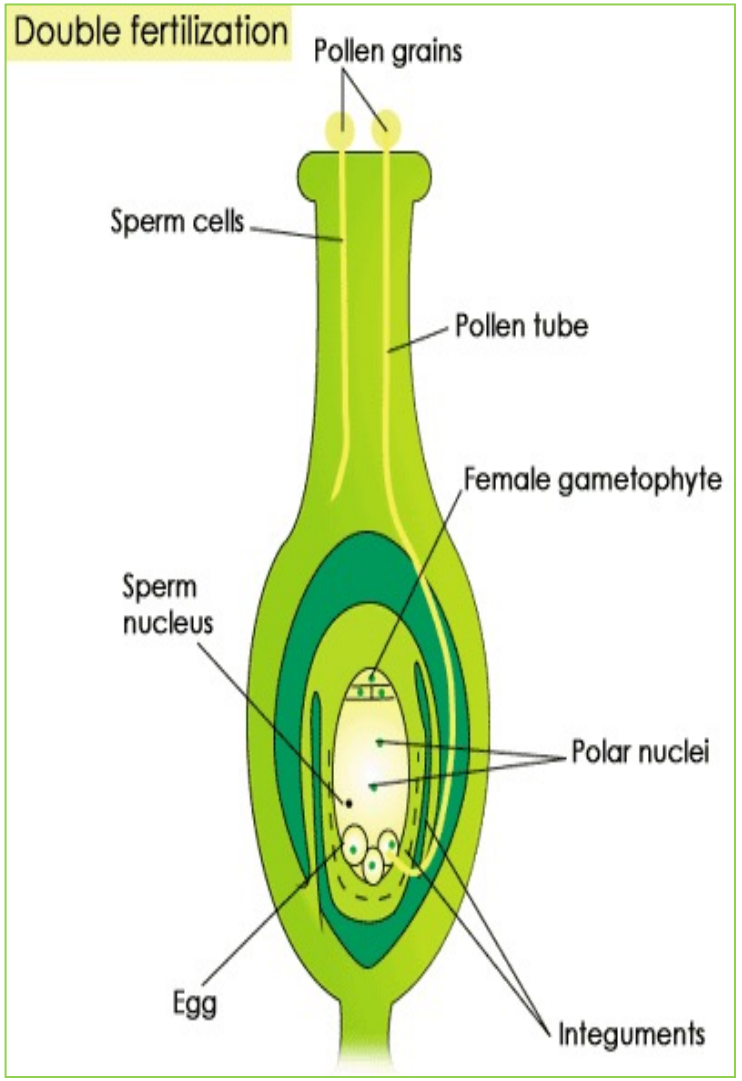
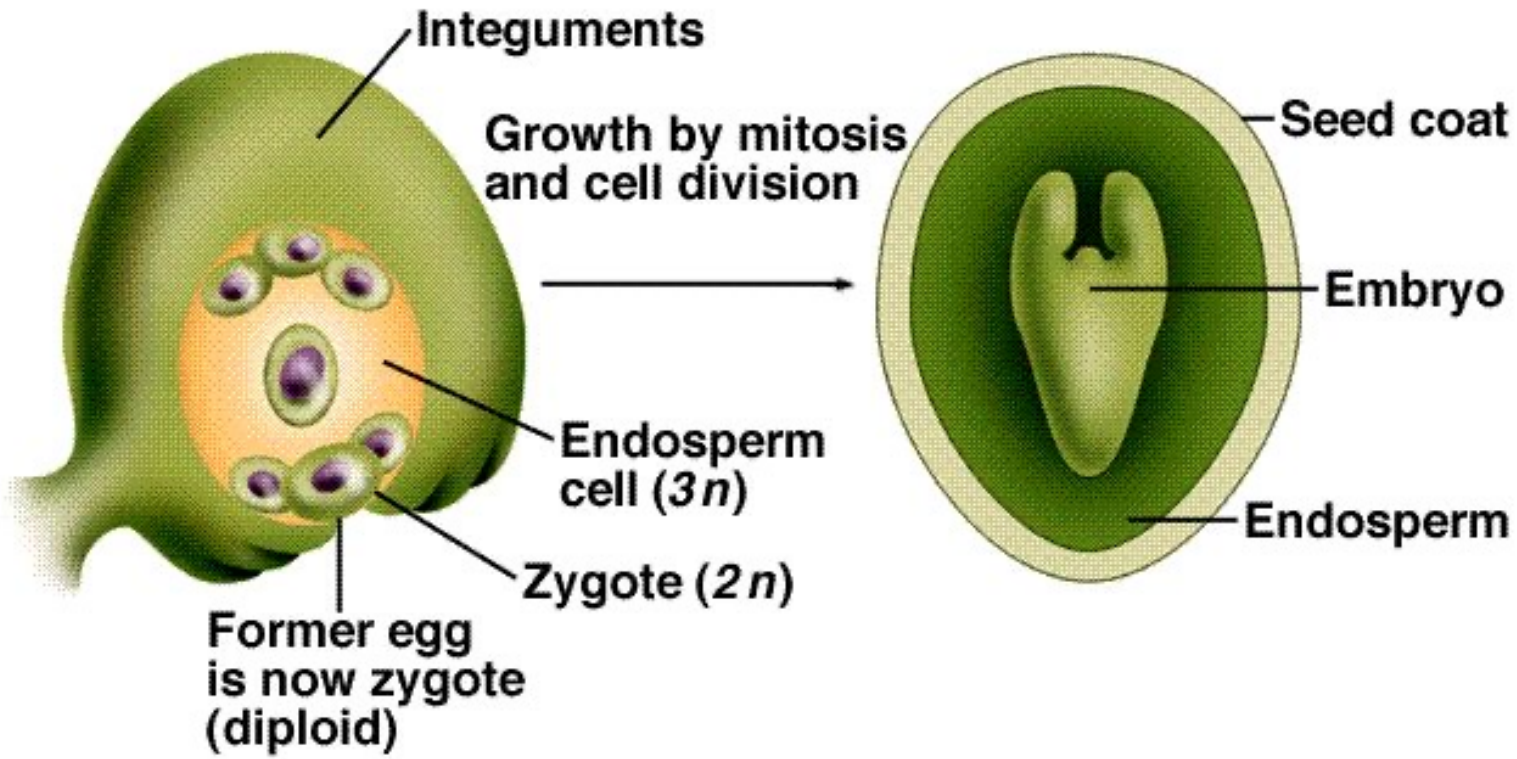
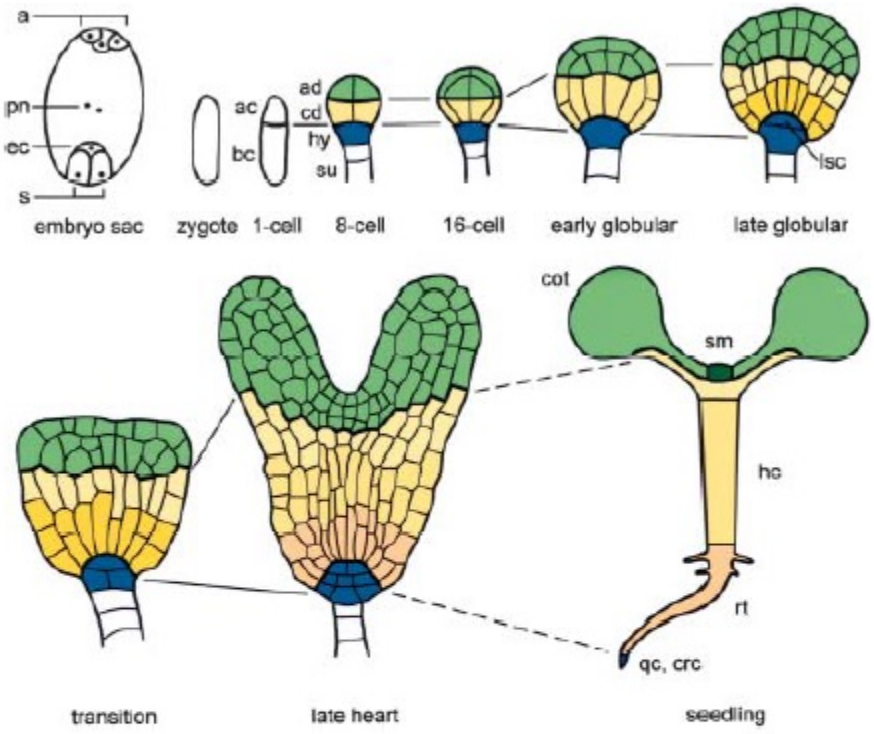

Pollen grain
Stigma
Pollen Tube
Two sperm nuclei
Style
Ovary
Polar nuclei
Ovule
Egg
Micropyle
Pollen tube grows through micropyle
Two sperm nuclei discharged into embryo sac
Triploid endosperm nuclei
Double fertilization occurs
Diploid (2n) zygote


Double fertilization
Pollen grains
Sperm cells
Pollen tube
Female gametophyte
Sperm nucleus
Polar nuclei
Egg
Integuments

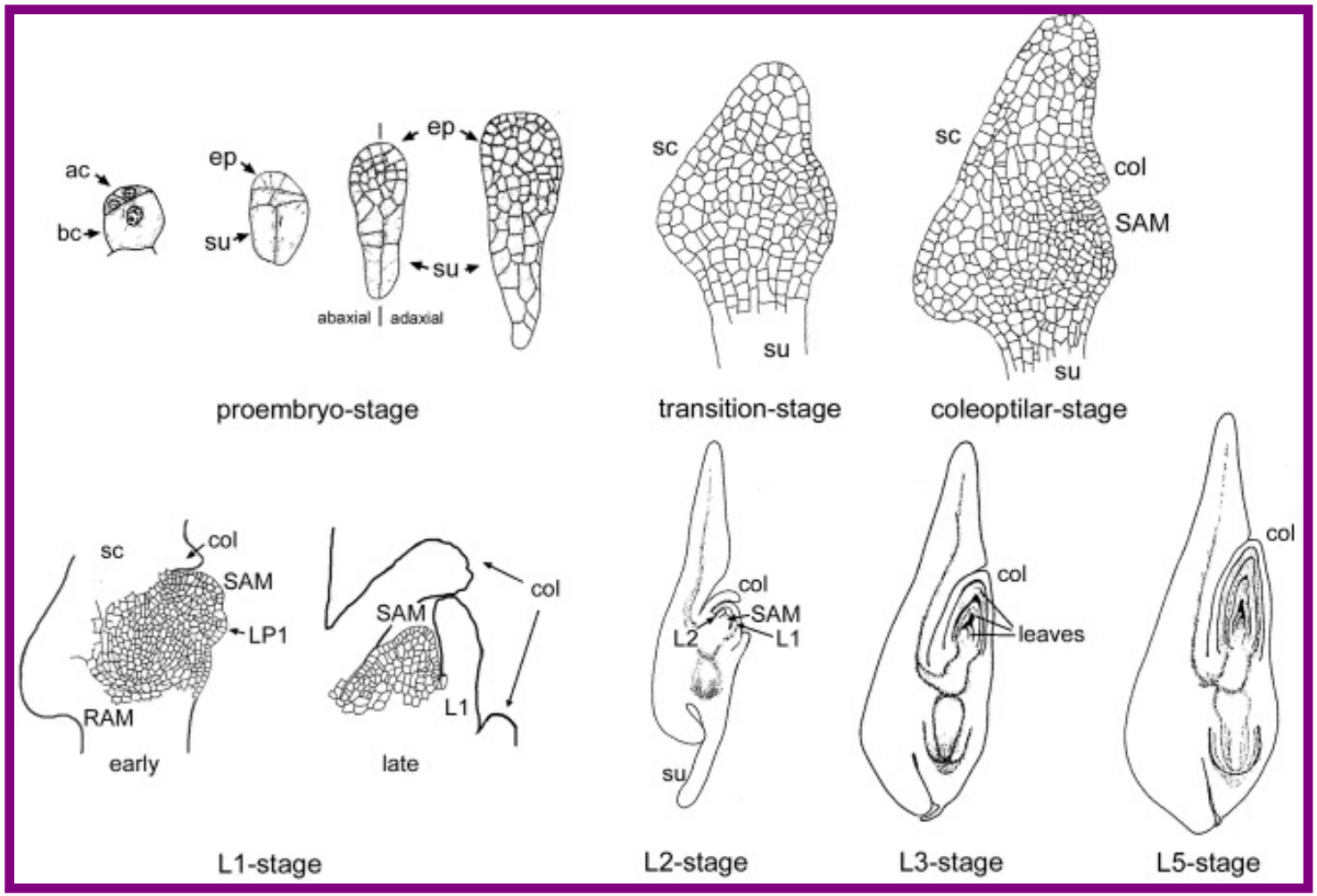
Zygote



Embriogenesi nelle dicotiledoni



Embriogenesi nelle monocotiledoni



I due compartimenti del seme

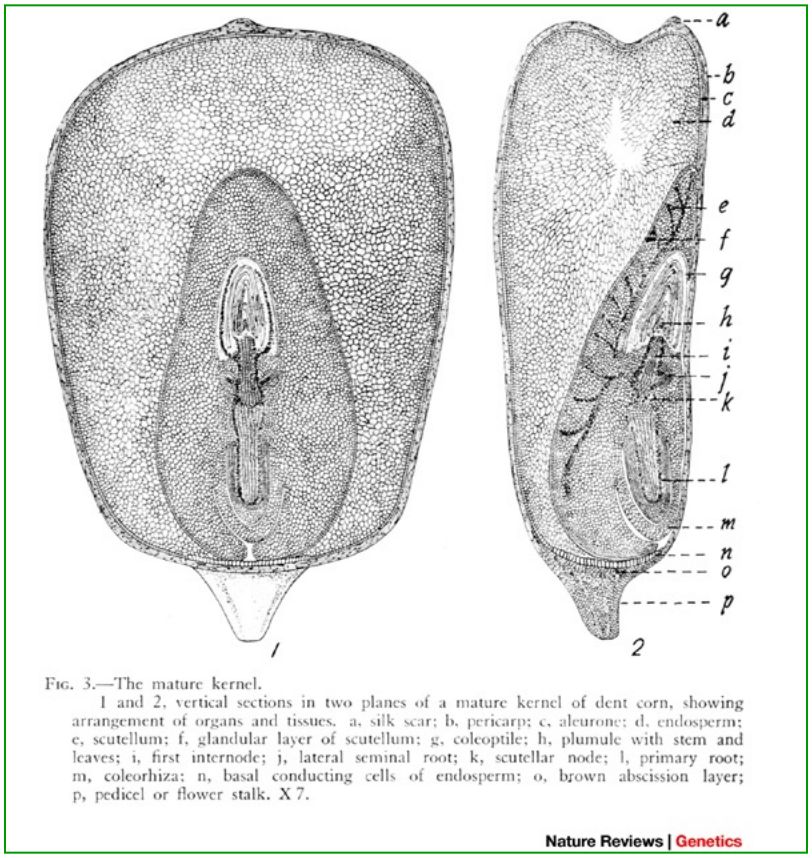


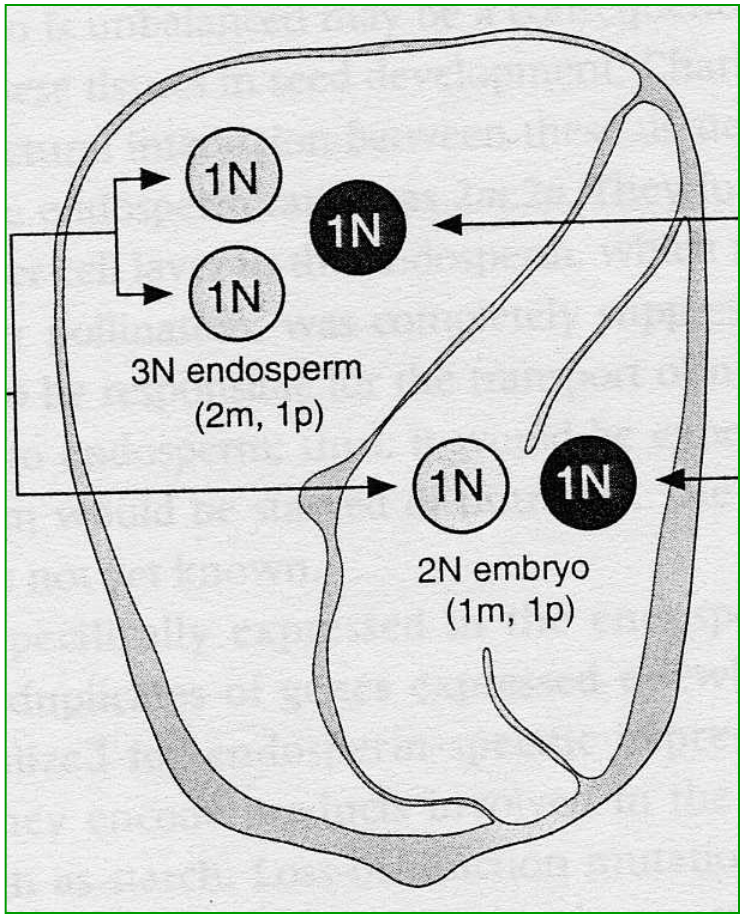
FIG. 3.—The mature kernel.
1 and 2, vertical sections in two planes of a mature kernel of dent corn, showing arrangement of organs and tissues. a, silk scar; b, pericarp; c, aleurone; d, endosperm; e, scutellum; f, glandular layer of scutellum; g, coleoptile; h, plumule with stem and leaves; i, first internode; j, lateral seminal root; k, scutellar node; l, primary root; m, coleorhiza; n, basal conducting cells of endosperm; o, brown abscission layer; p, pedicel or flower stalk. X 7.

- Embrione:
  - Nuovo organismo
- Endosperma:
  - Tessuto altamente specializzato con un preciso programma di sviluppo

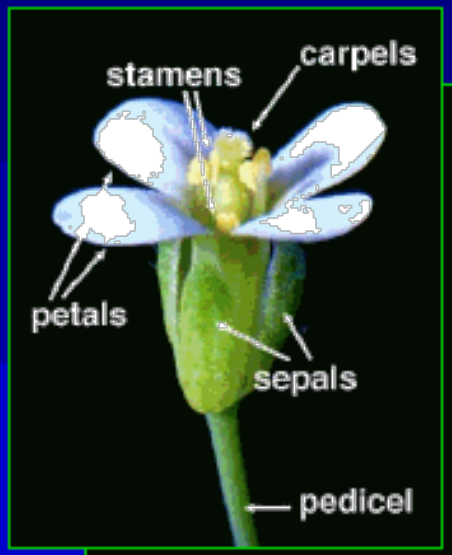
Doppia fecondazione e differente ploidia nei due compartimenti del seme.

- Embrione : 2N (1m:1p)
- Endosperma : 3N (2m:1p)

Il rapporto 2:1 è necessaria per un regolare sviluppo dell'endosperma.



--Model system- Arabidopsis thaliana



- Genome project
- Small size
- Fast growing (6wks)
- Genetics
- Transformation (able to insert genes)

Anche il genoma di vite è sequenziato

I GENOMI ITALIANI

- Vite
- Melo
- Fragola
- Pesco
- Citrus
- Pero
- Caffè

- Olivo
- Ciliegio

- Pomodoro
- Patata
- Orzo
- Solanum sp.
- Frumento
- Abete rosso