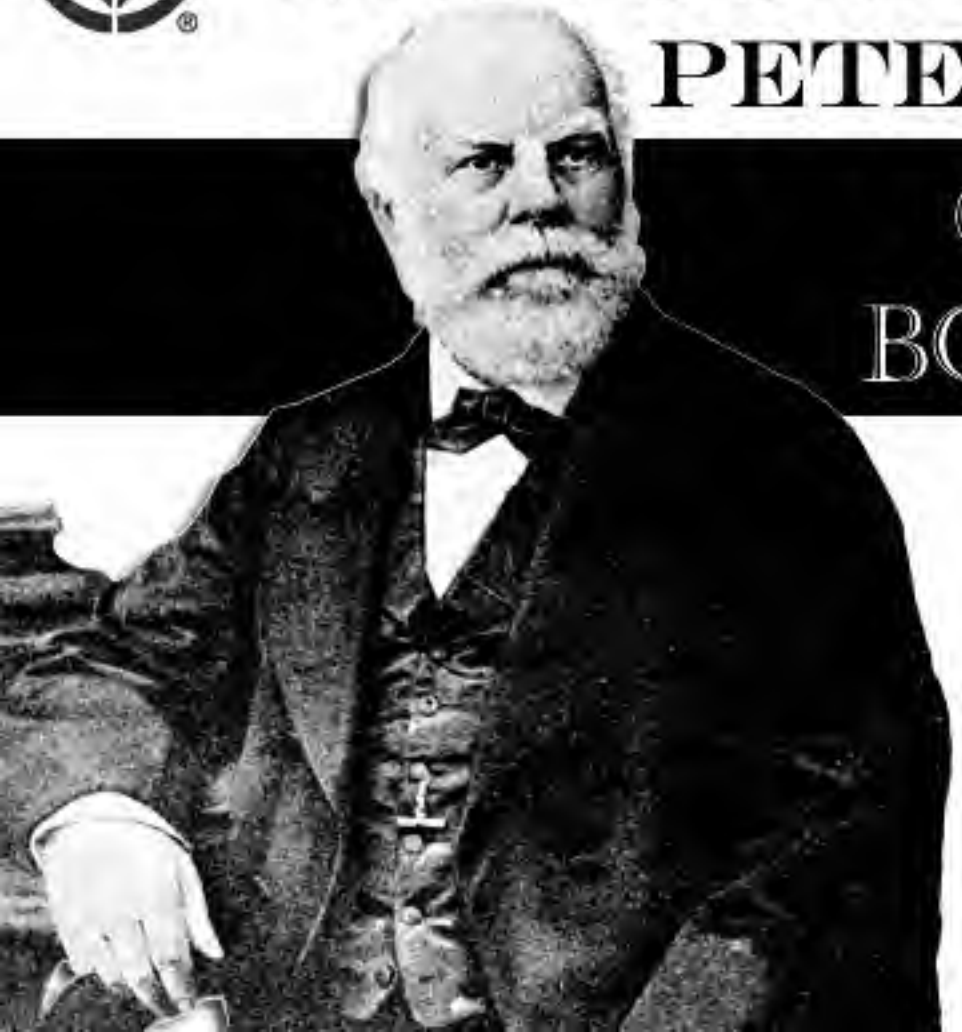
# Missouri Botanical Garden
## Peter H. Raven Library

# George Engelmann Botanical Notebooks



*Pagination Note:*
*Since many of the items lack a specific page number, the page number displayed online refers to the sequentially created number each item was given upon cataloging the materials.*

Nov 1863

# Pollen of Coniferæ

A. Braun Parthenogenesis 1856 p. 367. compares Pollencells with the Embryosack and refers to Schacht, Beitrage zur Anat & Physiol der Gew. 1854. p. 148 & 284 t. 2. –

J. Currey in his translation of Schacht's work on the Microscope, second Edit London 1855, appends the chapters (referring here of the Beitrage) at p. 172 – 192 of his publication, with figures in woodcut. – From Prof Gray's copy I make the following extracts –

p. 172. In all other cases the pollentube is a prolongation of the innermost Pollencell but in all Coniferæ examined by me (Schacht) a body of several cells is formed within the Pollengrain and the terminal cell of this body displaces the contents of the real pollencell and eventually forms the [always single] pollentube.

Fritsche, treatise on Pollen, noticed the existence of these cells

Meyer, Vegetable Physiology vol III p. 188. accurately describes and figures them of Larix; also found them in Pinus & Picea; – in some

p. 173 Liliaceæ similar cells in the pollengrains were found by him, but free

Jelezinoff (Ann Sc. Nat. 1850) gave a history of the developement of the Pollen and Embryo of the larch.

The bud of the male catkin of Abies pectinata is formed in the spring, at the time of the opening of the branch bud, as small green protuberances in the axis of a young leaf, on the under side of the young branch; during summer

p. 174 scales are formed, surrounding the punctum vegetationis (the rudiment catkin); in the fall no more leaves are formed, but ~~after that~~ only leaves which become developed into anthers. – The catkin bud in Abies is on the under side of the branch and numerous, the cone bud on the upper side and ~~few~~ solitary. – Even in August the young anther of Abies, Picea Pinus & Larix is bilocular; by the end of September 4 young Pollengrains are found in each mothercell of these anthers; there till Spring no changes of importance take place. At the beginning of May the pollengrains of Abies & Picea lie in 4s in the interior of their mothercell.

175 mothercells of Picea vulgaris which have become 4-locular by formation of special mothercells – Young pollengrains shape – 112 & 113. – This at the beginning of May. – The special mothercells (discovered by Naegeli) are a layer of cellulose secreted by the

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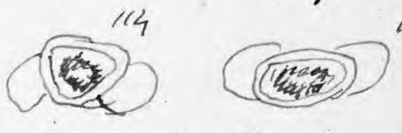
primordial utricle of the pollenwall; this last itself has originated by division of the primordial utricle

The escaped Pollengrain is now no longer round, the two lateral expressions are already perceptible

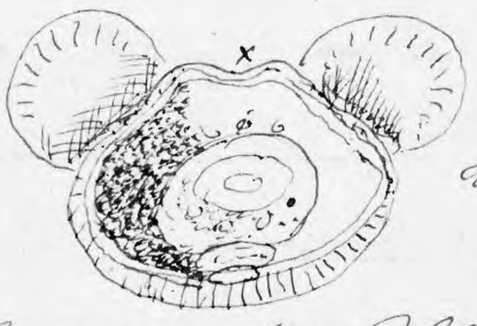



p. 176 f. 116

point of egress of pollentube — further developed Pollengrain

x 600

of Pinea



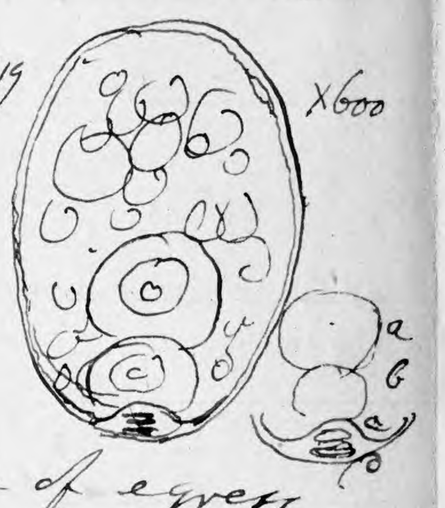
117 ripe Pollen of Abies pectinat

118 ripe Pollen of Pinus vulgaris

both soaked ½ hour in oil of lemons — x place of egress of Pollentube.

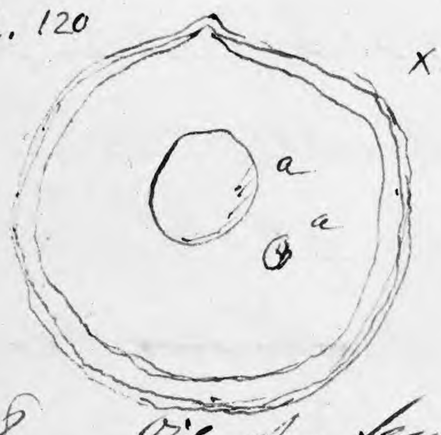
There is a fissure between the outer and inner membrane i.e. between the pollen cell and cuticle; above this fissure the pedral-cell of the cellular body seems to be seated. The cuticle seems to consist of two layers.

p. 177. Ripe Pollengrain of Larix Europaea in water




a terminal cell of cellular body b, larger pedral cell c. & d. smaller pedral cells having the appearance of fissures in the membrane of the pollengrain. The place of egress of the pollentube is opposite to the cellular body, also in the larch

f. 120




x600

Pollen of Larch in concentr. Sulph. Acid — Contents and true pollencell have disappeared, some oil drops only (a. a.) are seen, the cuticle remained, but rosecoloured exhibits two layers — and is thin at the spot ~~place~~ the egress of tube.

p. 178 Oil of lemons or turpentine makes the Pollen transparent and permits the cellular body plainly to be seen. —

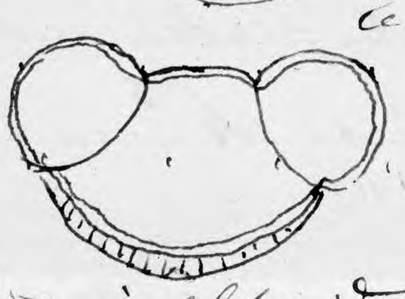
f. 121

x 300

Sulph. acid on quite fresh Pollen brings on a swelling and protrusion of the pollencell

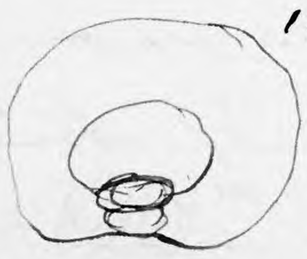
This figure represents Pinea vulgaris Pollen with Nitric acid

f. 122



Pinea in sulph. acid interior structure destroyed

123



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pollencell including cellular body forced out by nitric acid.

p. 179 Always 3 cells of cellular body in Abies pectinata, Pinea vulgaris and Pinus sylvestris [in Larix always? 4 cells]

In Pinus sylvestris the terminal cell of this body grows so

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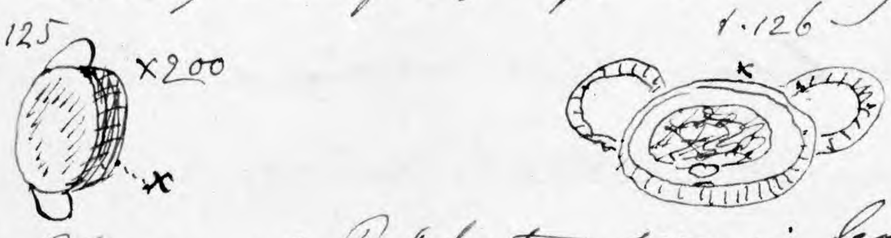
that it sometimes displaces the granular contents of the Pollen-cell, and fills up the cavity of the same.

p. 180 f. 125 ×200 f. 126



terminal cell of cellular body fills the cavity; Pollen-cell gelatinous and distended.

dry Pollen-grain of P. Sylvestris same in lemonade

128 129 ×400

Of two ripe Pollen-grains of Pinus sylv. the Pollen-cell is forced out by Nitric acid — the cells of the cellular body and the swollen coats of the pollen-cell are seen. It is probable that at last the terminal cell of the cell. body forms the Pollen-tube and has the same contents of granular matter as the original Pollen-cell. "In the larch the cuticle is completely stripped off by the tubular prolongation of the Pollen-cell" probably in other Coniferae the same.

p. 181 Cycadeae have a spherical pollen, and folded when dry — only one place for egress of Pollen-tube

1. Coniferae & Cycadeae have naked ovules, originating in an open fruit scale

2, The embryosac of both families produces corpuscula, which are large cells of the albumen, varying in number, and situated at the apex of the embryosac, into which the pollen-tube enters in order that after having extended itself within the corpusculum it may form the first cells of the embryo. In all other phenogams the corpuscula are wanting; the pollen-tube simply enters the embryosac and forms therein the first cells of the Embryo

p. 182 3, The Pollen-tube in these families is not a prolongation of the inner true pollen-cell, but an extension of the terminal cell of a small body consisting of several cells which body originates in the interior of the pollen-cell the contents of which it appropriates to the purposes of its own development.

p. 183 In the spring 1854 further observations afforded the following results: 1, In the larch shortly before the opening of the anther, the Pollen-cell divides into two unequal halves a & b; the lesser (b) is opposite [closeto?] the place of egress of P. Tube; this last cell becomes again and generally again divided. In this manner the cellular body

originates; the two lower cells remain stationary and the contents disappear; the two upper ones continue to grow; the uppermost becomes the pollentube, which destroys the contents of the larger derivative cell (a), and bursts through it.

2, In those Coniferae which have anthers with pollensacs (Cupressus, Thuja, Juniperus, Taxus) a similar division of

p. 184 pollencell in the round pollengrain takes place; the smaller undergoes no change, and the larger one becomes pollentube. In Cupressus the pollengrains often protrude tubes whilst still in the pollensacs.

3, The scales which carry the pollensacs are the true anthers; these sacs in Thuja, Cupressus, Callitris & Juniperus commonly are on the underside of the stalk, in Taxus the sacs appear in the form of 5 or 6 loculi on the inner side around the stem of the shieldlike anthers; they open like the others by fissure. Similar are the pollensacs of Cycadeae, not real anthers but only those parts of the anther which perfect the pollen. – The ament of Coniferae & Cycadeae is therefore a single flower, and not analogous to the catkin of Amentaceae.

4 Anthers of Podocarpus = Abietineae, bilocular; loculi

p. 185 towards the outer lower side, opening by a perpendicular longitudinal fissure – Pollen equal to that of Pinus with 2 excrescences – Ephedra has oval pollengrains, with 6 longitudinal ribs.

5, The division of the pollencell (only visible in quite fresh Pollen). In Juniperus communis ~~the pollengrain~~ where lies almost inactive on the nucleus for a year, takes place in the second spring. In Taxus it is inactive on the nucleus for several weeks, the division often takes place already in the anther; also in Thuja & Cupressus; the same in Abietineae; though in Pinus the pollentubes do not reach the Embryosac and corpuscula until the following year.

6 The cuticle of Pollen of Coniferae is stripped off when the tube is developed, and in Abietineae the lacerated remnants of the covering of the pollencell and derivative cells are often found hanging

parietal cells of the
on the ~~cellular body~~ ~~nucleus~~ which forms the termination of the pollen tube. The detached, collapsed outside may often be seen on the nucleus.

7, The contents of the pollengrains vary according to development starchgrains large & small and granular matter, not starch.

'Hofmeister considers the existence of phytozoa (Keimung Höheren Cryptogamen etc. p. 132) in the pollentubes of Coniferae probable – I have never found them. – Free cells never originate in the corpuscula of the Conifers. – Several pollentubes generally reach the embryosac through the tissue of the nucleus; nevertheless one pollentube can impregnate several corpuscula – The pollentube forces its way between the cells of the so-called Rosette, i.e. the cells which cover the apex of the corpusculum; the latter cells are pushed far apart by the pollentube, which then appears like a bladder in the interior of the corpusculum; the "mock cells" then make way for the pollen tube. 1, Hofmeisters opinion, that a cell existing in the corpusculum is impregnated by the pollentube, is erroneous, since no cell is present in the corpusculum before the entry of the pollentube. New and extended observations made upon Lathraea and Viscum have convinced me that of the accuracy of Schleiden's theory according to which the first cells of the future plant originate in the pollentube itself." [afterwards recanted by Schacht himself]

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Pseudostrobus

aristata (Parry) 4

mutica (Brewer) 4

leiophylla (Gregg) 6 (-8)

Montezumae (Gregg) 9-10

Sylvestres quaternatae

Sylvestres ternatae

~~ponderosa Rocky Mts~~

~~Calif.~~

~~insignis (Boland No 1)~~

Cubensis (Wright) 15-16)

"tuberculata" HB Mass. 8

insignis (Boland No 1) 6-8

Chihuahuana (Wright) 8

ponderosa (Fendler) 10 (Wislizy) 10

" ? (Boland) 10 (A. Lyall) 12-13

Canariensis Naples 4-5

Sylvestres Cembratae

Sylvestris 3

pumilio (HB. Mus) 9-10 HB Cambr 6(-7) solalex 6(-7) (Carlsruhe) 6 (Chaldyse) 6

dotinata HB. Berl 4

resinosa (HB. M) 6 (Mass) 6

contorta (Parry 1864) 6 (Parry 1862) 6(-8) (Lyall) 5-6

(Boland No 2) 6-8 (Brewer 2092) 6 (Brewer (2830) 8

pinaster (Paris) 3(-4)

maritima (3-) 4

Pinea (Naples) 4-6

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Flowers!

# Involucrum of Male Aments of Pines

## Pinus : masc. cal. 4-phyllus (Cod Lin. pag 946

Number of involucral bracts (Calyx, Lin)

may 1829 always more than 2, primary, lateral and keeled (important character is their proportion to the length of the others) 3d is posterior to axis of fl. — opposite axis of efflorescence (and branch) 4 anterior or opposite bract. 5 & 6 lateral etc.

### Pinea

P. Sabiniana (Poland) 12 Wislizen (15) (Brewer) 10 (Naples) 18-19

### Cembroides

monophylla (Fremont) 5-6 (Hayden) 6

Parryana (Parry) 4

edulis (Wislizen) 4 (Fendler Parry) 5

### Cembra

cembra Cambridge 6-8

flexilis Parry 8-9

### Strobus

Strobus (Frankfort) 8 New Hampsh. 6-7

excelsa (Cambridge) 8-9 (Bethlehem) 8-9

Lambertiana (Parry) 14-16

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very deep and sometimes even tubular (1/2 - 1 inch deep) ~~with~~ covered with brown lanceolate (imbricate ~~subpubescent~~) scales; nut slender, acute? 3/4 - 1 1/2 inches long. — Prod 16.2.67. Lagda oaks 396 Q. Morehus, Kellogg Proc. Ac. Calif. 2. 36.

Var. frutescens, shrub 3 - 10 feet high, with smaller ~~leaves~~ oval entire or spinose-dentate leaves, 1 - 1 1/2 inches long.

Common in the Valleys and on the lower Mountains throughout the State, ascending into the Sierras: Shasta, Mount Diablo, Santa Lucia Mountains, Brewer, Anderson Valley, Bolander; the variety is the "desert-oak" of the southeastern desert, Parry, Santa Anna, Brewer 137, to Battle Creek and Shasta, Brewer 1467. — A magnificent tree with shining, dark green, very dense foliage, sometimes 10 - 12 or even 18 feet (Shasta, Brewer) in circumference, 50 - 60 feet high; bark paler and smoothish when young, very rough and black in old trees; wood said to be tough and durable. Leaves persist 14 or 15 months, longer than in the last, but rarely until the fruit matures; winterbuds oval, 1 - 2 lines long, brown and shining and slightly ciliate; cups very variable in size, often deeper than in any other N. American Oak. This species has ~~often~~ been confounded with Q. agrifolia, but is readily distinguished by its biennial fruit, the strongly reticulated, shining leaves etc; some forms closely approach the next species, which, however, has broader, more deeply lobed, deciduous leaves and obtuse acorns.

++ Leaves deciduous.

13. Q. Kelloggii, Newberry. A middle sized tree with rough black bark; branchlets soon glabrate; leaves broadly oval, pinnatifid lobed (like those of Q. cornea), 3 - 4 1/2 rarely 6 inches long, with lobes entire and tapering or broad and lobe-dentate, in early youth tomentose or ~~nearly~~ glabrous, at last glabrate, thick; petioles slender, 8 - 15 lines long; aments stellate-pubescent or smoothish, calyx with 5 broad ovate lobes, bearing 4 or 5 anthers; acorns mostly on peduncles, 1/2 - 1 inch long, often several together; cups hemispherical, often very deep (6 - 8 lines wide, 8 - 12 lines deep) with ovate-lanceolate blackish imbricate scales; nuts oblong, obtuse 12 - 16 l. long, 10 - 12 wide. — Pacif.

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# Involucr

Skeletts and Coss. have also leaf-phylla
Cons divides and punctat — (deciding leaving part of the base)
deciduous
Entire or serrate leaves.
Persistence of leaves — off during after 2 yrs — with 3d
articulate more scales (as off the buds) resinous — Coniferæ
Involucr of ♂ 3 (3–4) sylvestris pumilio (3–4) Calyx 4-phyllus Lin

4 Pasyanus edulis (-5) Balfour durnifolia (3–6) Thea (4–7) Halesia (4–6)
Cornaceæ Groggii California
6 Strobus (-8) monophylla (5–6) Massoniana (6–7) nudicaulis (6–7) resinosa (6–7)
leiophylla Lambertiana contorta (6 rarely 8) tuberculata (6–8)
rigida 6–8 Banksiana (6–8) pungens 6–8 muricata (6–8)

8–10 monticola flexilis (8–9) Cembra (6–8) insularis Pyrenaica (4–10)
Chihuahuana (8–10) Thunbergii Lambertiana (8–10) austrina (8–12)
Coulteri (8–10) Sabiniana (10) mitis (9–12) inops 8–10

10–15 excelsa (8–11) Peuce (9–10) Khasiana (13–14) Merkusii 12 Thunbergii 9–13
ponderosa 10–12 Sabini (10–15) Torreyana 8–12 palustris 12–14
Elliottii 12) Coulteri 14–16. australis 12–14

12–19 Lamb 14–16 Sabini 12–19.

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Arrangement of involucral scales of male ants and of virgin queen

3
8
11
16
1. 6. 9. 14 15 13 10. 5. 2
12
7
4

with 9 the first
cycle recommence

3
8
11
16
1 6 9 14 17 13 10 5 2
15
12
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4

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2905
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# Involucrum of Male aments of Pinus

[Linne (Cod. p. 946) cal 5 4-phylla : Pin
" " gemma : Abies
3-4

**3 involucre bracts**

P. sylvestris (~~P. maritima~~) P. Pinaster (P. densiflora)

**4 involucral bracts** (or with a 5th one)

P. Greggii P. aristata x Balfouri ~~P. maritima~~ (or 3)
P. Canariensis (or) P. rotundata Link P. densiflora (or 3)
(P. Brutia) P. edulis (or 5) P. Parryana

**6 (or rarely 7–8) invol. bracts** pungens (6–8)

P. pumilio (6–7) P. Mugho (P. rigida) P. resinosa (6–8)
P. Strobus (6–8) P. Cembra P. leiophylla P. muricata
P. contorta (5–6) P. Halepensis (5–6) Larricio "Brutia"
"P. maritima" (Neapl.) P. Syriaca P. monophyllos (5–6) ~~Pinea~~ (7)
Banksiana (5–7)

**8 involucral bracts** (or 9–10

P. Banksiana P. flexilis (P. Taeda) P. inops
P. rigida P. serotina P. tuberculata (6–8)
P. excelsa (P. Cembra) P. Chihuahuana
(P. Montezumae) Coulteri (8–10) australis

**10 or 12 invol. bracts** insignis (10) inops dense

P. Austriaca (8–12) P. Montezumae (8–12) P. Taeda (or)
P. mitis P. ponderosa ~~glabra~~ (12–14) ~~Elliotti~~

**14–19 invol bracts**

P. Lambertiana (14–16) P. Sabiniana (12–19)

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Washington University
St. Louis May 28. 1883

Dear Sir,

The final Examination of the Senior Class of Washington University, in Italian, will be held, from 11½ A.M. to 1 P.M. on Tuesday next, (June 2nd).

A committee consisting of yourself, Dr. L. Safel, Dr. Baumgarten & Mr. I. Kenn, is respectfully invited to attend the Examination.

Very truly Yours
W. Chauvenet
Chancellor

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Dr. G. Engelmann.

P.S. We shall be pleased to have your attendance at all the Examinations on Monday & Tuesday from 9 A.M. to 1½ P.M.

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involucral bracts

Sylvestris binatae

"Syriaca" Naples 6

Halepensis (Algiers) 4–5 (Naples) 6 (Hb. Bernh) 5–6

Densiflora (Sepe Herb Bernh) 3–4

Laricio

var Calabra H.B. Naples 6

Austriaca (H.B. Wien) 8–13 H.B. Cambr 8 (Berlin) 8 (Naples) 10–11

maritima (Parry Monterey) 6

Taeda

Taeda (Charleston) 12–13 (Delaware) 8 Texas (11–)12

rigida (Chadsford) 8 (Oswego) 6–7

inops (Chadsford) 8–9

mitis (Virginia Ashe) 10–12 (Missouri) (9–)10

Banksiana (Lapp) 7 (Oswego) 7–8

serotina (H.B.M.) 8–9

Greggii (Saltillo) 4

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arrived this morning from
Mr. Green, in the same box
with an instrument for the
University. I send
all that came marked
for me, by the bearer.

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Linne (Cod Lin pag 946)

Pinus: mas. cal. 4 phyllus

(— et Abies: mas. Cal. gemma

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