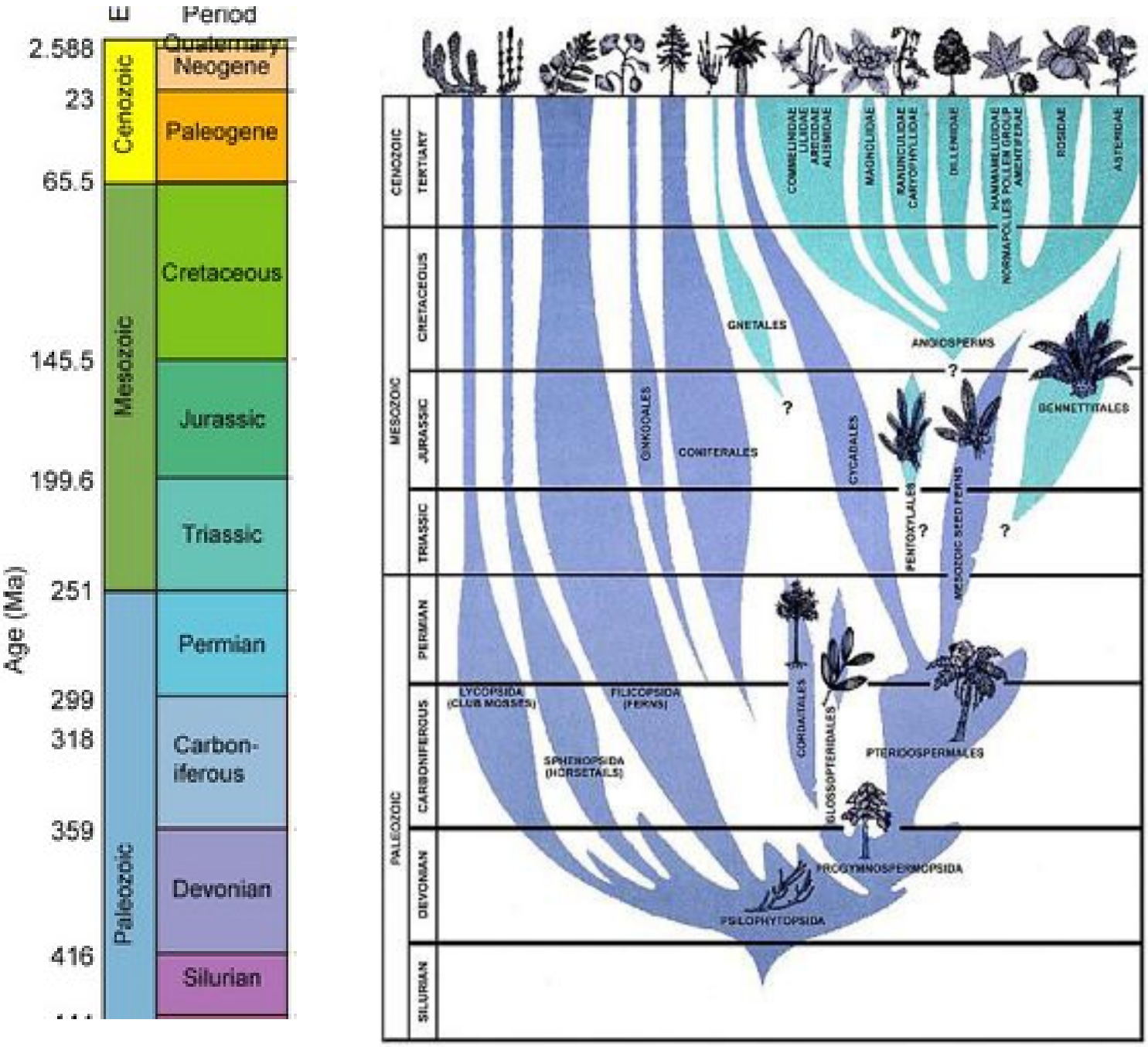
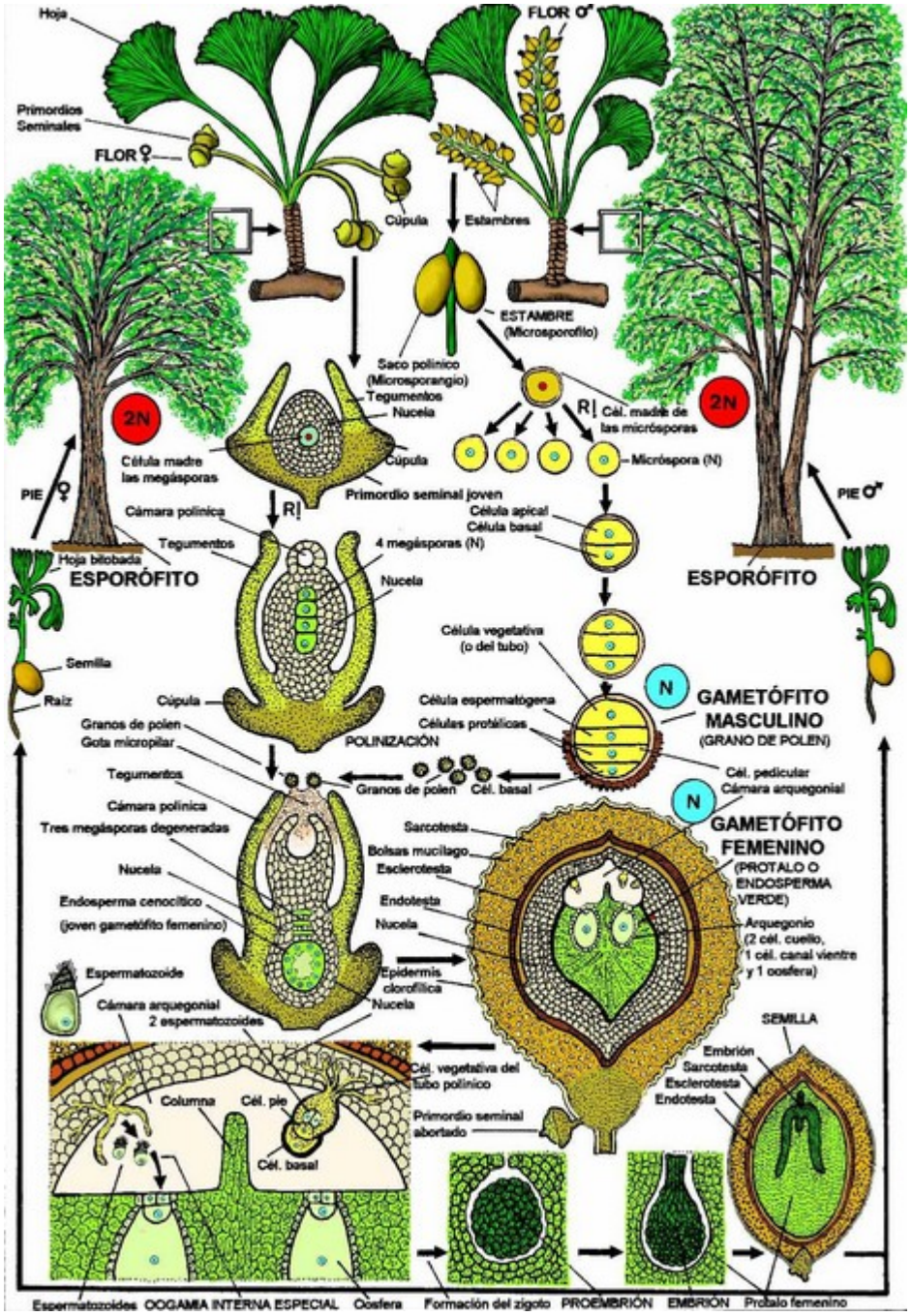
CORSO DI BOTANICA SISTEMATICA

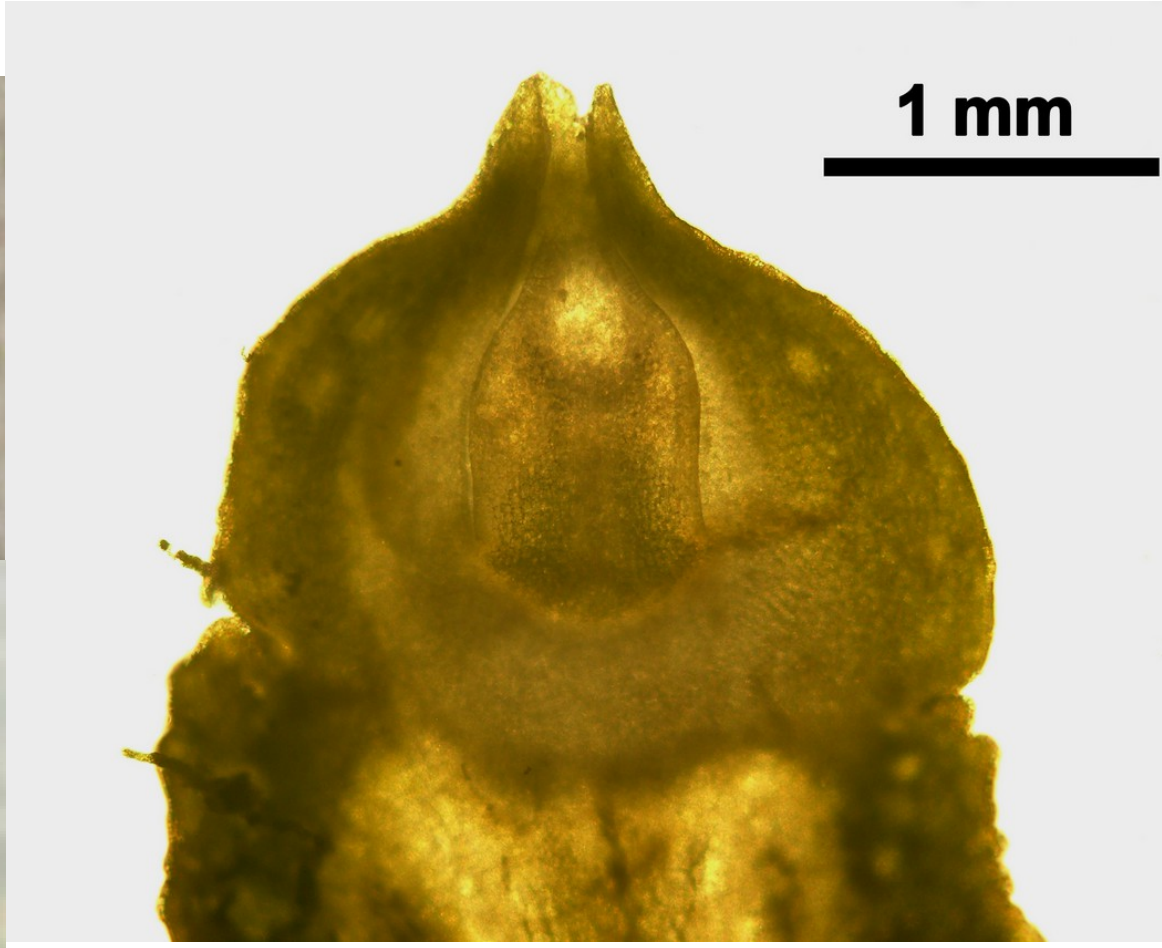
LEZIONE 6

Evoluzione dei cicli metagenetici (seconda parte)

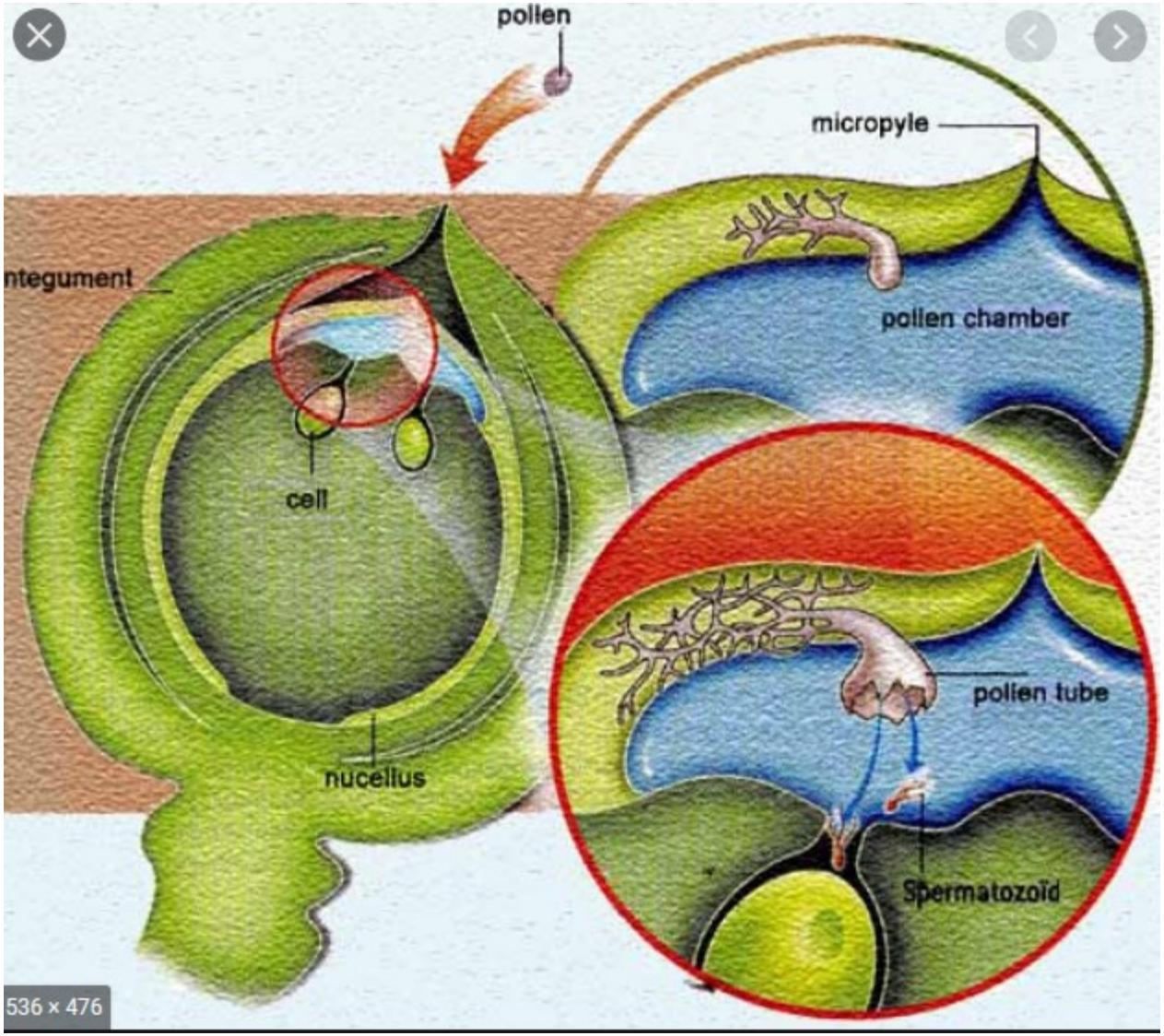

Era
Period
Age (Ma)
2.588
23
65.5
145.5
199.6
251
299
318
359
416
Cenozoic
Mesozoic
Paleozoic
Quaternary
Neogene
Paleogene
Cretaceous
Jurassic
Triassic
Permian
Carbon-
iferous
Devonian
Silurian
CENOZOIC
MESOZOIC
PALEOZOIC
TERTIARY
CRETACEOUS
JURASSIC
TRIASSIC
PERMIAN
CARBONIFEROUS
DEVONIAN
SILURIAN
COMMELINIDAE
LILIIDAE
ARECIDAE
ALISMIDAE
MAGNOLIIDAE
RANUNCULIIDAE
CARYOPHYLLIIDAE
DILLENIIDAE
HAMAMELIDAE
NORMAPOLLES POLLEN GROUP
AMENTIFERAE
ROSIDAE
ASTERIDAE
GNETALES
ANGIOSPERMS
BENNETTITALES
GINKGOALES
CONIFERALES
CYCADALES
PENTOXYLALES
MESOZOIC SEED FERNS
LYCOPSIDA
(CLUB MOSSES)
FILICOPSIDA
(FERNS)
SPHENOPSIDA
(HORSETAILS)
CORDAITALES
GLOSSOPTERIDALES
PTERIDOSPERMALES
PROGYMNOSPERMOPSIDA
PSILOPHYTOPSIDA

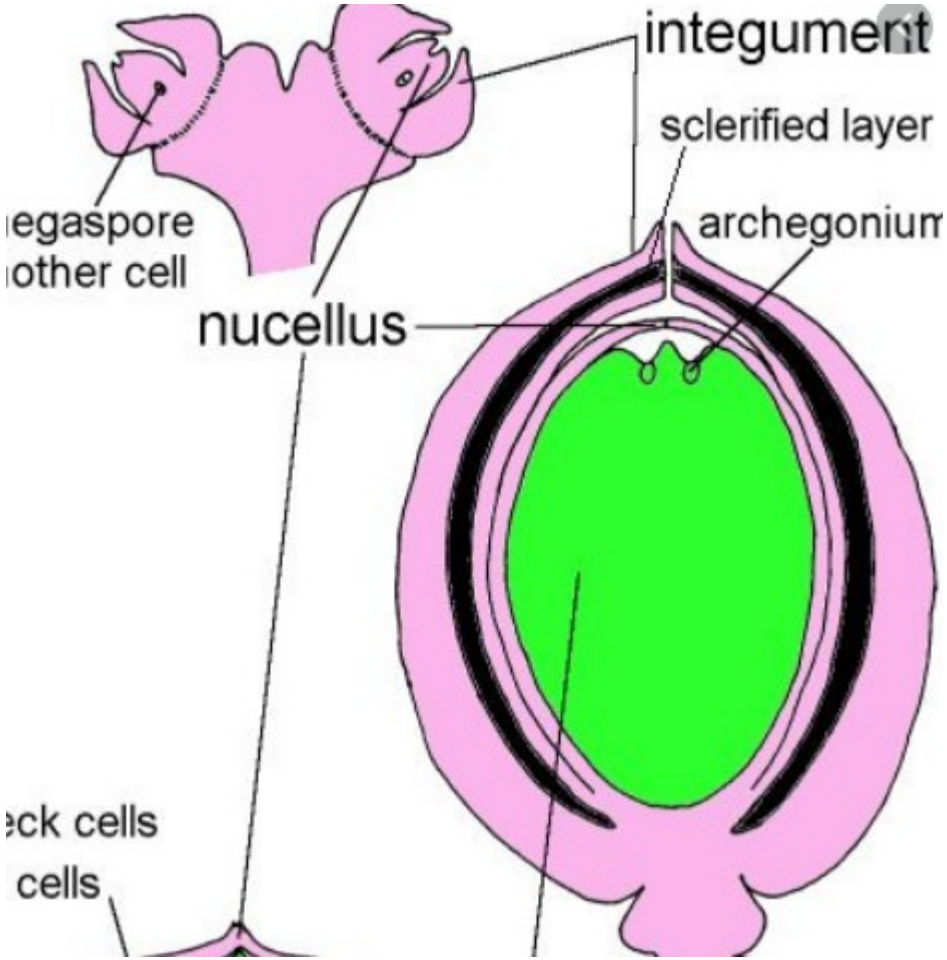

Lucas Attwell 2019

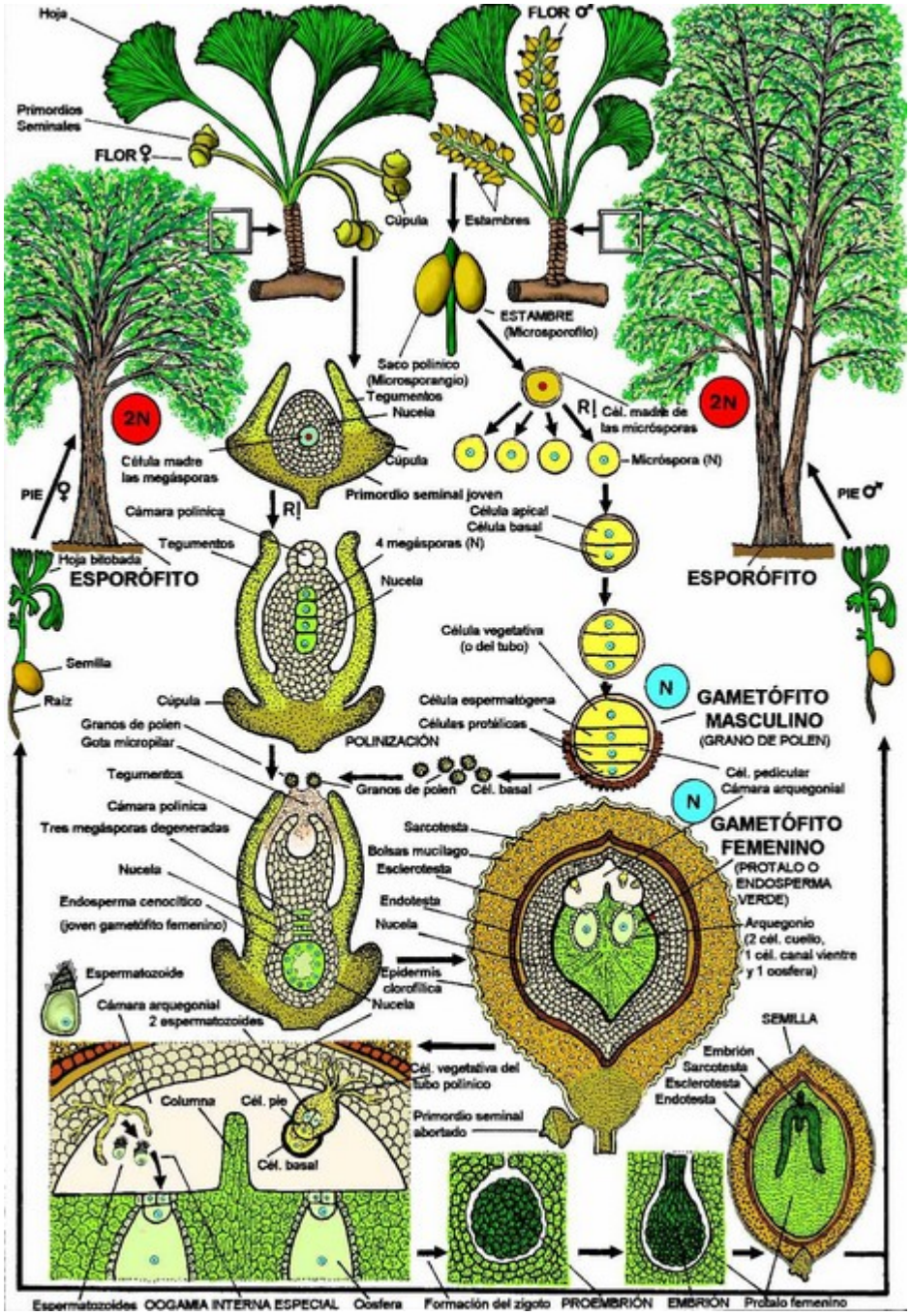

Hoja
FLOR ♂
Primordios Seminales
FLOR ♀
Cúpula
Estambres
ESTAMBRE (Microsporofilo)
Saco polínico (Microsporangio)
Tegumentos
Nucela
2N
Célula madre las megásporas
Cúpula
Primordio seminal joven
R!
Cél. madre de las micróspora
Micróspora (N)
PIE ♀
PIE ♂
Cámara polínica
Tegumentos
Hoja bilobada
ESPORÓFITO
4 megásporas (N)
Célula apical
Célula basal
Nucela
Semilla
Raiz
Cúpula
Célula vegetativa (o del tubo)
Célula espermatógena
Células protálicas
N
GAMETÓFITO MASCULINO
(GRANO DE POLEN)
Granos de polen
Gota micropilar
POLINIZACIÓN
Granos de polen
Cél. basal
Cél. pedicular
Cámara arquegonial
Tegumentos
Cámara polínica
Tres megásporas degeneradas
Nucela
Endosperma cenocítico
(joven gametófito femenino)
Sarcotesta
Bolsas mucilago
Esclerotesta
Endotesta
Nucela
GAMETÓFITO FEMENINO
(PROTALO O ENDOSPERMA VERDE)
Arquegonio
(2 cél. cuello, 1 cél. canal vientre y 1 oosfera)
Espermatozoide
Cámara arquegonial
2 espermatozoides
Epidermis clorofílica
Nucela
SEMILLA
Embrión
Sarcotesta
Esclerotesta
Endotesta
Cél. vegetativa del tubo polínico
Columna
Cél. pie
Cél. basal
Primordio seminal abortado
Espermatozoides
OOGAMIA INTERNA ESPECIAL
Oosfera
Formación del zigoto
PROEMBRIÓN
EMBRIÓN
Protalo femenino

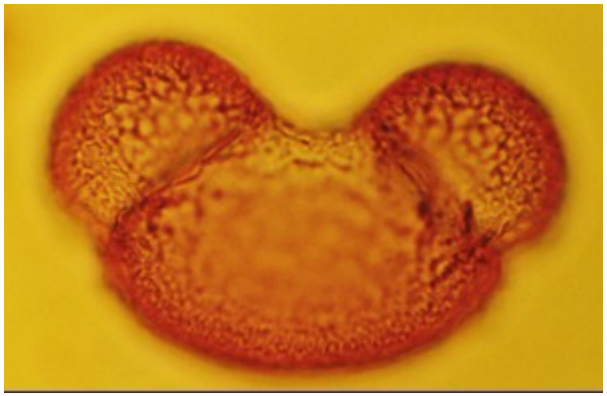

1 mm


Pollen
grains


pollen
micropyle
ntegument
pollen chamber
cell
nucellus
pollen tube
Spermatozoid
536 × 476


integument
sclerified layer
archegonium
egaspore
other cell
nucellus
ck cells
cells


Hoja
FLOR ♂
Primordios Seminales
FLOR ♀
Cúpula
Estambres
ESTAMBRE (Microsporofilo)
Saco polínico (Microsporangio)
Tegumentos
Nucela
2N
Célula madre las megásporas
Cúpula
Primordio seminal joven
R
Cél. madre de las micrósporas
Micróspora (N)
2N
PIE ♀
PIE ♂
Cámara polínica
Tegumentos
Hoja bitobada
ESPORÓFITO
4 megásporas (N)
Célula apical
Célula basal
ESPORÓFITO
Nucela
Célula vegetativa (o del tubo)
Semilla
Raíz
Cúpula
Célula espermatógena
Células protálicas
N
GAMETÓFITO MASCULINO
(GRANO DE POLEN)
Granos de polen
Gota micropilar
POLINIZACIÓN
Granos de polen
Cél. basal
Cél. pedicular
Cámara arquegonial
Tegumentos
Cámara polínica
Tres megásporas degeneradas
N
GAMETÓFITO FEMENINO
(PROTALO O ENDOSPERMA VERDE)
Sarcotesta
Bolsas mucílago
Esclerotesta
Endotesta
Nucela
Endosperma cenocítico
(joven gametófito femenino)
Arquegonio
(2 cél. cuello, 1 cél. canal vientre y 1 oosfera)
Espermatozoide
Epidermis clorofílica
Nucela
Cámara arquegonial
2 espermatozoides
SEMILLA
Embrión
Sarcotesta
Esclerotesta
Endotesta
Cél. vegetativa del tubo polínico
Columna
Cél. pie
Primordio seminal abortado
Cél. basal
Espermatozoides
OOGAMIA INTERNA ESPECIAL
Oosfera
Formación del zigoto
PROEMBRIÓN
EMBRIÓN
Protalo femenino



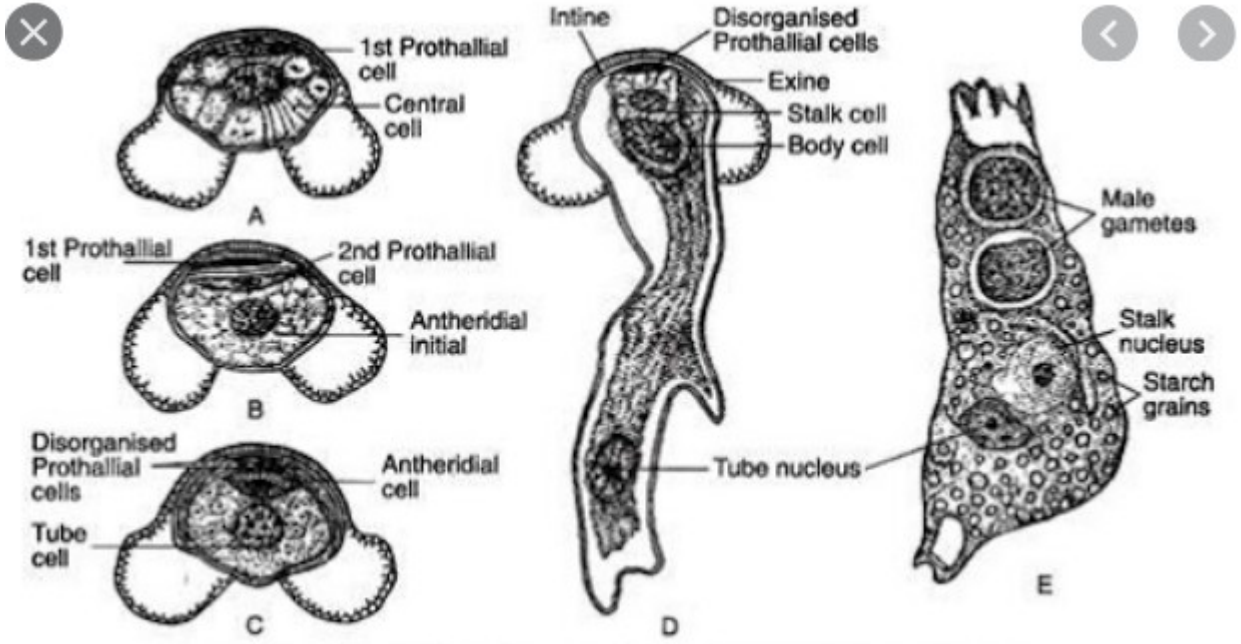


Fig. 1.65 : *Pinus* : A–E. The stages in the development of male gametophyte

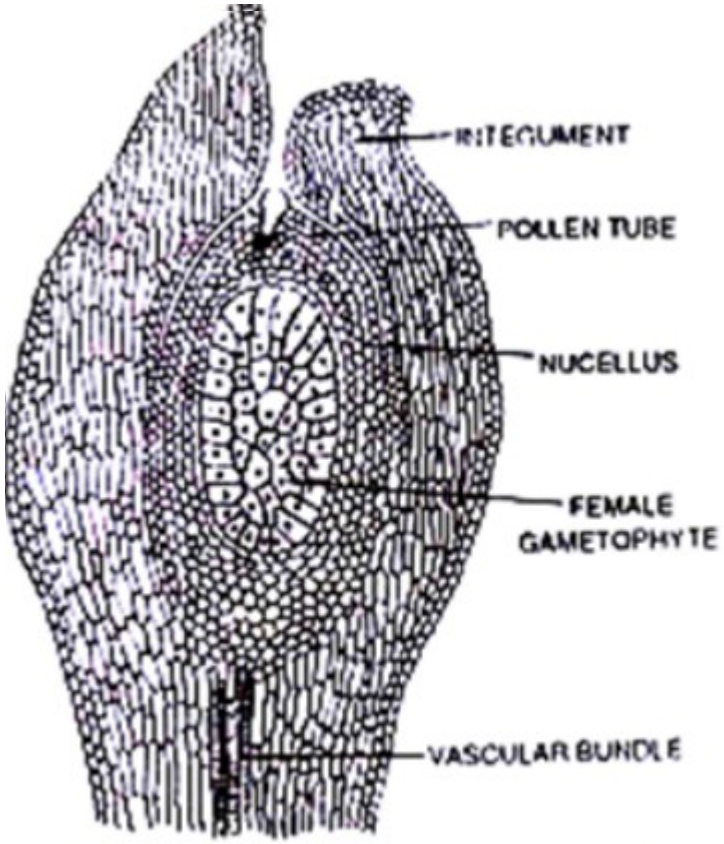
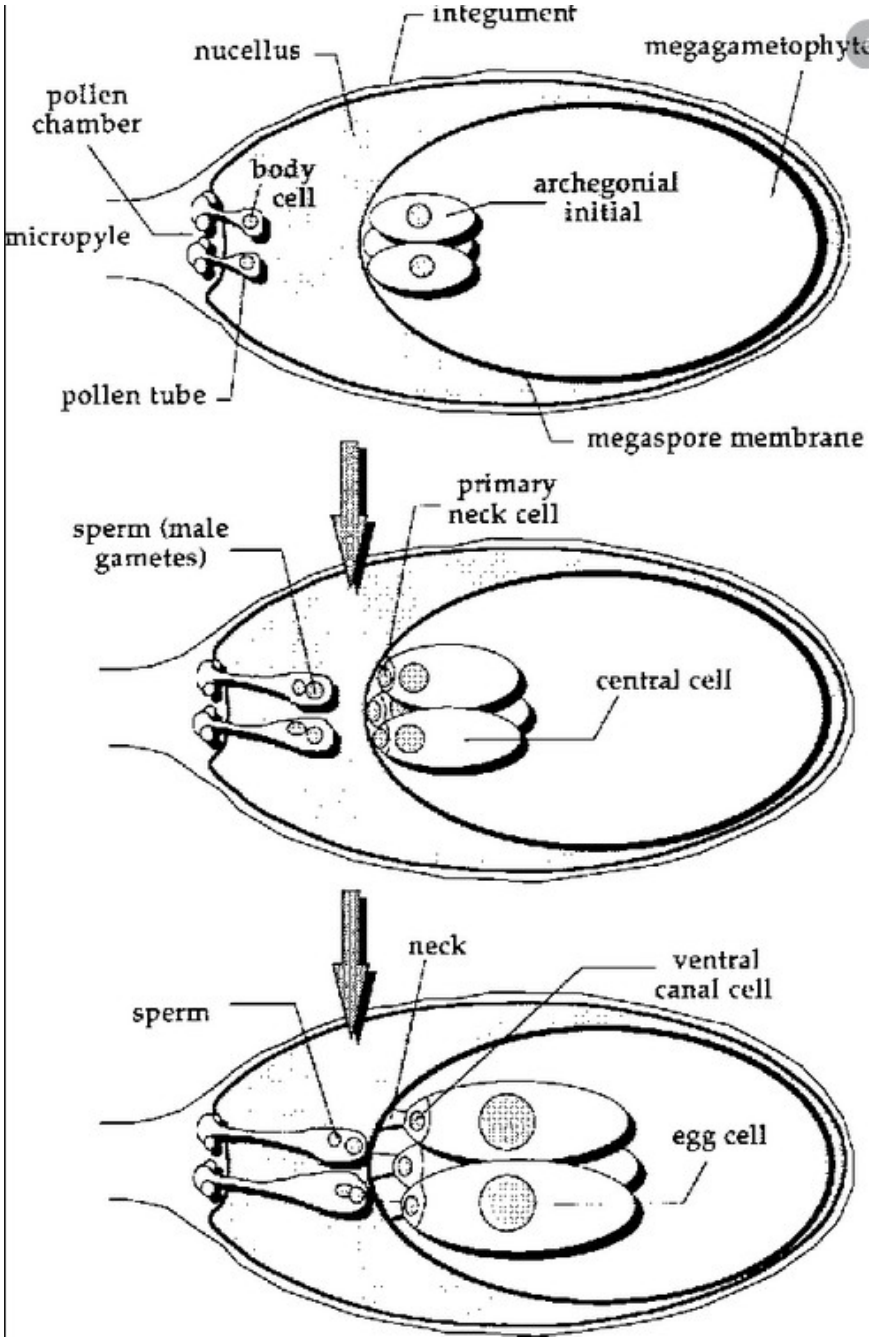
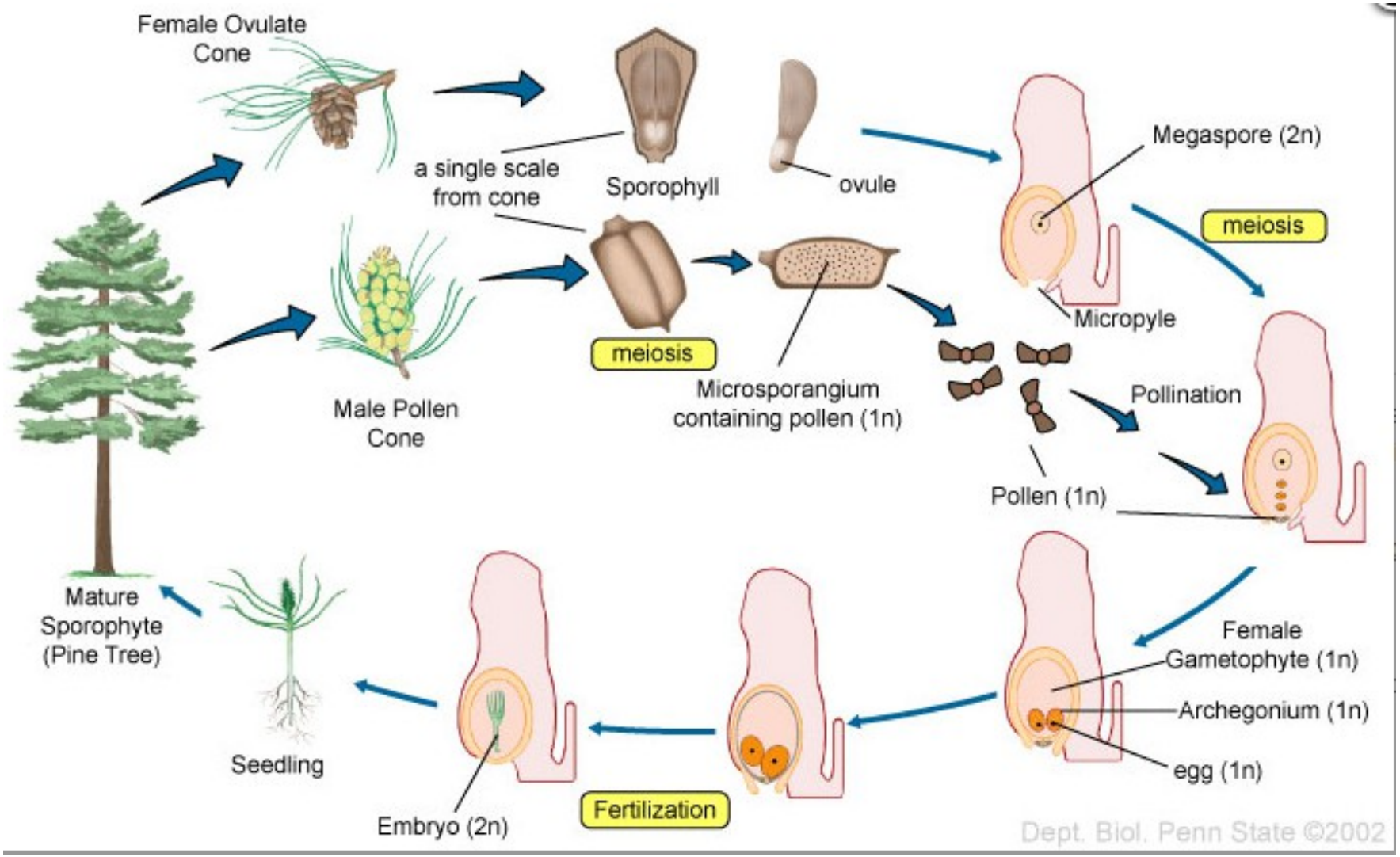


Fig. 4.46. *Pinus roxburghii.* V.S. ovule with young cellular female gametophyte.


integument
nucellus
megagametophyte
pollen chamber
body cell
archegonial initial
micropyle
pollen tube
megaspore membrane
primary neck cell
sperm (male gametes)
central cell
neck
ventral canal cell
sperm
egg cell


Female Ovulate Cone
a single scale from cone
Sporophyll
ovule
Megaspore (2n)
meiosis
Micropyle
Male Pollen Cone
meiosis
Microsporangium containing pollen (1n)
Pollination
Pollen (1n)
Mature Sporophyte (Pine Tree)
Seedling
Embryo (2n)
Fertilization
Female Gametophyte (1n)
Archegonium (1n)
egg (1n)
Dept. Biol. Penn State ©2002

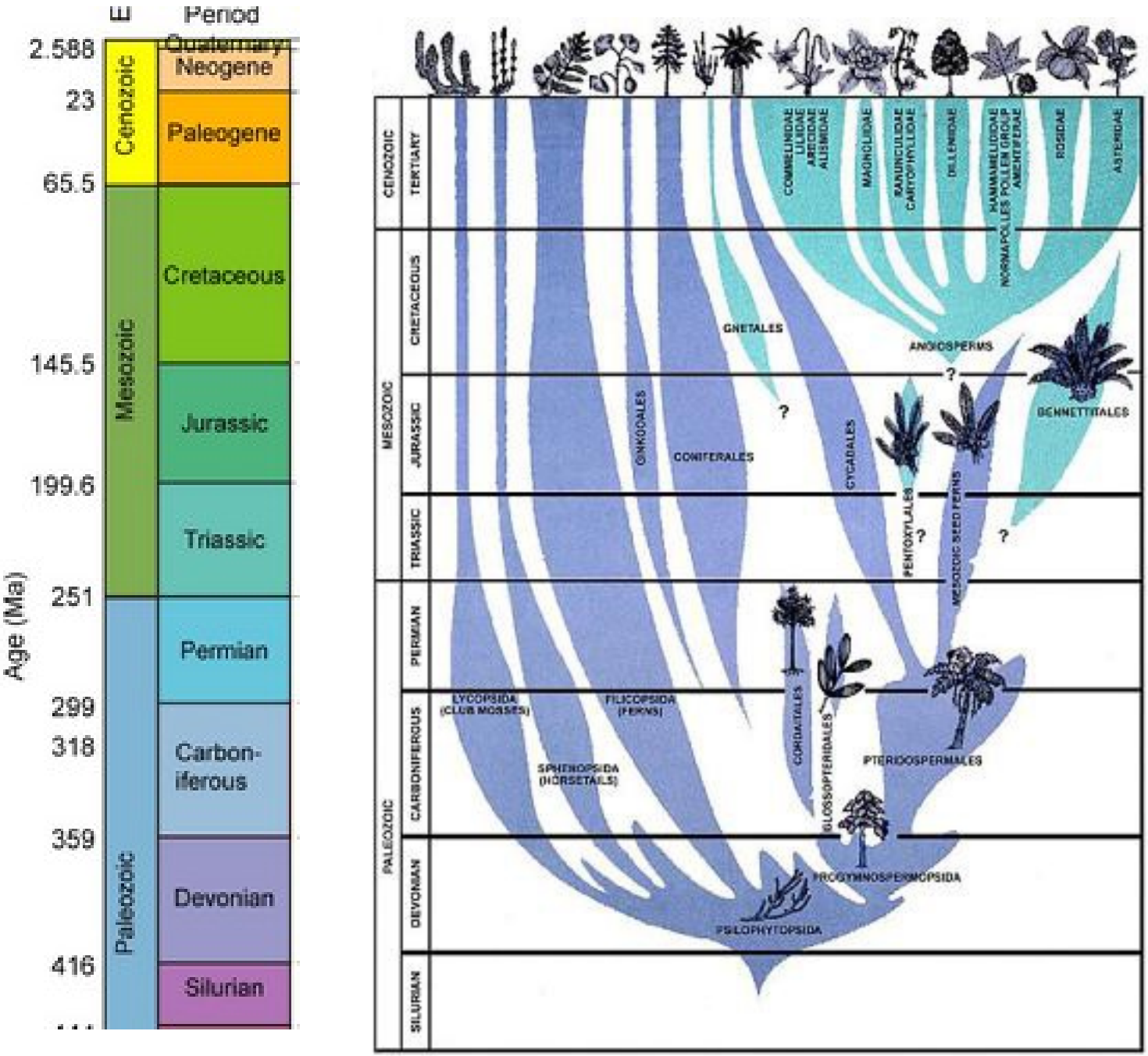
End·Ordovician,·444·million·years·ago,·86%·of·species·lost·-·Graptolite·2-3·cm·length¶

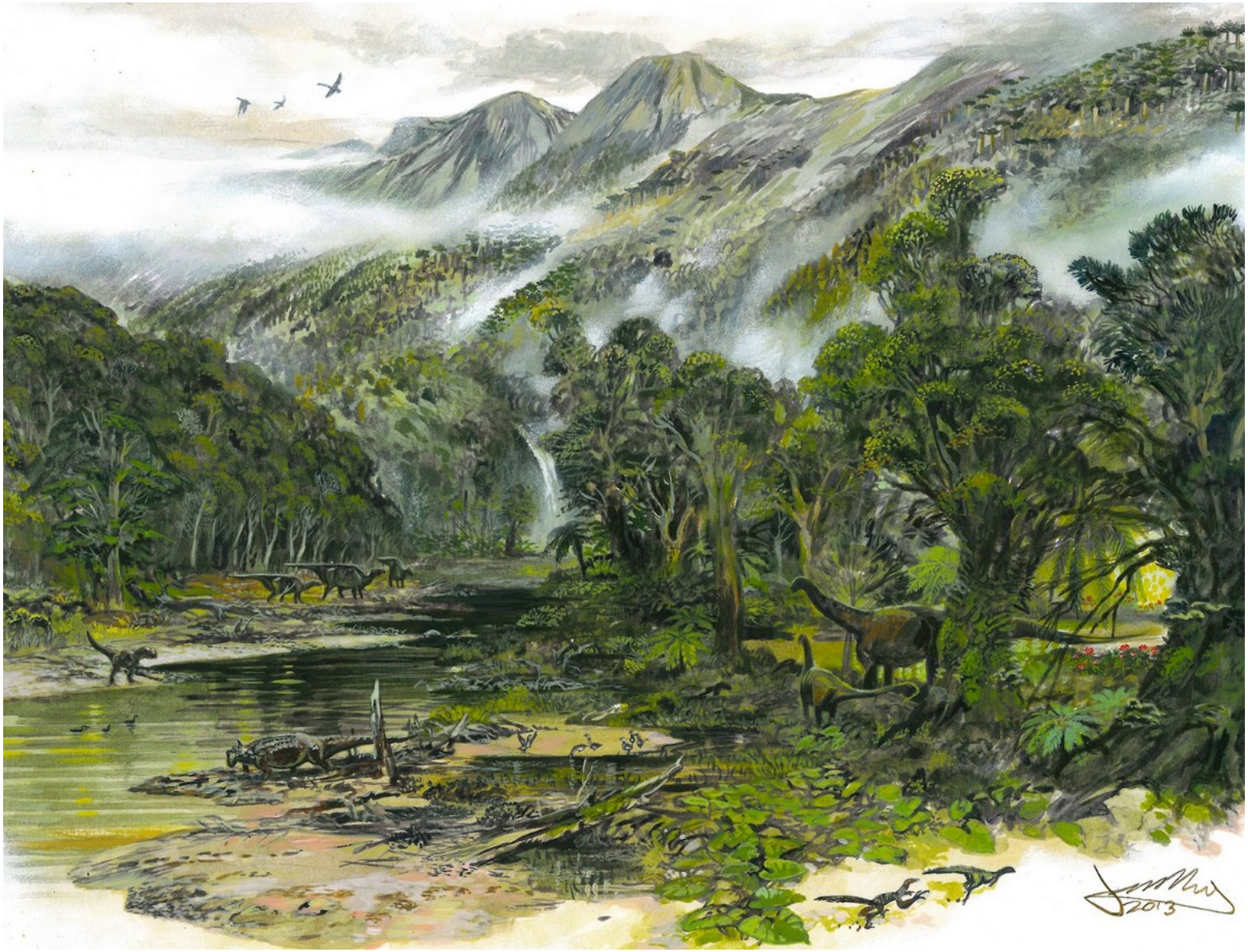
Late·Devonian,·375·million·years·ago,·75%·of·species·lost·-·Trilobite,·5·cm·length¶

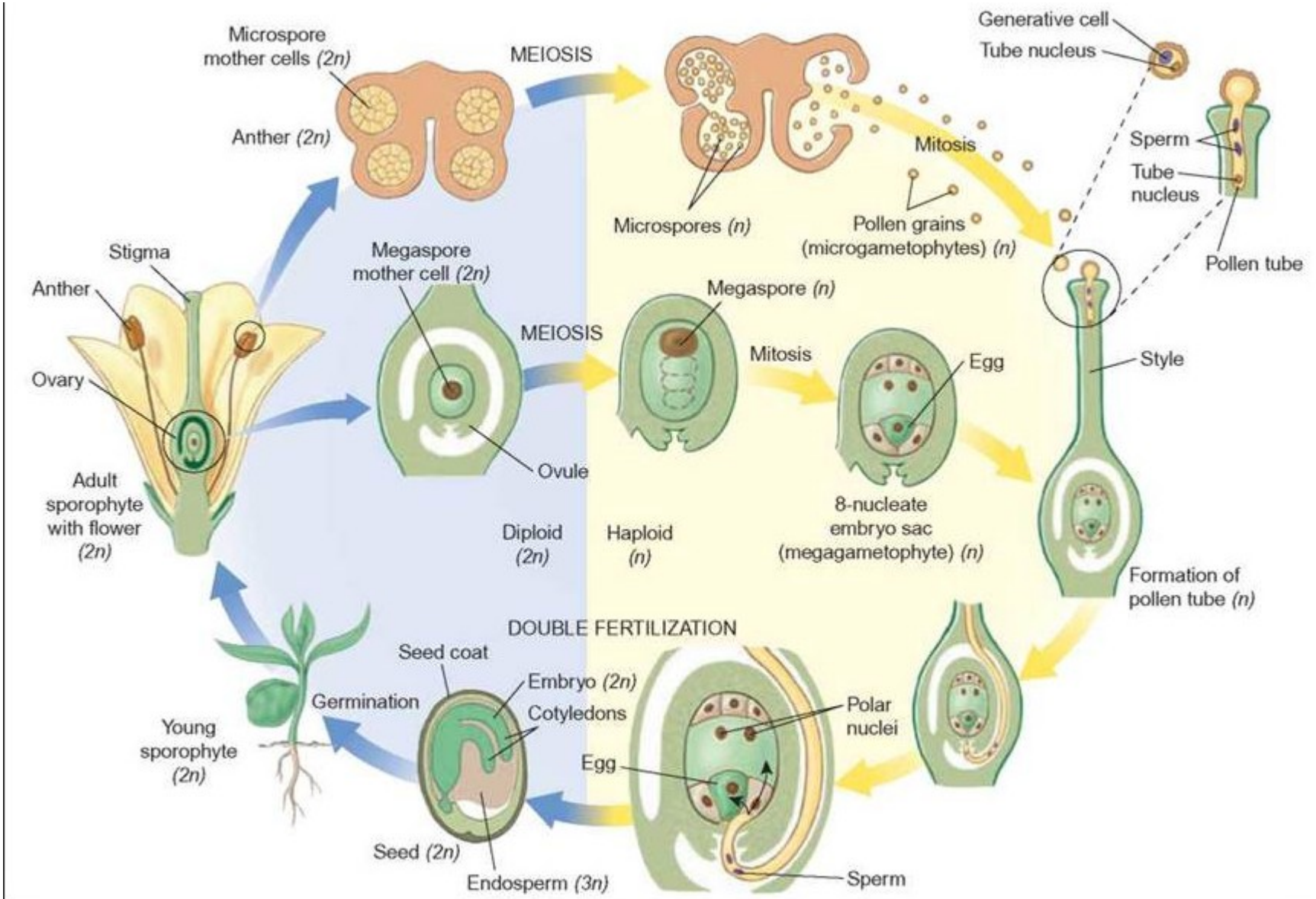
End·Permian,·251·million·years·ago,·96%·of·species·lost·-·A·cataclysmic·eruption·near·Siberia·blasted·CO2·into·the·atmosphere.·Methanogenic·bacteria·responded·by·belching·out·methane,·a·potent·greenhouse·gas.·Global·temperatures·surged·while·oceans·acidified·and·stagnated,·belching·poisonous·hydrogen·sulfide.°¶

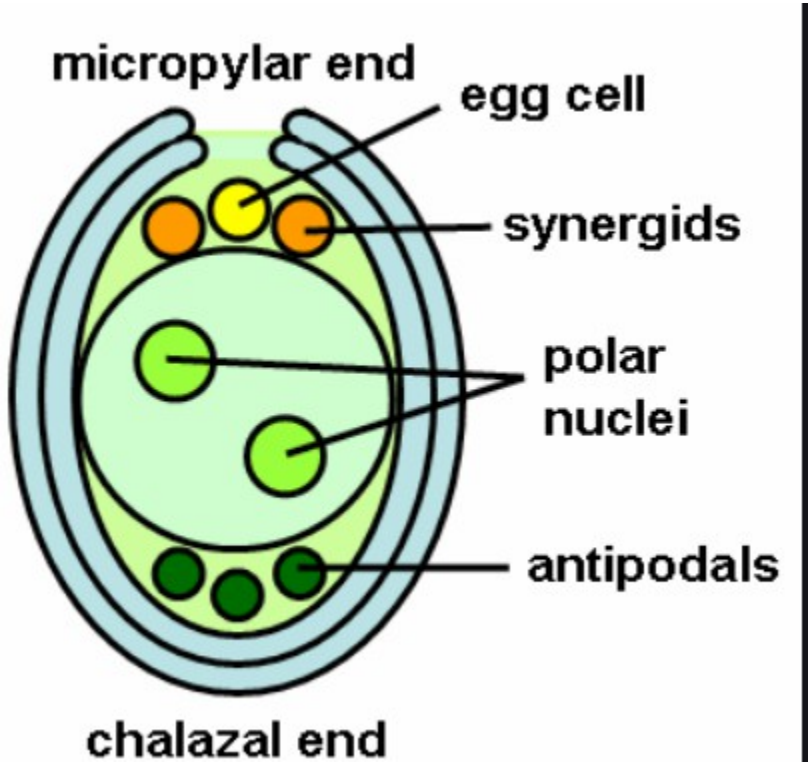
End· Triassic,· 200· million· years· ago,· 80%· of· species· lost· -· Of· all· the· great· extinctions,·the·one·that·ended·the·Triassic·is·the·most·enigmatic.·No·clear·cause·has·been·found.¶

End·Cretaceous,·66·million·years·ago,·76%·of·all·species·lost·-·volcanic·activity·and·climate· change· already· placed· the· ammonites· under· stress.· The· asteroid· impact· that·ended·the·dinosaurs'·reign·provided·the·final·blow.¶


Era
Period
2.588
23
65.5
145.5
199.6
251
299
318
359
416
Age (Ma)
Cenozoic
Mesozoic
Paleozoic
Quaternary
Neogene
Paleogene
Cretaceous
Jurassic
Triassic
Permian
Carbon-
iferous
Devonian
Silurian
CENOZOIC
MESOZOIC
PALEOZOIC
TERTIARY
CRETACEOUS
JURASSIC
TRIASSIC
PERMIAN
CARBONIFEROUS
DEVONIAN
SILURIAN
COMMELINIDAE
LILIIDAE
ARECIDAE
ALISMIDAE
MAGNOLIIDAE
RANUNCULIIDAE
CARYOPHYLLIIDAE
DILLENIIDAE
HAMAMELIDIDAE
NORMAPOLLES POLLEN GROUP
AMENTIFERAE
ROSIDAE
ASTERIDAE
GNETALES
ANGIOSPERMS
BENNETTITALES
GINKGOALES
CONIFERALES
CYCADALES
PENTOXYLALES
MESOZOIC SEED FERNS
LYCOPSIDA
(CLUB MOSSES)
FILICOPSIDA
(FERNS)
SPHENOPSIDA
(HORSETAILS)
CORDAITALES
GLOSSOPTERIDALES
PTERIDOSPERMALES
PROGYMNOSPERMOPSIDA
PSILOPHYTOPSIDA

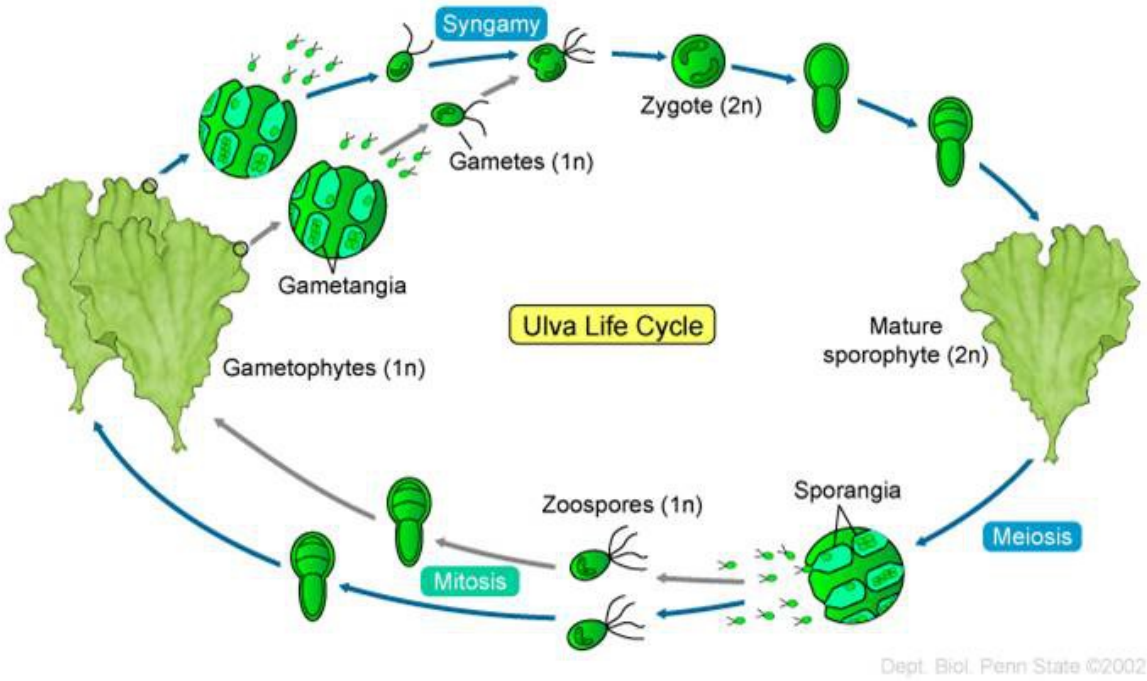

2013


Microspore mother cells (2n)
Anther (2n)
MEIOSIS
Microspores (n)
Mitosis
Pollen grains (microgametophytes) (n)
Generative cell
Tube nucleus
Sperm
Tube nucleus
Pollen tube
Stigma
Anther
Ovary
Adult sporophyte with flower (2n)
Megaspore mother cell (2n)
MEIOSIS
Ovule
Megaspore (n)
Mitosis
Egg
8-nucleate embryo sac (megagametophyte) (n)
Style
Formation of pollen tube (n)
Diploid (2n)
Haploid (n)
DOUBLE FERTILIZATION
Seed coat
Embryo (2n)
Cotyledons
Germination
Young sporophyte (2n)
Polar nuclei
Egg
Seed (2n)
Endosperm (3n)
Sperm


micropylar end
egg cell
synergids
polar
nuclei
antipodals
chalazal end

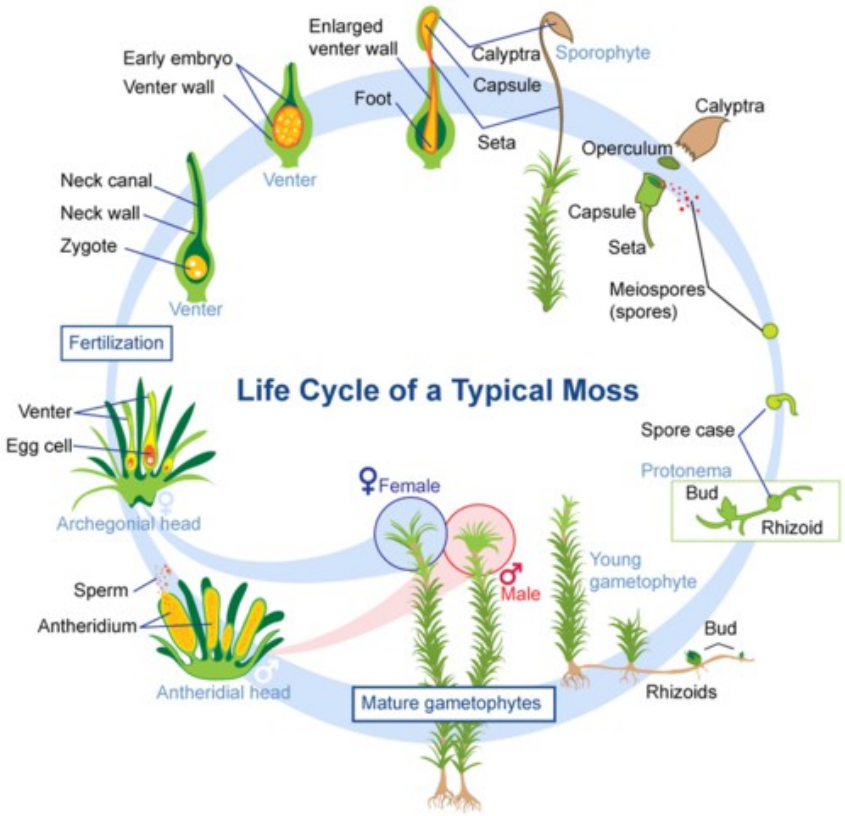
RIASSUMENDO

1) Nelle piante si ha un alternanza tra SPOROFITI diploidi che per meiosi producono spore e GAMETOFITI aploidi che per mitosi producono gameti



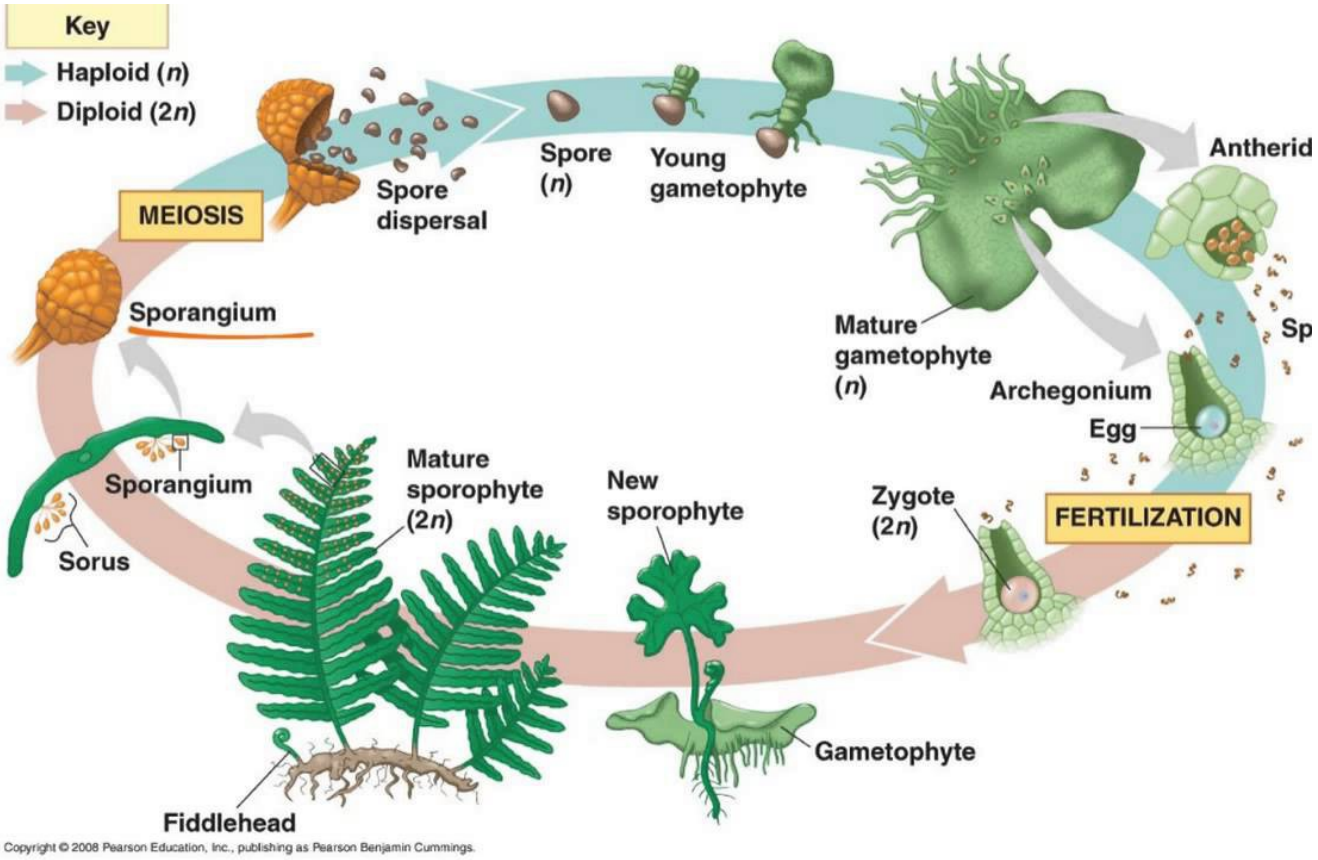
RIASSUMENDO

2) In muschi ed epatiche il Gametofito è prevalente per biomassa e durata, mentre lo sporofito perde la capacità di fare fotosintesi e vive a spese del Gametofito



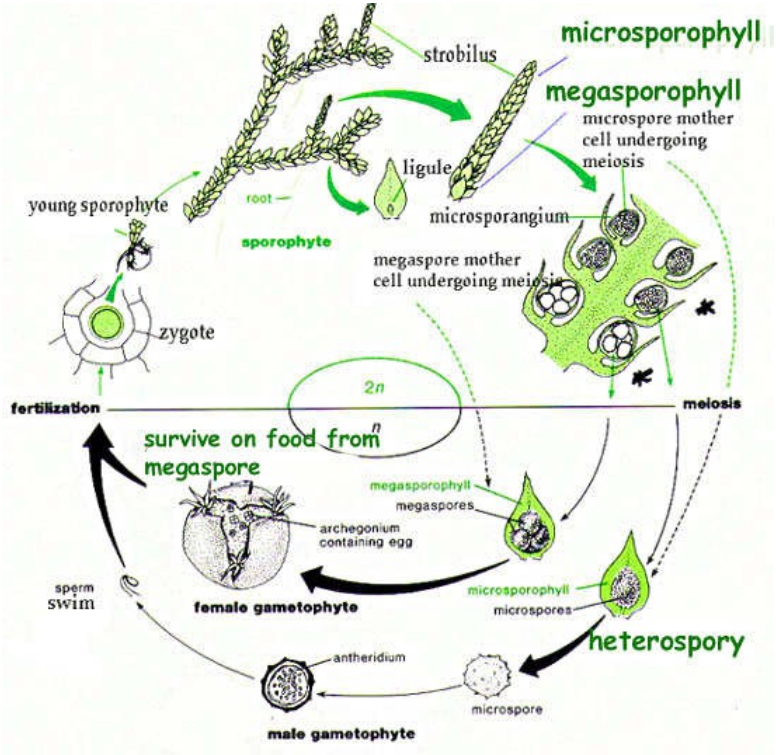
RIASSUMENDO

3) Nelle Pteridofite lo Sporofito è prevalente per biomassa e durata, mentre il Gametofito (che ha vita indipendente) ha biomassa e durata molto brevi



RIASSUMENDO

4) Nelle Selaginelle (“Pteridofite”) lo Sporofito presenta eterosporia: produce macrospore da cui originano gametofiti femminili, e microspore da cui originano gametofiti maschili.



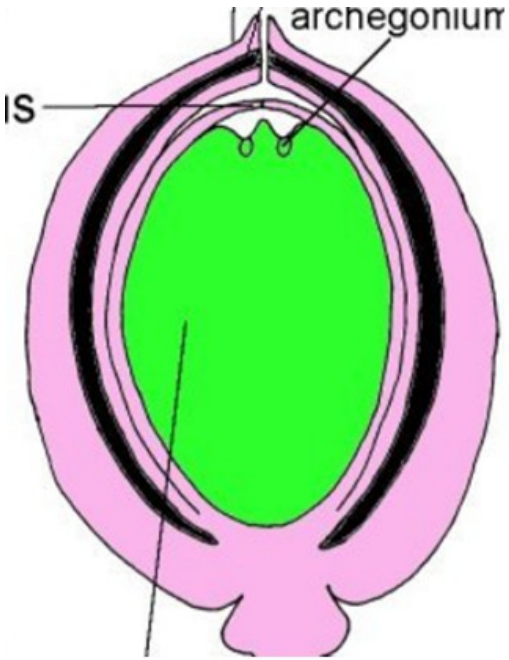
RIASSUMENDO

5) Nelle Gimnosperme:

A) le spore non vengono trasportate dal vento, ma germinano direttamente sullo sporofito.

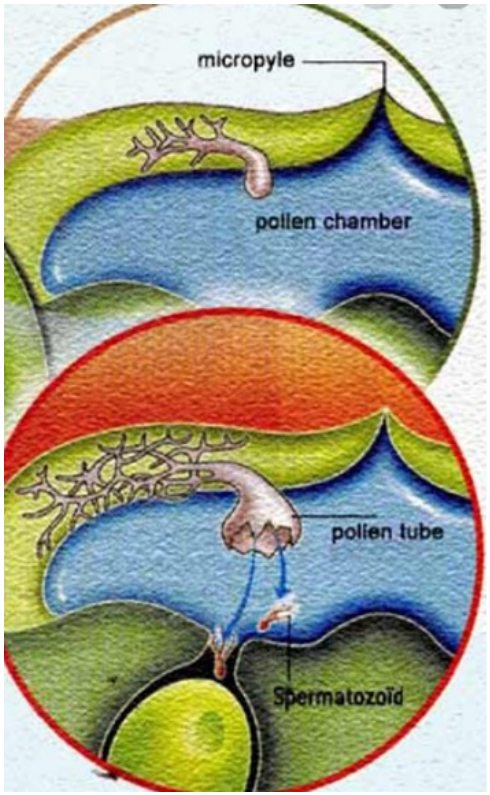
B) i gametofiti maschili (granuli di polline) vengono trasportati dal vento,

C) i gametofiti femminili sono rinchiusi in una struttura (la nocella) prodotta dallo sporofito, che ha un' apertura verso l'esterno (micropilo)



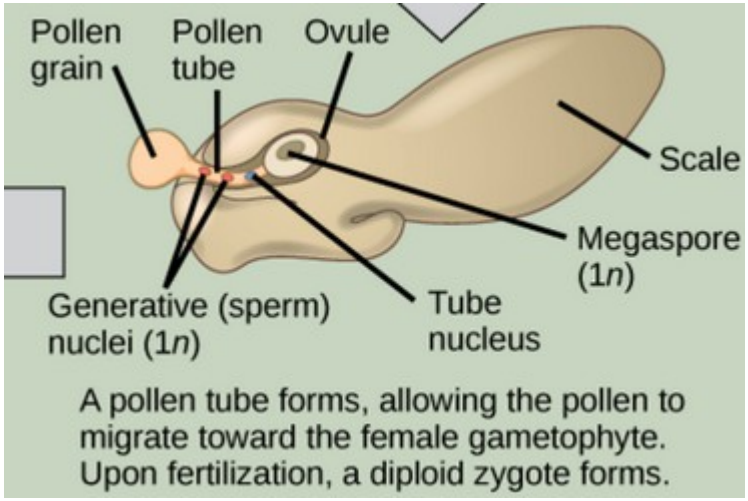
RIASSUMENDO

6) Nelle Gimnosperme più primitive (Cycas e Ginkgo) i gametofiti maschili producono un tubetto pollinico che ha principalmente funzione trofica, e successivamente gameti cigliati che nuotano nel liquido della camera micropilare per raggiungere il gamete femminile. La fecondazione è ancora legata alla presenza di acqua esterna.



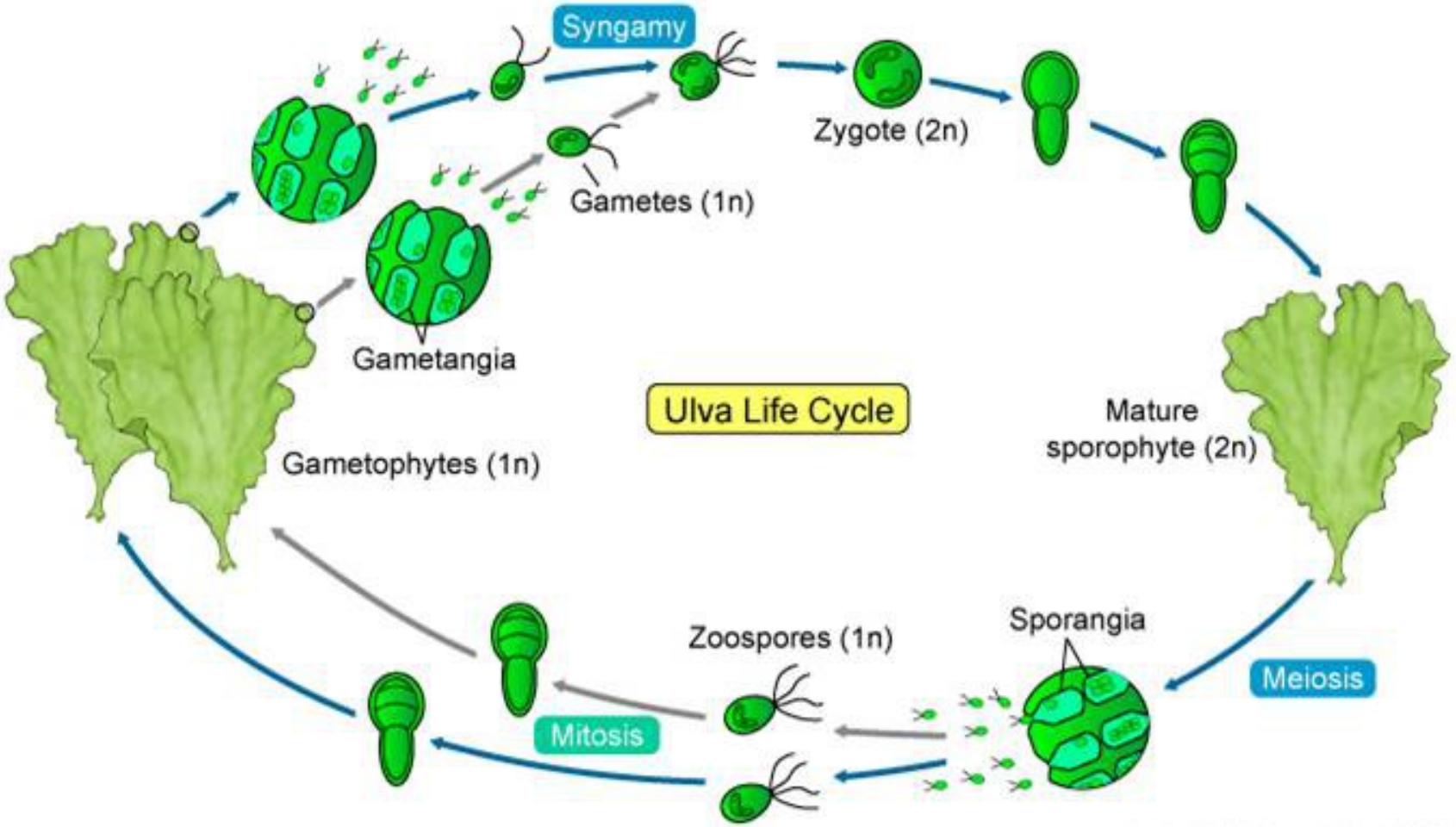
RIASSUMENDO

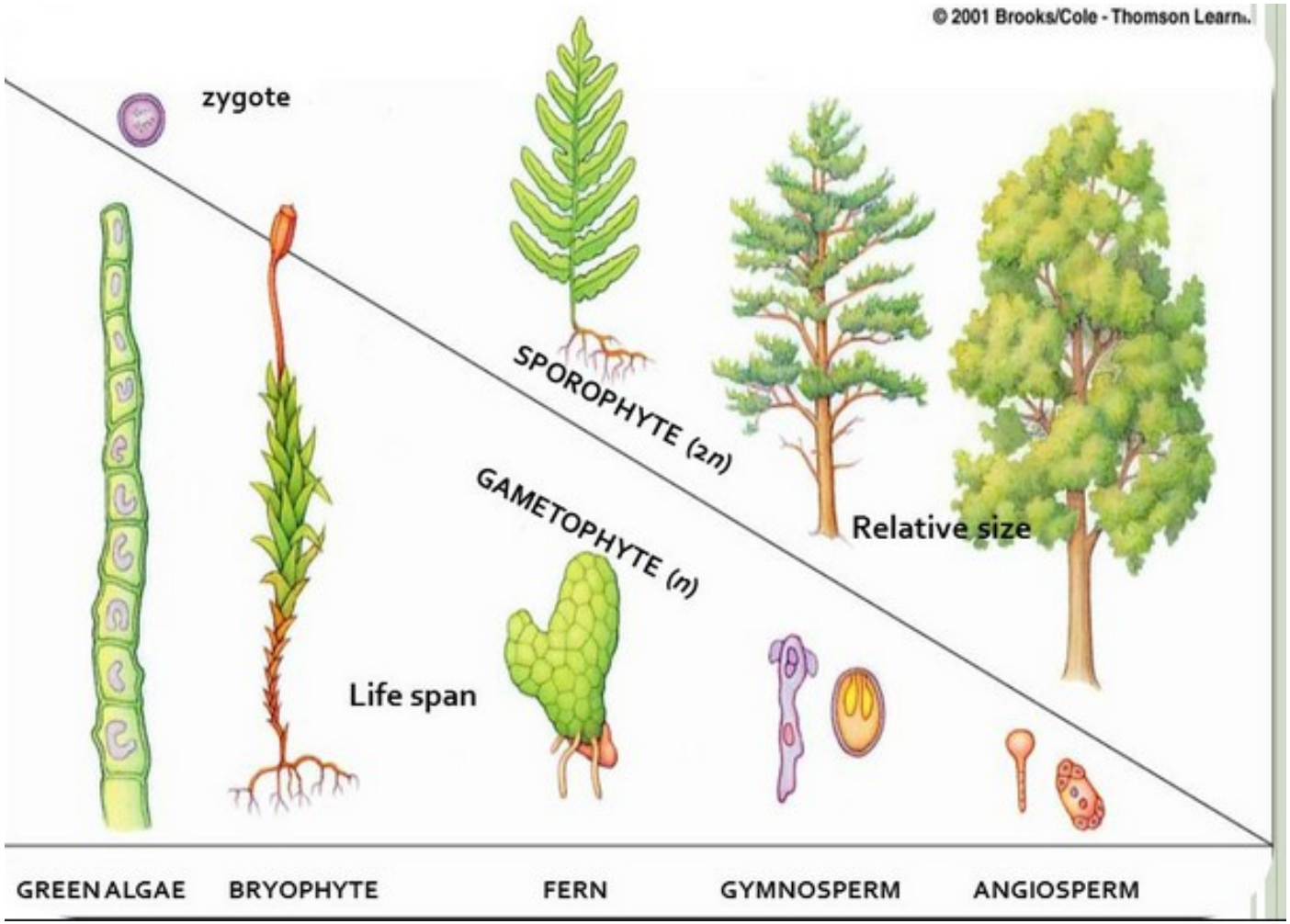
7) Nelle Gimnosperme più evolute (ad es. Pini e Abeti) i gametofiti maschili producono un tubetto pollinico che raggiunge direttamente il gamete femminile. I gameti maschili perdono le ciglia (sono trasportati da correnti citoplasmatiche all'interno del tubetto) e la fecondazione si svincola per la prima volta dall'acqua esterna.

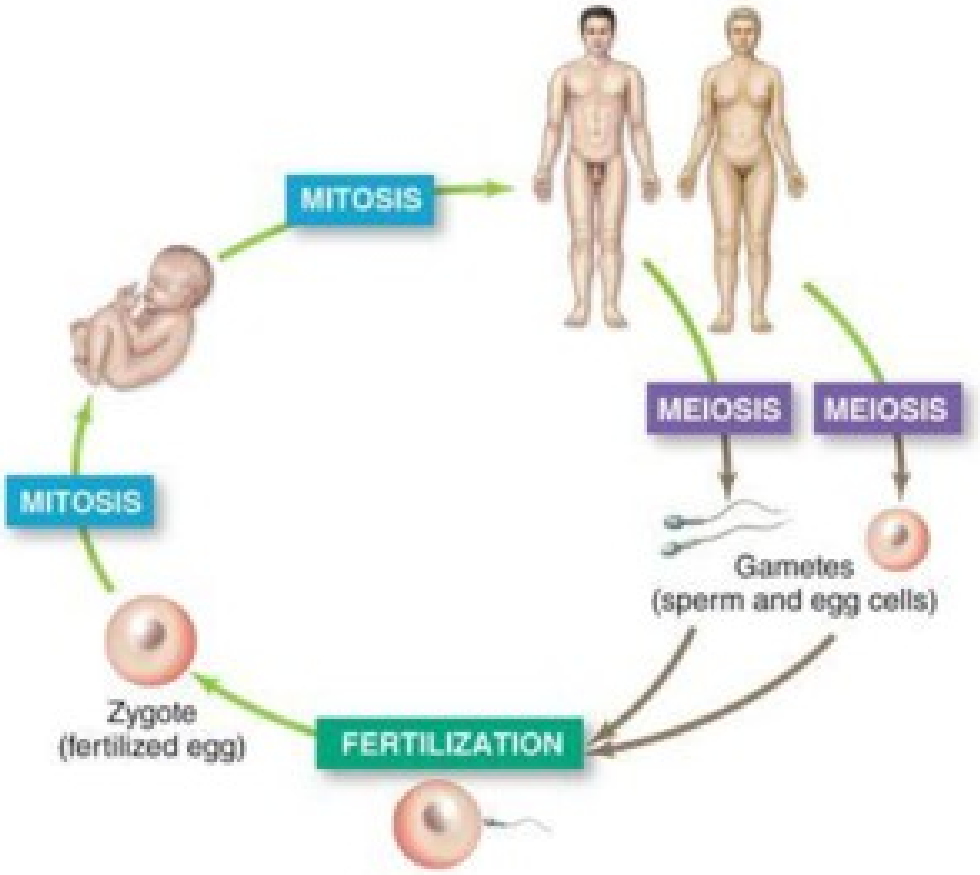


RIASSUMENDO

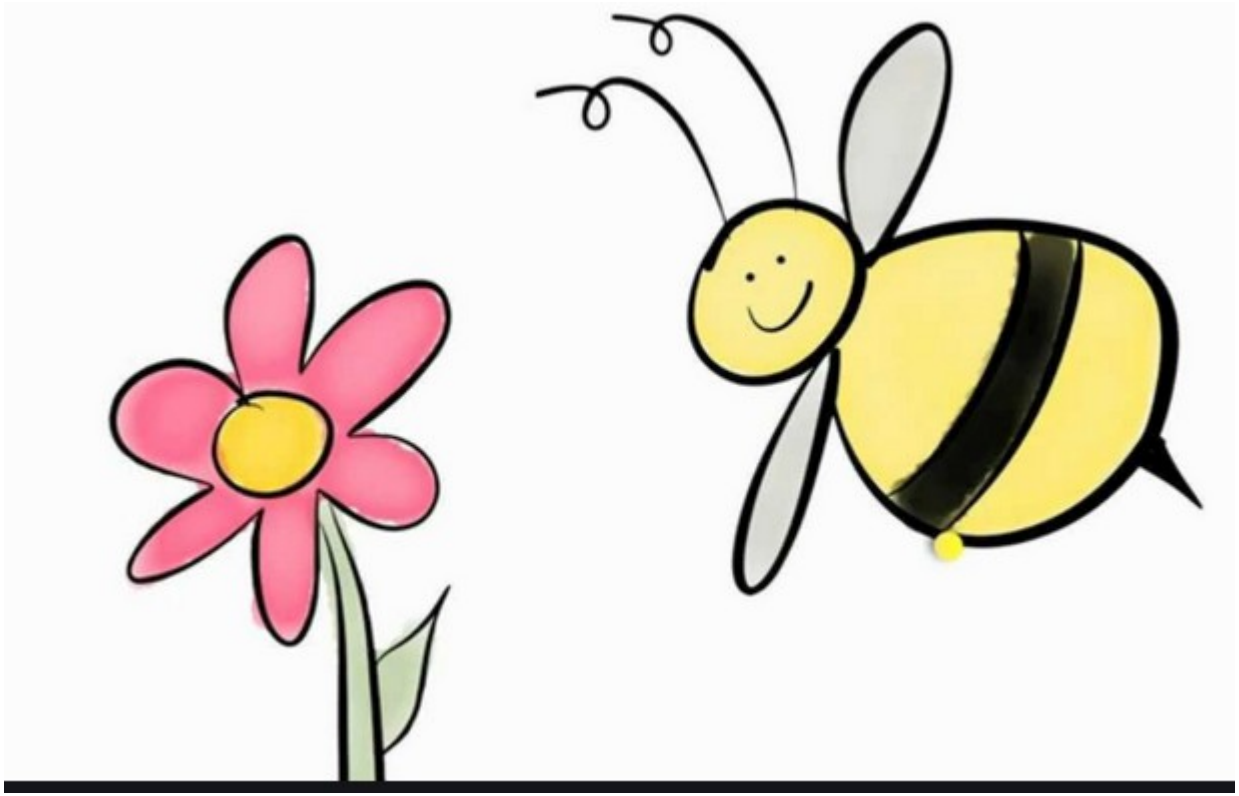
7) Nelle Angiosperme il Gametofito femminile è completamente rinchiuso in una struttura diploide formata dallo sporofito (l'ovario). Il tubetto pollinico trasporta 2 gameti aploidi, uno dei quali feconda la cellula uovo, l'altro un nucleo diploide derivante dalla fusione dei 2 nuclei polari (formando un tessuto di riserva triploide detto endosperma secondario)


Syngamy
Zygote (2n)
Gametes (1n)
Gametangia
Gametophytes (1n)
Ulva Life Cycle
Mature
sporophyte (2n)
Sporangia
Zoospores (1n)
Meiosis
Mitosis
Dept. Biol. Penn State ©2002


© 2001 Brooks/Cole - Thomson Learn.
zygote
SPOROPHYTE (2n)
GAMETOPHYTE (n)
Relative size
Life span
GREEN ALGAE
BRYOPHYTE
FERN
GYMNOSPERM
ANGIOSPERM


MITOSIS
MEIOSIS
MEIOSIS
MITOSIS
Gametes
(sperm and egg cells)
Zygote
(fertilized egg)
FERTILIZATION


INNOCENT,
I TELL YOU!



FINE DELLA SESTA LEZIONE