

opt. 28 - A 118

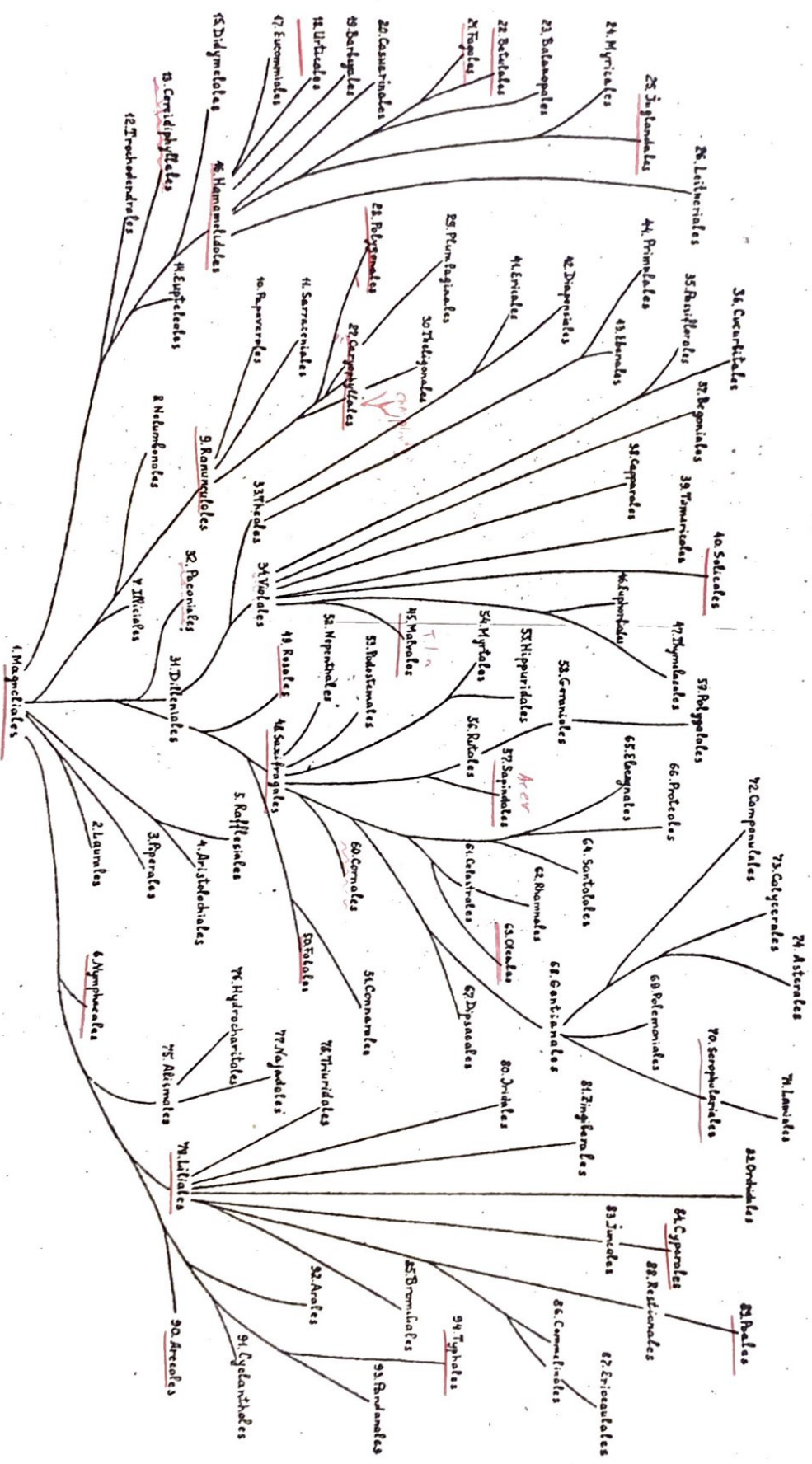
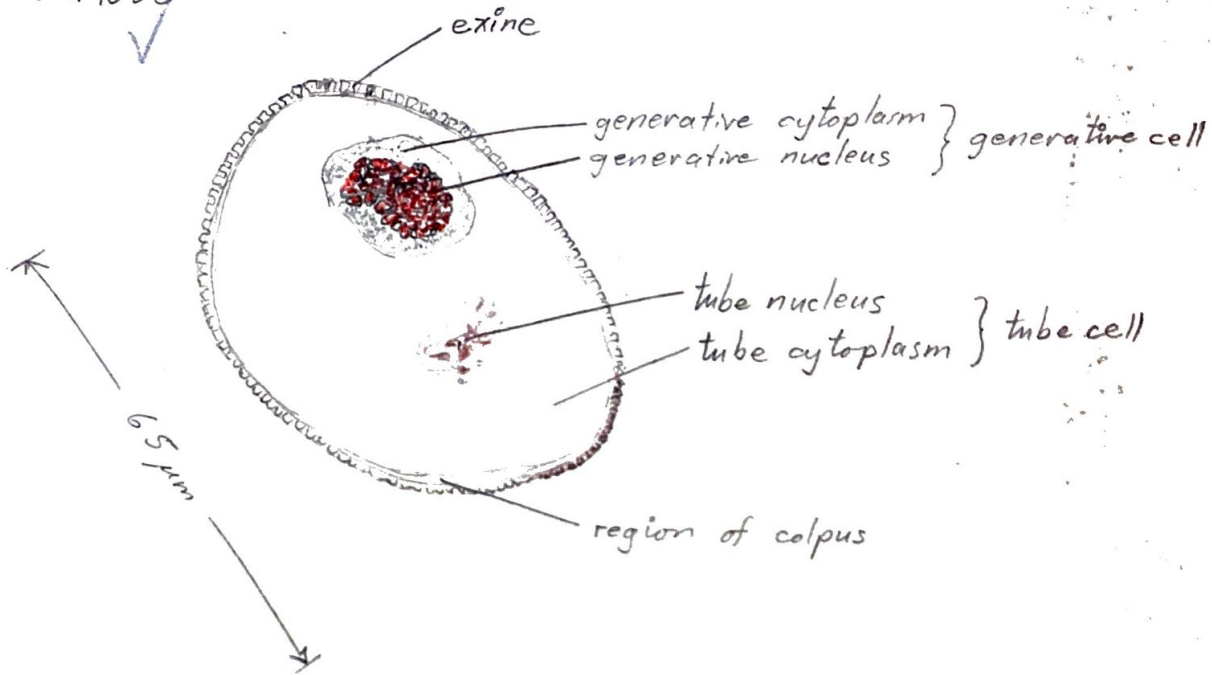


Fig. 31. Dendrogram showing the probable relationships of the orders of flowering plants. (Modified after Takhtajan, 1966.)

Sept. 14

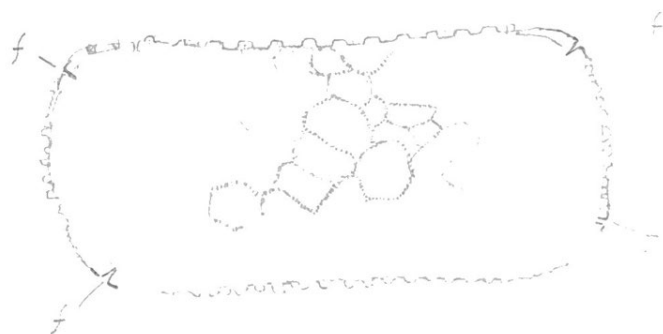
Lilium: mature anther's pollen grain fixed, sectioned, stained
ca x 1000



detail of reticulate structure of exine

Sept. 16

Impatiens sultani (Sugar, broad meadow)



f. f. f. f.



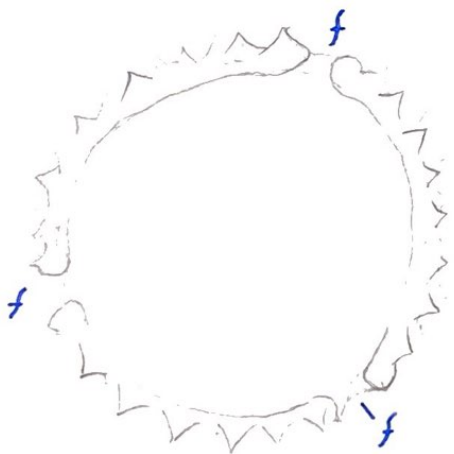
Homocentrisch
ringförmig



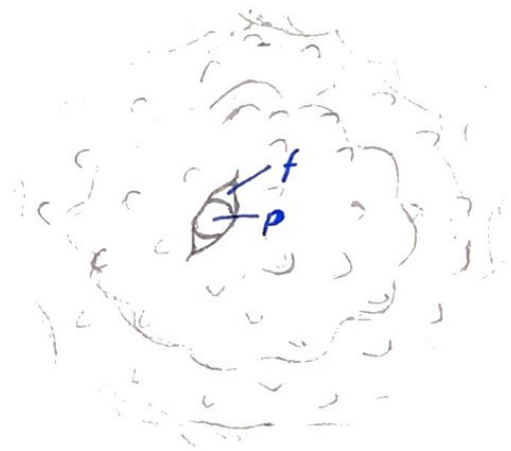
1/2 cm x 1/2 cm

Dec. 23 '76
Th.

Ambrosia artemisiifolia var. elator U. of Stockholm Collection #56.
(Common Ragweed) - in PAV



polar view, an optical slice



equatorial view X2000

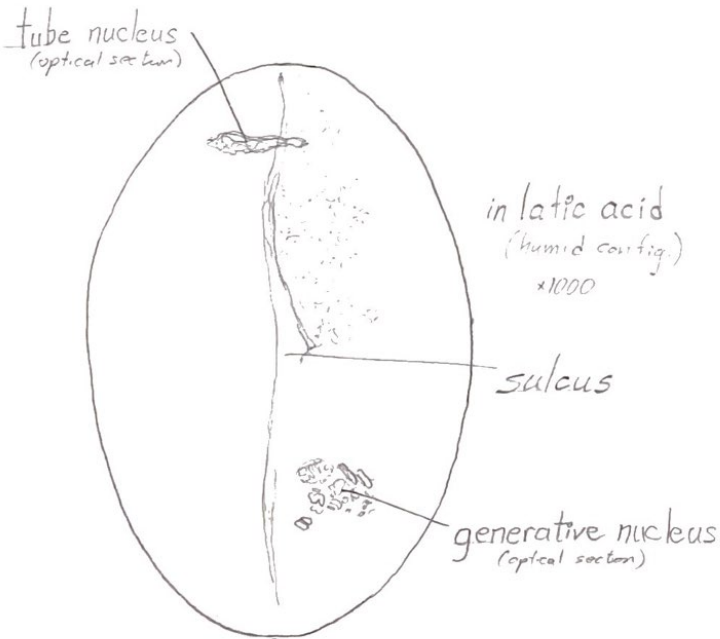
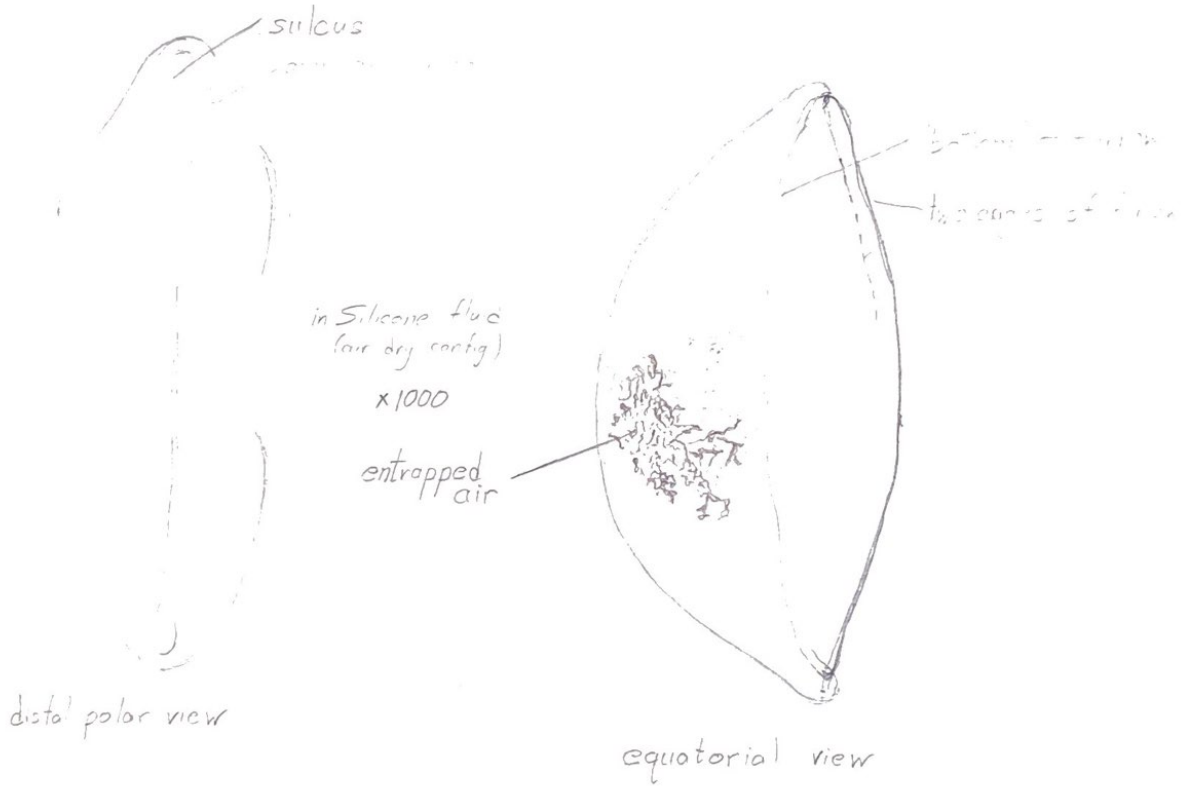
f = furrow
p = pore

sept. 28-30
Th

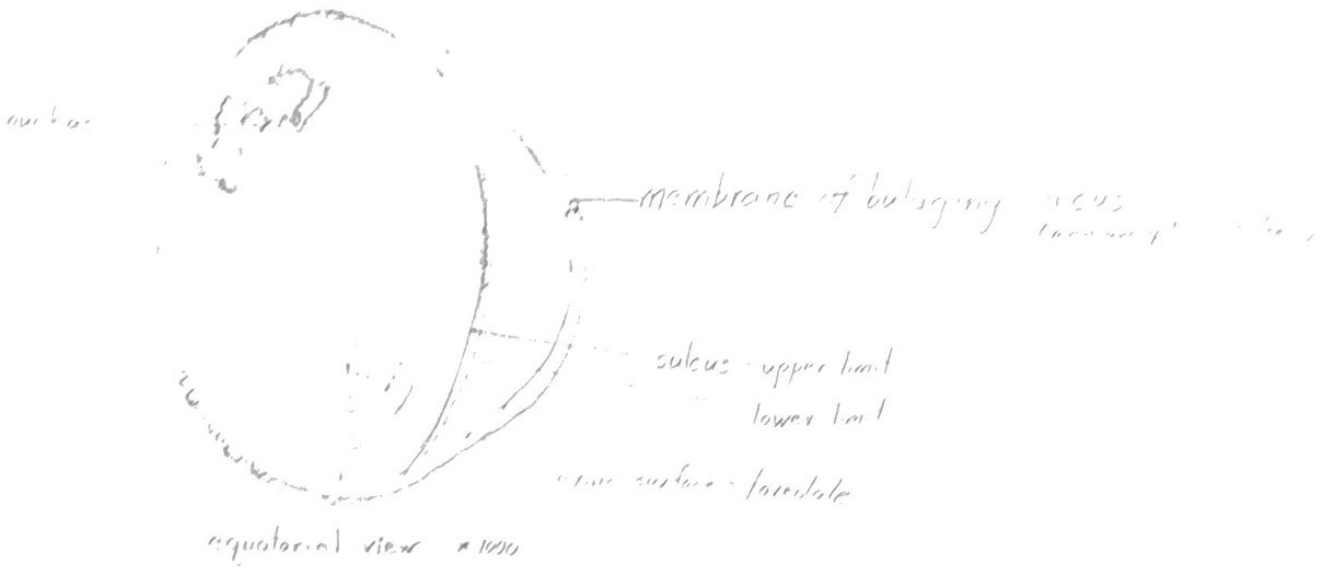
A Phylogenetic Survey of Basic Pollen Characters

Magnolia grandiflora ("Evergreen Southern or Bull Bay Magnolia")

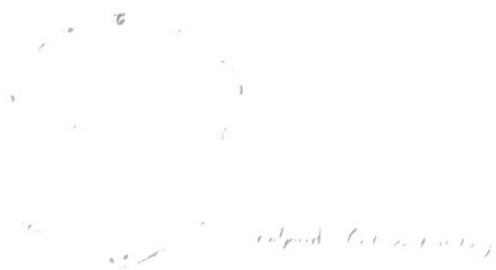
M.A. 72-84



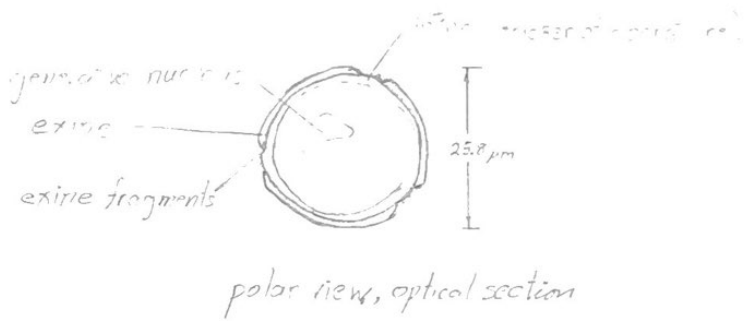
Lilium longicorne *Liliflorae* NatP teaching Herb. 1953 PVA



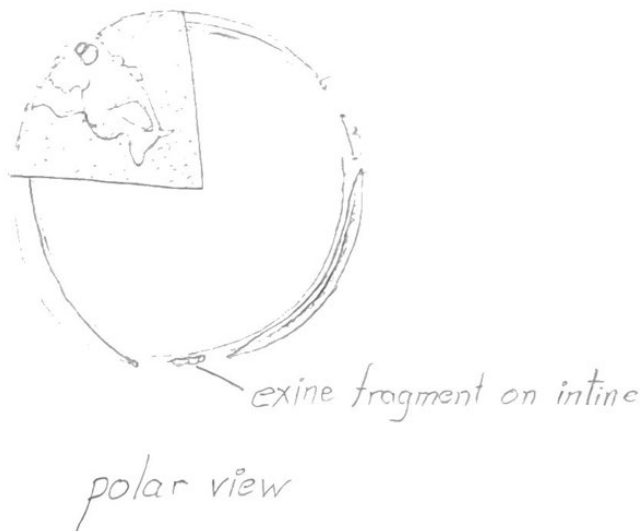
Anemone coronaria, NatP dupl PVA (red flower, dark violet purple pollen)



Anemone blanda MA 3/9/73 PVA x 1000



Eranthis byemalis MA 3/9/73 PVA x 1000



Euptela polyandre (Japan) fam. Eupteleaceae
acetolyzed glycerine-jelly = 7/26/50

acetolyzed glycerine-jelly



6. calpate

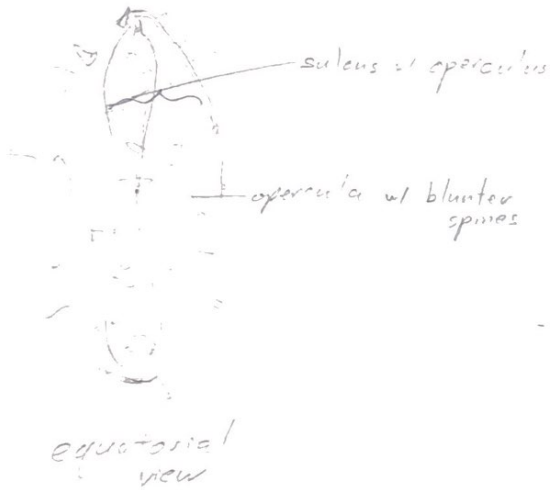
acetolyzed glycerine-jelly = same as former membrane

foveate
cune

Berberis julianae (China: "Barberry") fam. Berberidaceae
acetolyzed glycerine-jelly = same as former specimen

Nuphar advena (L.) Rostk Schmidt fam. Nymphaeaceae
 Batsto, N.J. 6/3/72 A.C.D. 45% acetic acid → PK4

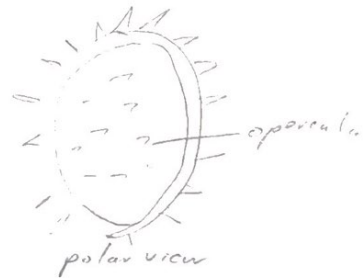
x2000



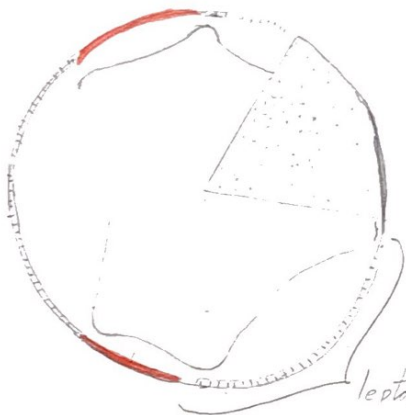
(size ca. $65 \times 45-50 \mu$)

echinate
 (some spines $> 5 \mu$)

± heteropolar

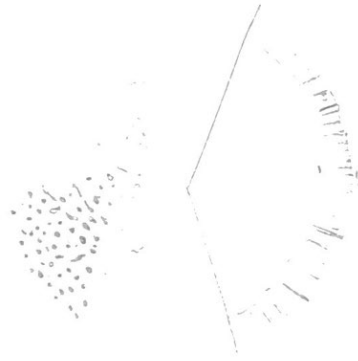


Cercidiphyllum japonicum (Japanese "Katsura Tree") fam. Cercidiphyllaceae
 MA 3/20/73 x2000



leptomeres = vague apertural-harmamegathy region

Nelumbium (Nelumbo pentaphyllum (Walters) "Amer. Lotus Lily")
 fam. Nelumbonaceae J. R. Britton, No. 1541, Vol Penn Herb.
 → see protophyta (see also Nepenthesaceae)

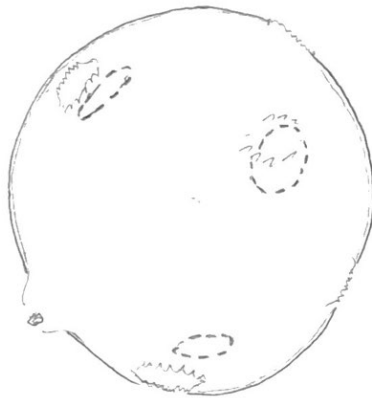


x 2000

reticulate exine
 tricolpate

Thalictrum polygamum (fam. Ranunculaceae) "Meadow Rue" N. Amer

PVA x 2000



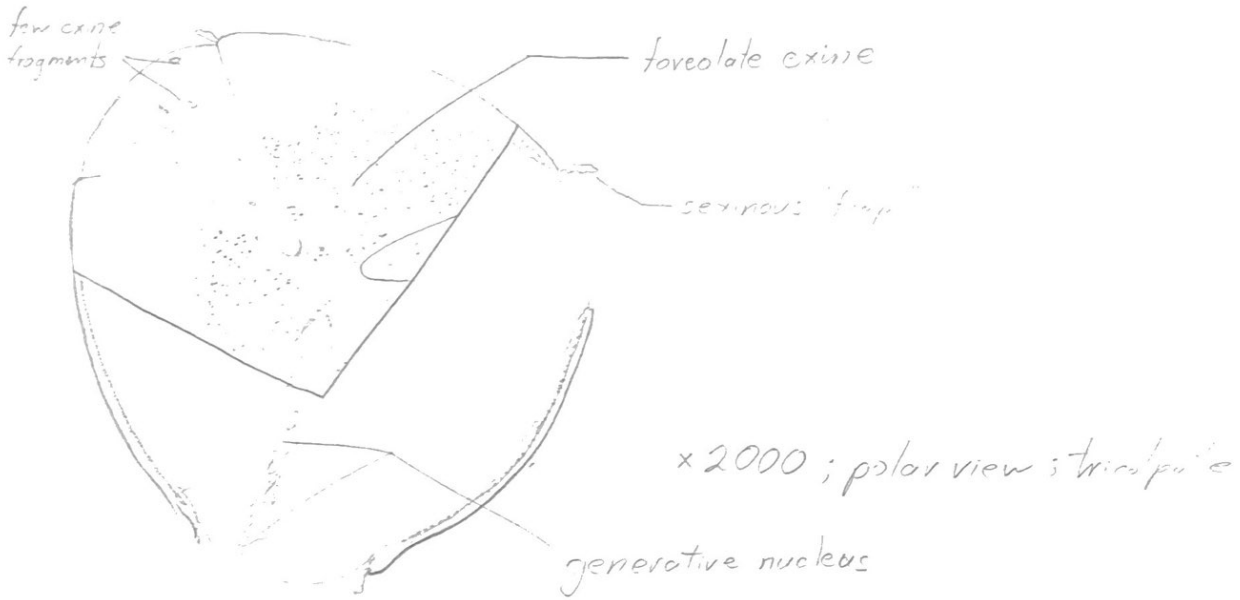
4-12 pores

finely granulate exine
 = verrucate = papillate

- sphaoidal
- perforate
- aperture margin indistinct
- membrane flattened w granules
- size: medium (25-50 μ)

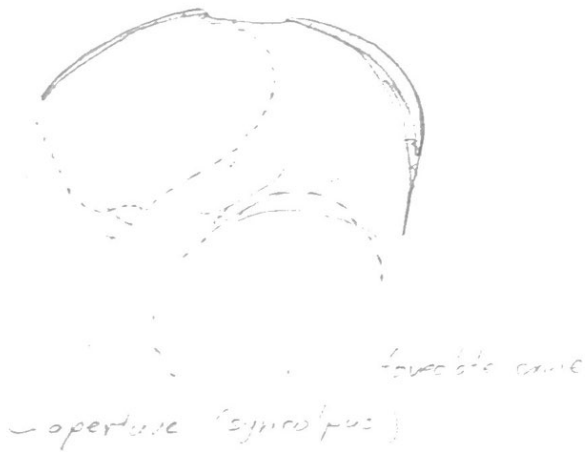
Paeonia potaninii fam Paeoniaceae ("Paeony")

Bequaert: Bot. Gard. Stockholm 1971



Mahonia aquifolium fam Berberidaceae (near Ranunculaceae)

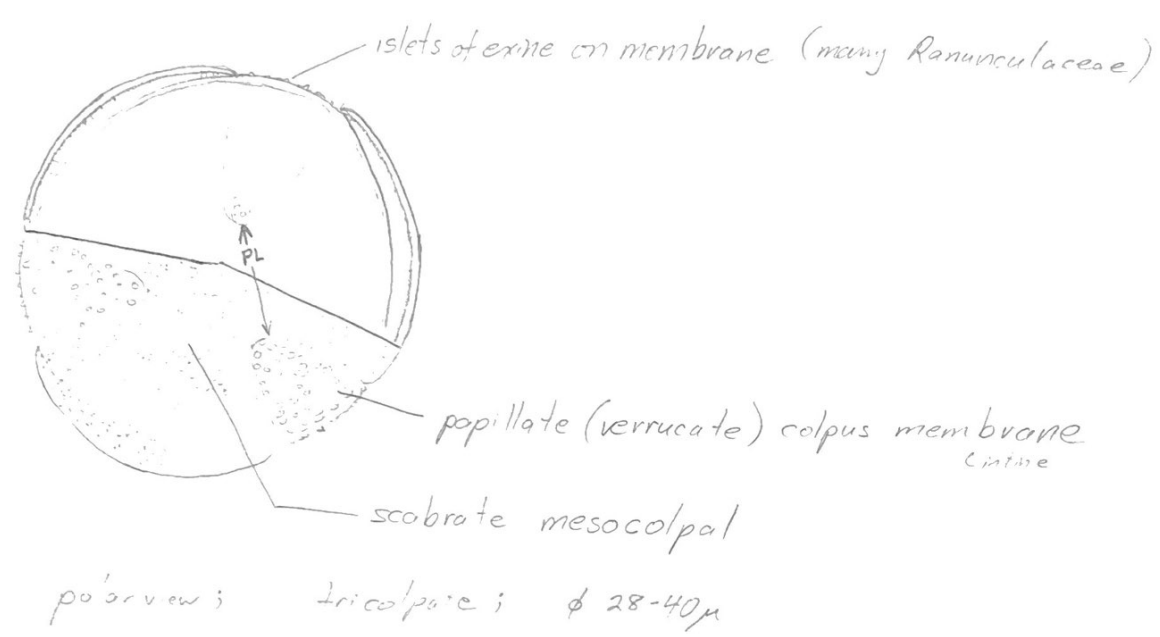
("Oregon Grape", USA Bot Gard 20125 FVA)



damascena

Nigella damascena (S. Europe) fam Ranunculaceae

USP Herbarium, Teaching Collection J.M. Fogg, Jr 7/6/53 PVA 10/9/75



chimonanthus

Chimonanthus praecox (fam Calycanthaceae, order Laurales)

MA 12/10/73

PVA

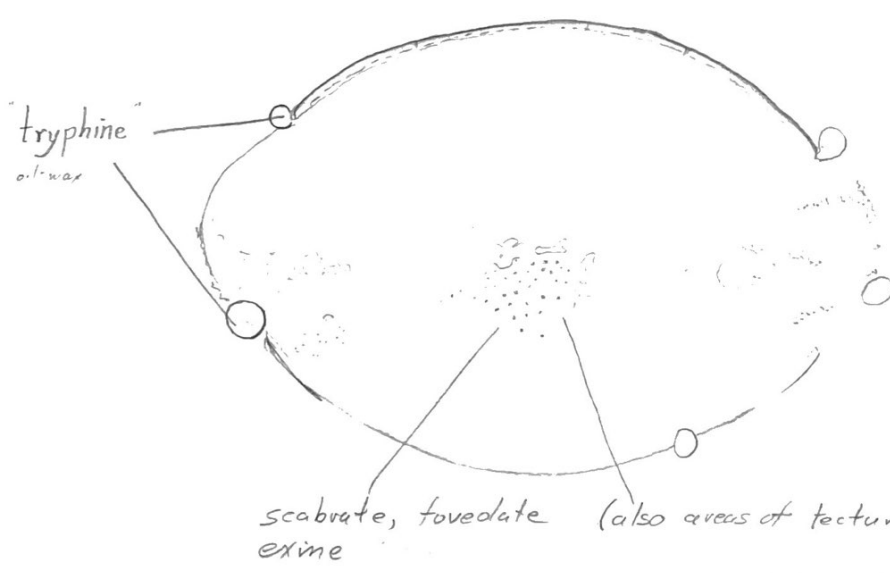
("Winter sweet", China)

Mag. derivative

ca X2000

(φ range : 45-60μ)

- disulcate
- isopolar, oblate
- scabrate, foveolate



(as focus down on upper hemi:)

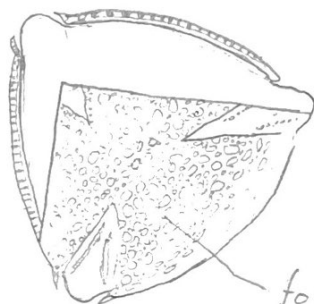
1. dark pit = foveolae
2. bright point = scabrae
3. dark beneath "



oct. 21 - slide labels
from Blue → Black

Hamamelis virginiana (order Hamamelidales ifam. Hamamelidaceae)
native American "Witch Hazel"

fresh → PVA
×2000



- oblate

- $19.2 \mu (D) \times 17 \mu (L)$

- tricolpate

↳ transitional to
tricolporate
"tricolporoidate"

- foveate (foveae ca. 1μ)

fresh → PVA

$$D = 20.87 \pm 1.16 \mu$$

$$L = 17.1 \mu = \text{polar axis}$$

D

$$\bar{x} = 20.87$$

$$s = 1.16$$

$$n = 24$$

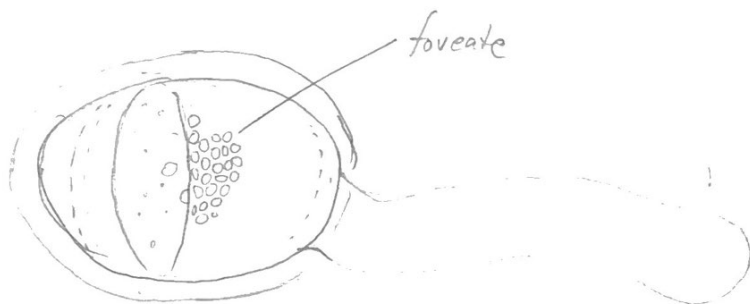
air dry → PVA
M.A. 10/15/73

$$D = 21.85 \pm 0.89 \mu$$

$$L = 19 \mu$$

(n=4)

fresh → 8% sucrose + .015% B 2.25 hrs.
fix in acetic acid
mount PVA



germinated grain,
equatorial view ×2000

Demonstration:

Liquidambar styraciflua L. (from Norhammidaeae; Amer. "Sweet Gum")

PVA x2000 ($\rho \approx 35 \mu$)

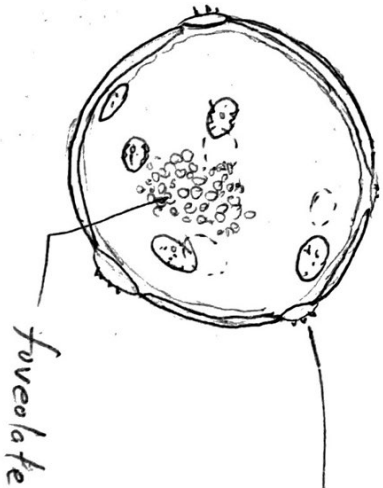
- perisporate (forte)

12-20 μ ms

per membrane of
exocrine glandular

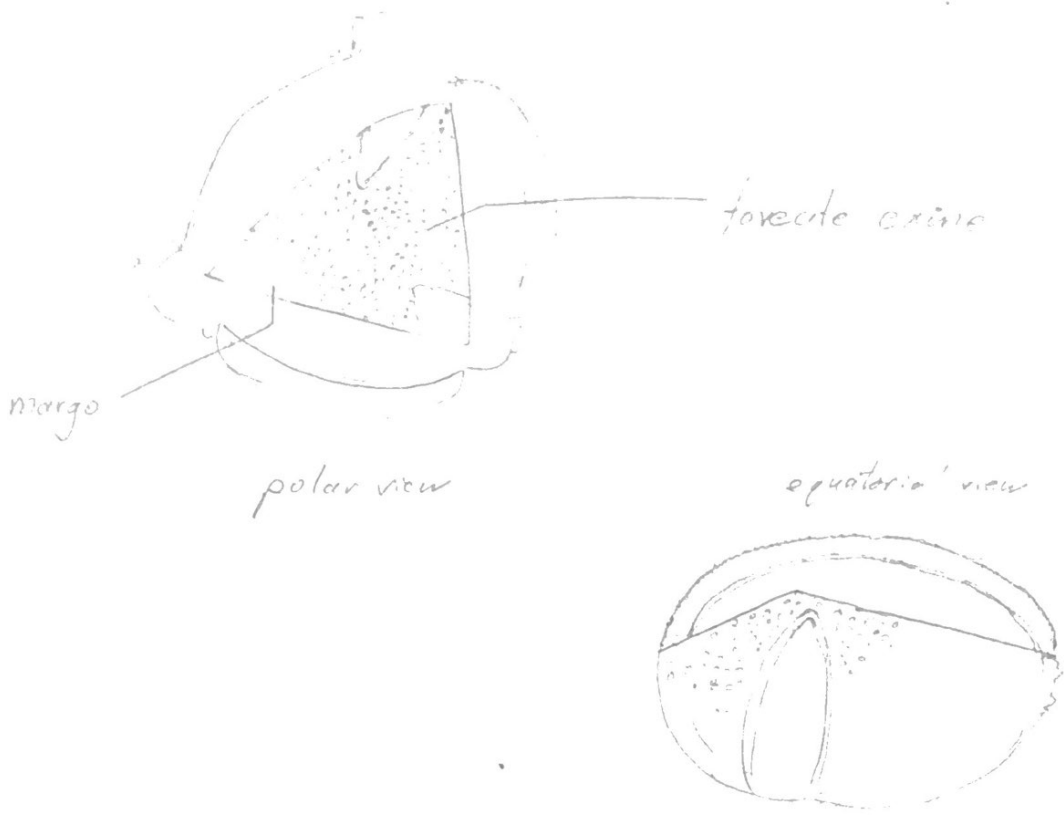
- pore ring 4.5 - 8.5 μ m

- foveolate spine



oct 26
 D. ...

Corylopsis spicata (fam. Hamamelidaceae, Japanese "Winter Hazel")
 MA. 31272

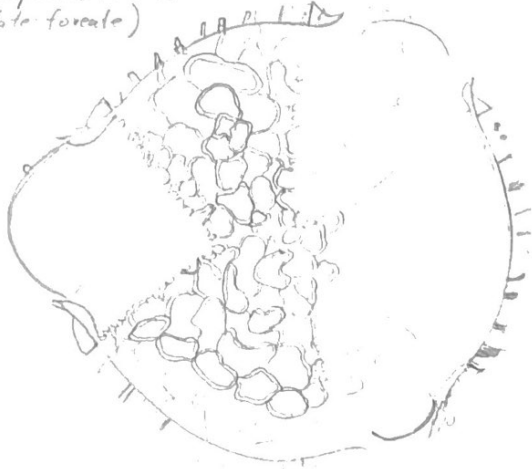


Demonstration
 oct. 28

Bucklandia populnea (Himalayam, fam. Hamamelidaceae)
 MA, Griffiths & Hawkinson # 4921

Called to Liquidambar, yet
 differs markedly in aperture,
 exine (Liq pollen: perforate (brate)
 foveolate-foveate)

- oblate ($35 \mu D \times 31 \mu L$)
- coarse reticulate exine
 (lumina ca $4.5 \mu \pm$)
 some granules
- tricolporoid → tricolporate

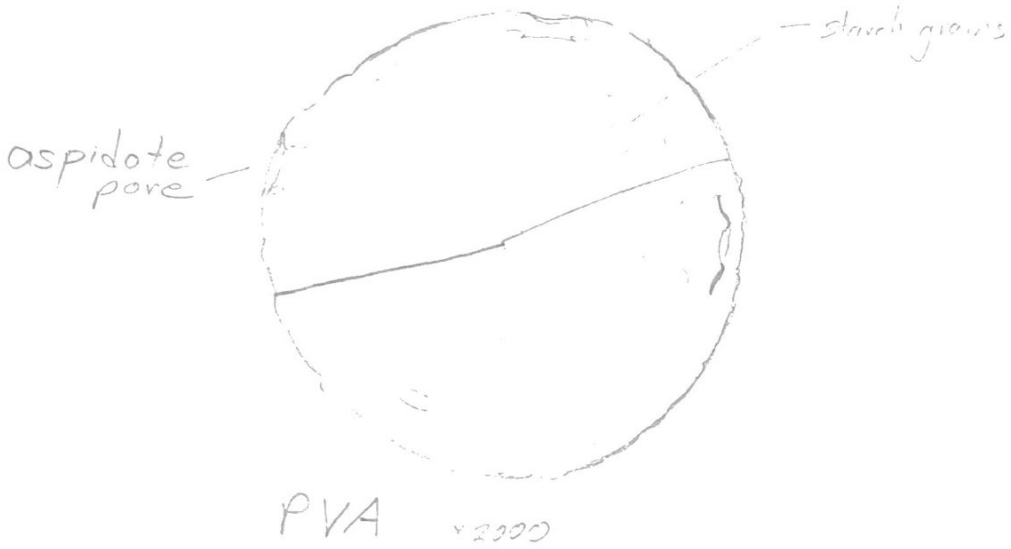


polar view
 ca x 2000

ca equatorial
 w/ ± ellipsoid poroid → pore
 - furrow w/ margo and
 ± granulate membranes

Order Urticales

Ulmus scabra. (Ulmaceae) "Wych Elm"
Urt. Stockholm # 50



Silicone (air-dry config.)

Urtica dioica (Urticaceae) "Stinging Nettle"
U. Stockholm #51

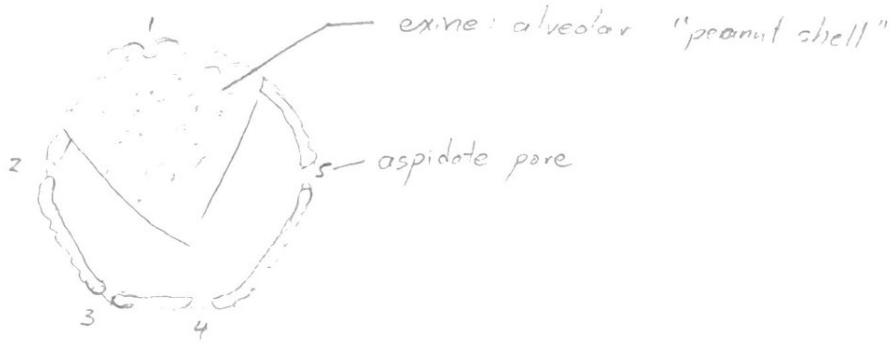


4-porate
exine psilate
± aspidote



Ulmus americana

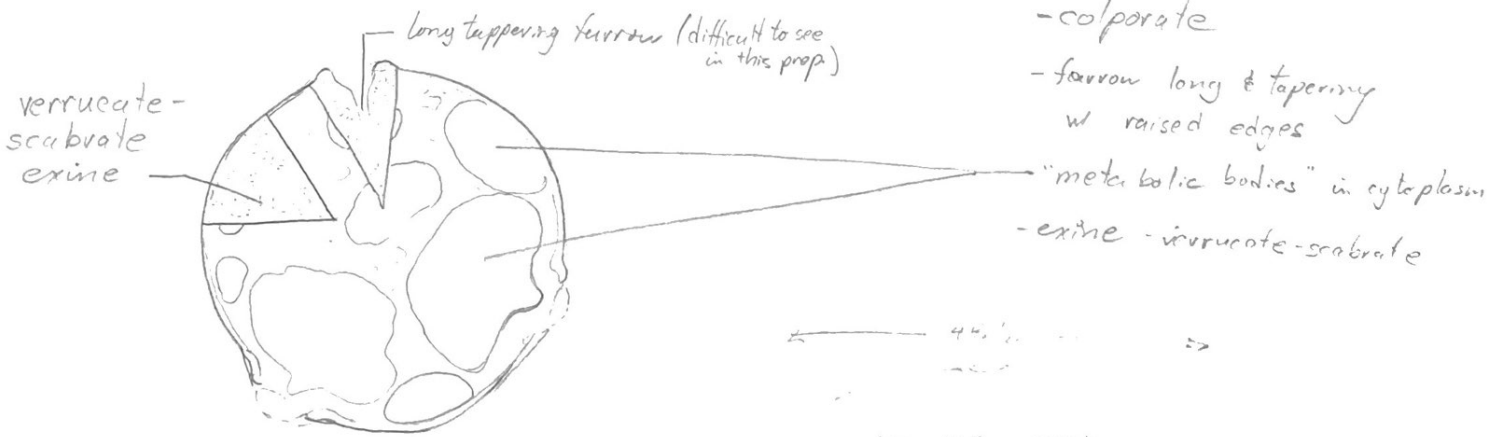
U of Minn. Pollen Collection; acetolyzed (fossilized) w/
marker Pollen Alder (*Alnus*) (arcate-aspidote - 4.5 vestibulate) as
check on severity of acetolysis



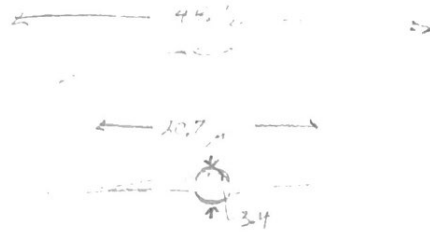
acetolysed → PVA x 1000

Order Fagales (Beech, Oak, Chestnut) fam. Fagaceae

Fagus sylvatica (European Beech) U. of Stockholm, No. 19



PVA x 1000



equatorial view

order Fagales, fam Fagaceae

Quercus alba

U. Minn. Pollen Collection

acetolyzed (w/ Alnus marker); PVA mount

many conformations -



x1000

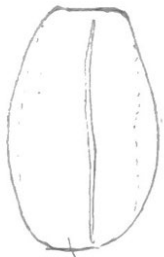
□ verrucate-scabrate

- cf. Figs. 28, 28A, B in Species

nov. 4
demonstration

Quercus alba (White Oak)

(MA. Herbarium; H. Koster, Herman, N.J. 5/22/35)



exine verrucate-scabrate

Silicone x1000
equatorial view

- Size

Polar axis ca 34 μ

Equatorial axis ca 22 μ

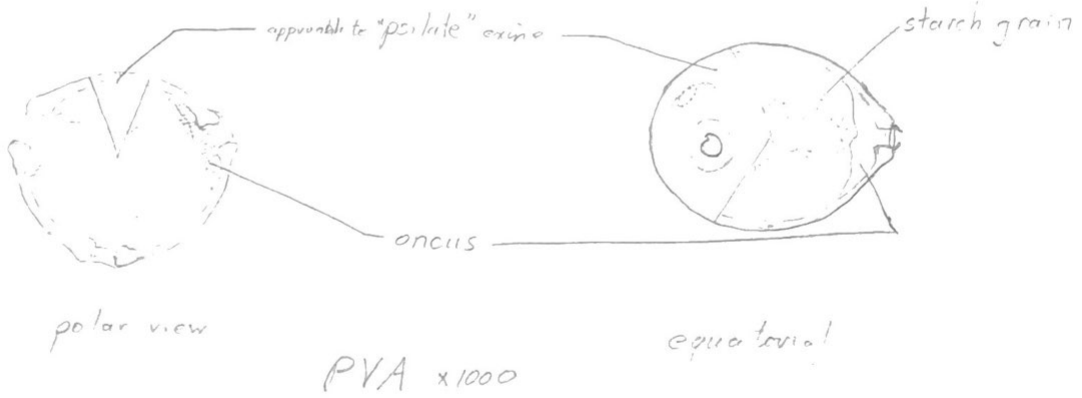
- 3 furrowed

Order Betulales

fam. Betulaceae

Betula verrucosa (3, pendular) (European Birch)

U. of Stockholm Pollen Collection No. 52



- porate, aspidate, oblate, "psilate"

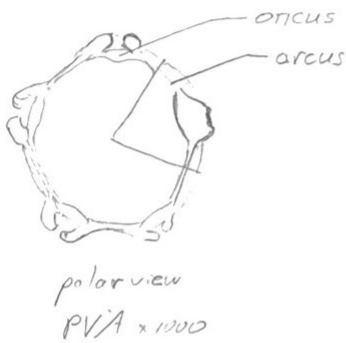


no. 9

Alnus glutinosa (Black Alder)

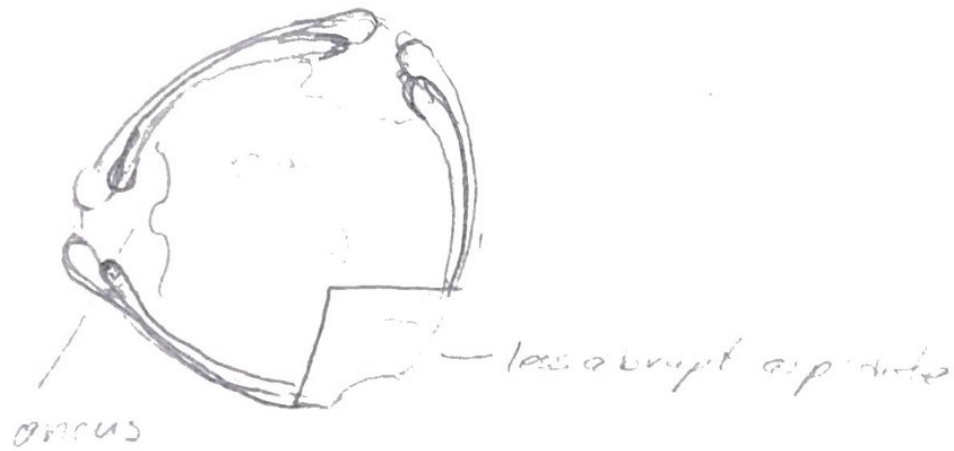
U. of Stockholm, No. 2

- 5 aspidate pores
- oblate
- cf. PVA w/ Ulmus & Quercus slides which contain acetolysed Alnus



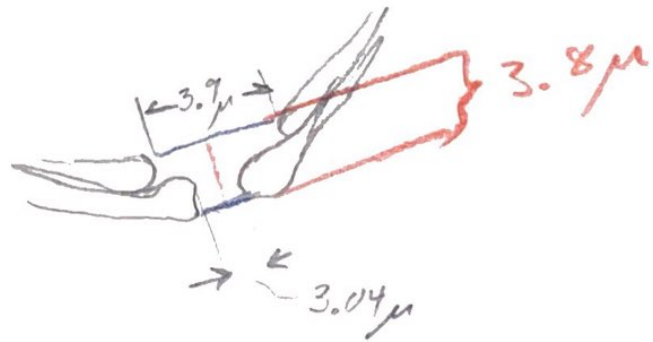
Corylus avellana (Filbert, European Hazel)

MA 3/9/73



PVA x 1000

-oblate
-

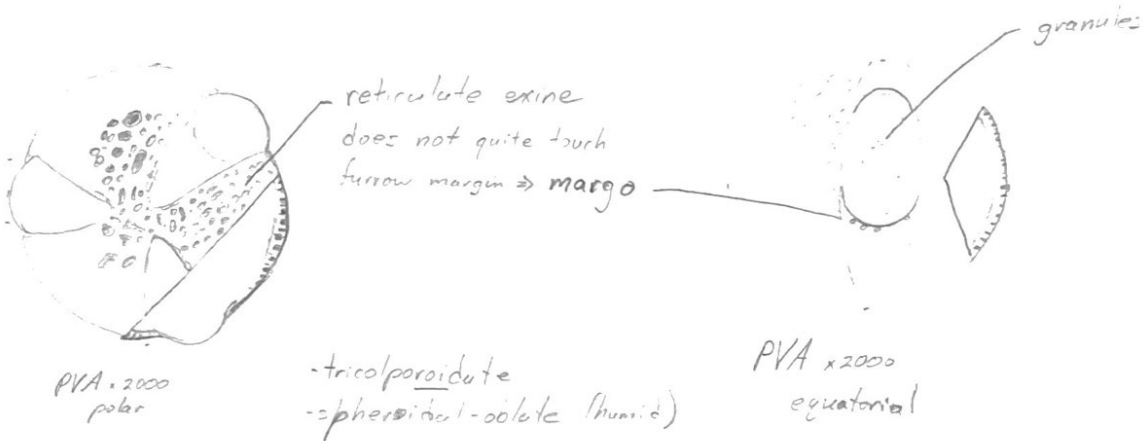


Order Salicales

fam. Salicaceae (Willow, Poplar)

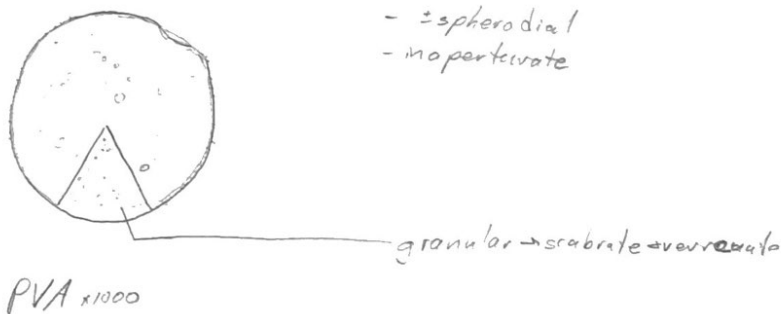
Salix caprea (European Goat Willow)

Stockholm No 39



Populus tremula (European Aspen)

Stockholm No 36



Order Juglandales

fam Juglandaceae (Walnut, Hickory)

Juglans nigra (Black Walnut)

M.A. AJEames, Hb. Acad. N.Y. 6/1/32



- many pored (10-20)
commonly 12-14
- pores mainly in distal hemisphere \rightarrow heteropolar
- aspidote pores
- size: smaller than Carya
(34-36 μ (D))

Carya ovata (N. Amer. Shagbark Hickory)

M.A. Heubner, coll. with AJ Eames, Hb. Acad. N.Y. 6/2/32



PVA

Bald
Zone

- usu triporate
- slightly aspidote
- "subisopolar" = slightly heteropolar
pores slightly off equator; "Bald zone"
on distal pole
- size: 40-45 μ (D)

Order Rosales
fam. Rosaceae

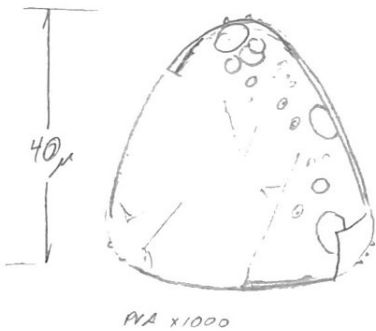
Sorbus aucuparia (Md. Ash)
Stockholm No. 43



- angular amb
- tricolporate
- exine minutely striate
- oblate (PE = .86)



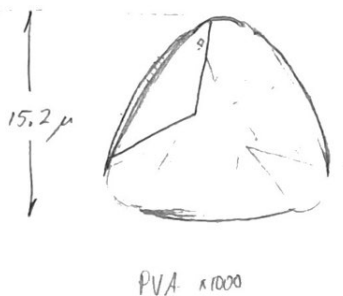
Malus sylvestris (Apple)
Stockholm No. 77



- angular amb
- tricolporate (furrow margin indistinct)
- exine: striate (w/ tryphine on it)
- oblate (PE = .85)
- "metabolic bodies"



Prunus padus (Bird Cherry)
Stockholm No. 37



- angular amb
- tricolporate (margin definite)
- exine striate
(forming ± "net P. d.")
- oblate (PE = .85)



Order Fabales

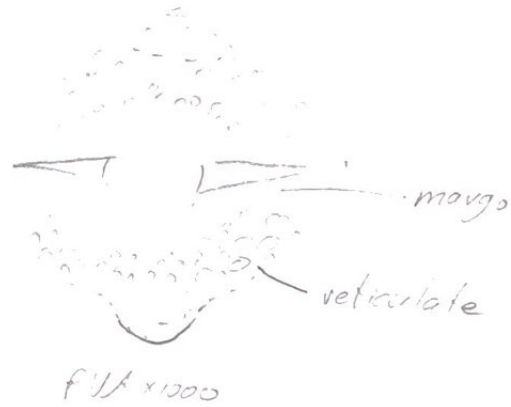
fam. Fabaceae (Leguminos)

Trifolium pratense (Red Clover)

U. Stoenholm No. 46



- tricolpate
- prolate

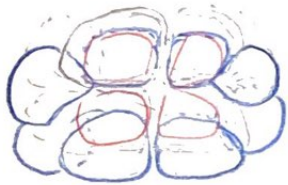


Nov 16

dehiscence

fam. Mimosaceae

Albizzia julibrissin (Silk Tree "Mimosa")



- 16 adherent grains
(4 tetrads)
- psilate exine

fam. Caesalpinaceae

Cercis canadensis (N. Amer. "Red Bud")

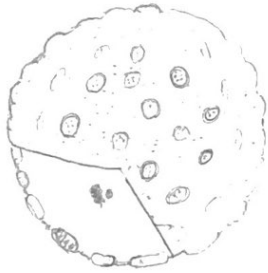


PVA 1000

- tricolpate
- delicate foveation
- diam 20-27 μ
(ca 25 μ)

Order Caryophyllales
fam Chenopodiaceae

Chenopodium album (Lamb's Quarters)
Stockholm 83



PVA x 1000

- perforate } w/ exine fragments upon
- operculate }
- exine scabrate "dimpled" agal/bull
- ± spheroidal continuous w/ struct. bacula
- size ca 33 μ

$$\bar{x} \begin{cases} C = 5.87 \pm 2.02 & n = 9 \\ D = 36.1 \end{cases}$$

$$C/D = .163$$

$$\# \text{ pores} = \text{ca } 135$$

another, smaller, grain

$$C = 5.51 \quad C/D = .177$$

$$D = 31.16$$

$$\# \text{ pore} = \text{ca } 120$$

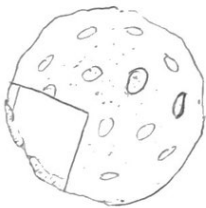
another, still smaller grain

$$C = 5.04 \quad C/D = .170$$

$$D = 29.64$$

$$\# \text{ pores} \text{ ca } 125$$

Salsola kali var. tenuifolia ("Russian Thistle")



PVA x 1000

$$C = 7.35 \mu \quad C/D = .2613$$

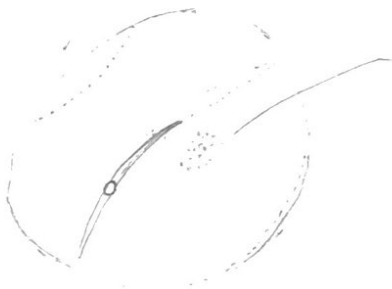
$$D = 28.12 \mu \quad \# \text{ pores} \text{ ca } 55$$

Atriplex patula
Stockholm 9, PVA

- pore number ca 40-45
- operculate
- prominent bacula in exine (continuous w/ structural bacules)

Order Polygonales
fam Polygonaceae

Rumex acetosa (Aonel, Dock)
Stockholm 38

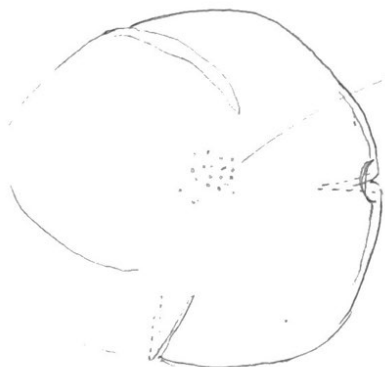


4-colporate
exine: foveate

long, slit-like colpi
may be curved or
distorted in unexpanded
grain

p/1 x 2000

Rumex acetosella
U. Minnesota

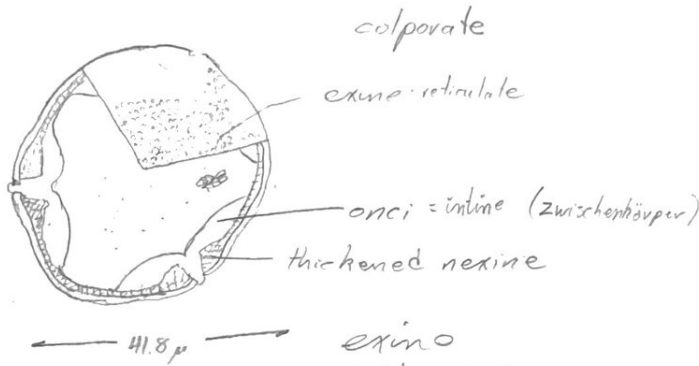


exine foveate

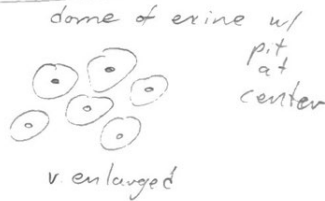
x 2000

Order Malvales
 fam. Tiliaceae

Tilia cordata (European little-leaf Linden)
 Stockholm 53



exine
 Erdtman's &
 strobiculate



PIA x 1000
 equatorial

nov. 23 demonstration

Tilia heterophylla (American White Basswood; Linden)
 MA 6/30/70



PIA

- oncate, tricolporate
- foveate (designated scrobiculate by Erdtman)
- ± sub-planaperturate (inter sub angular amb)
- diam. ca 35-42 μ

Order Sapindales
 fam. Aceraceae (Maples)

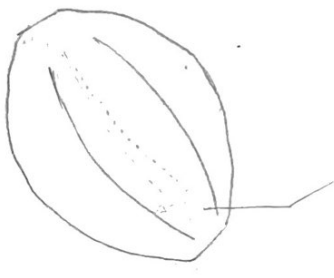
Nov 30
 demonstration

Acer negundo (Box Elder; Manitoba Maple)

U. Minn 11/13/73

acetolyzed → PVA

⇒ povid not visible



tricolporoidate

much reduced rugulation "finger-printing"
 associated w anemophily



humid, not acet'd ⇒ spheroidal → oblate

fam. Hippocastanaceae (Horse Chestnut Gen.)

Aesculus hippocastanum (Horse Chestnut)

U. Stockholm No. 1

tricolporate



x 1000

exine: minutely striate-reticulate (like in Acer)

granules on membrane

ϕ ca 27 μ



subprolate → prolate

Order Oleales fam Oleaceae

Syringa vulgaris (Lilac)

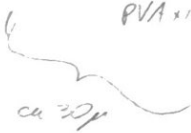
Stockholm 44

- buttressed, conspicuous reticulum
- variation in size of
lumina (brochi)

tree - colporate



PVA x1000

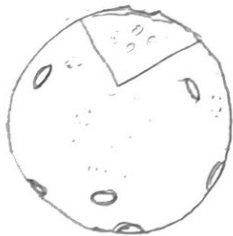


Order Scrophulariales fam Plantaginaceae (Plantago)

Plantago lanceolata (English Plantain; Rib Grass)

Stockholm 33

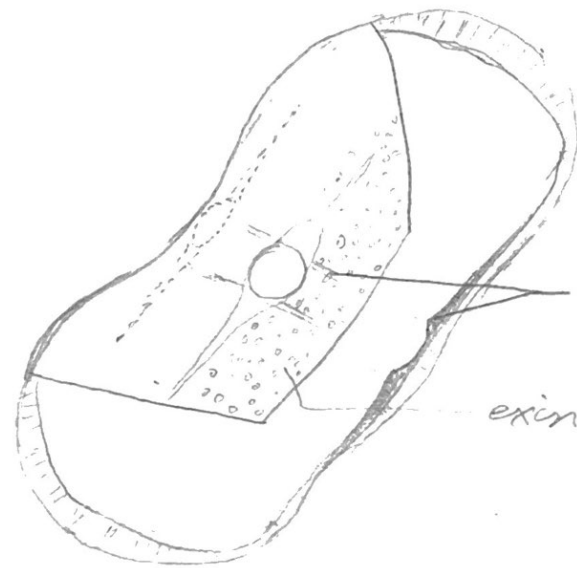
- annulate, operculate pore
- undulating exine w/
microechinae



x1000

Order Cornales (Umbellales)
fam. Umbelliferae (Apiaceae)

Meracleum mantegazzianum
Stockholm No. 68



shape: "dog bone"
perprotute

costae transversales

exine: bacculate

PVA x1000

Order Gentianales

fam. Rubiaceae (Coffee, Madder, Bedstraw)

Galium verum (Golden Ladies Bedstraw)
Stockholm 66



PVA x 2000

6-colpate
exin: foveolate

± oblate



Order Asterales
fam. Asteraceae (Compositae)

1) subfamily Liguliflorae; tribe Cichorieae (Chicory)

Taraxacum vulgare (Dandelion)
Stockholm 45



PVA x1000

echinophyte
ca 15 lacunae w/ 4-6 μ muri
numerous small (2-3 μ) spines

(Order Asterales fam. Asteraceae continued)

2) subfam Tubuliflorae tribe Anthemideae (Chrysanthemum tribe)

Chrysanthemum carinatum

Stechbahn no. 15



PVA x1000

colporate
± short colpus
thick becculate exine
3-4 μ spin 6-8 μ spat
granulate bottom spines



Artemisia vulgaris (Wormwood, Mugwort)

Stechbahn 7



PVA x1000

much reduced echinate oris (ast w/ anemophily)

tricolporate
w well developed colpus
complex sporoderm
w becculate resine

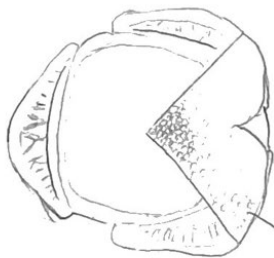


3) subfamily Tubuliflorae tribe Cynareae (Thistle tribe)

Centaurea cyanus (Cornflower, Bachelor's Buttons)

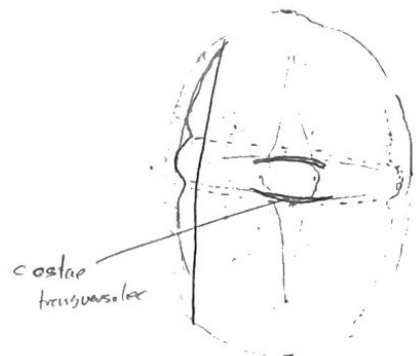
Stechbahn 14

shape: planopentulate



PVA x1000

"negative reticulum"
under exine w/
reduced spines
(n Artemisia)

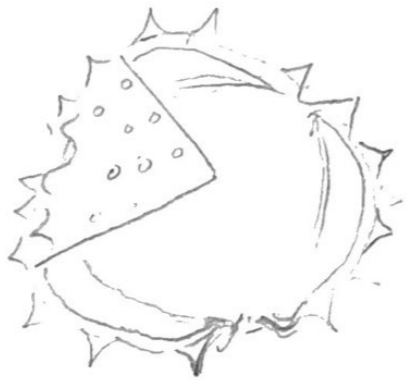


costae
transversales

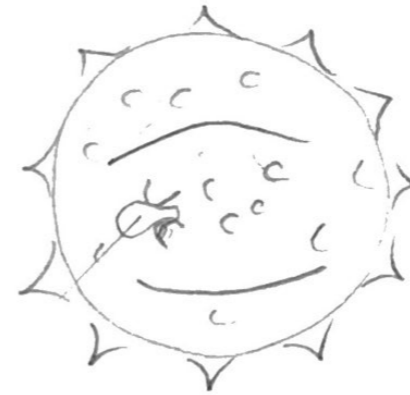
x1000

Order Asterales fam. Asteraceae
subfamily Tubuliflorae tribe Ambrosieae (Ragweed tribe)

Ambrosia trifida



acet'd → PVA x1000



pore

cf. A. elatior - v. similar

Monocotyledoneae
Order Typhales, Typhaceae (Cattail fam.)

Typha angustifolia (Narrow leaved Cattail)

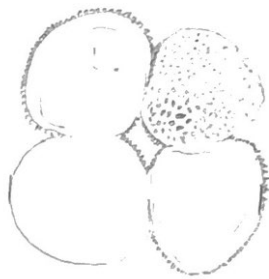
Stockholm 47



demonstration
dec 2

Typha latifolia (Common Cattail)

Stockholm 48



in tetragonal tetrads

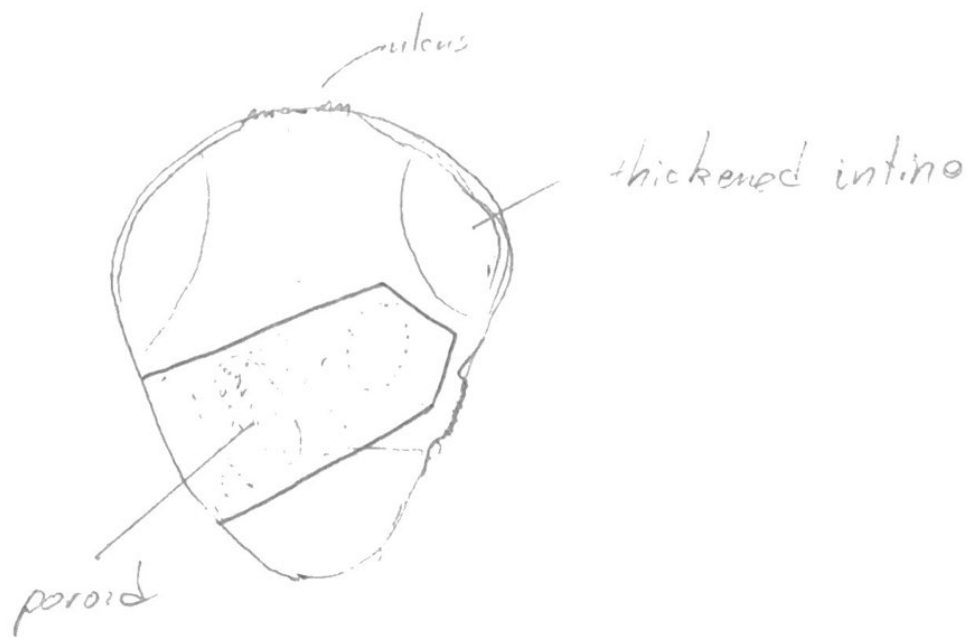
exine: reticulate

single distal germ pore aperture

Order Cyperales fam. Cyperaceae (Sedge fam.)

Carex arenaria (Sedge)

Stockholm 60



PVA x 1000

Order Poales suborder Poaceae (True Grasses;
Gramineae)

Poa pratensis (June Grass; Ky Blue Grass)
Stuedem. 25

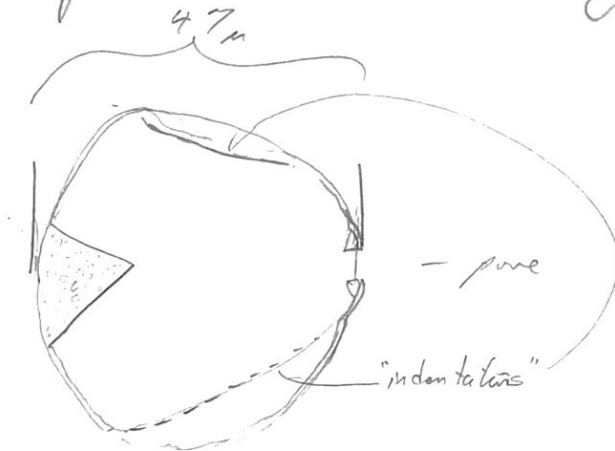


PVA x1000



pore, surface view x1000

Phleum pratense (Timothy)



acet'd \rightarrow PVA x1000

Gymnospermae

Coniferae (Conifers)

Pinaceae (Pine family)

Pinus strobus (White Pine)

aceted → PVA

