

CATEGORY 40

Epidermal Appendages

40I. double-outline trichome (one part may or may not appear more silicified; "base" is often spherical-elliptical or can have "straight" edges)

40IA. armed

a. armed only on base

1. blunt tip

2. acute tip

b. armed on tip (Boraginaceae, *Cordia/Heliotropium* diagnostic)

40IB. non-armed

a. outer edge straight

1. acute tip

00. large size

A. elongated bottom; short tip

B. small, pistol-shaped base; long tip

01. moderate size

2. blunt tip

b. curved tip

1. length of base greater than or equal to $\frac{1}{2}$ length of tip

2. length of base less than $\frac{1}{2}$ length of tip

3. length of base less than $\frac{1}{2}$ length of tip; base flat to sinuous

c. base rounded to oblong

1. not blocky

00. acute tip

A. whole trichome

B. broken off tips

01. blunt tip

2. blocky; may have indentations or ridges

d. triangular

e. curved; base not apparent; may be circular in top view

f. base with obtuse angles (Burseraceae, *Trattinnickia peruviana*, genus level diagnostic)

40II. single outline, highly silicified trichome

40IIA. armed

a. armed on all parts

b. armed on base only

40IIB. non-armed

a. outer edge straight

1. acute tip

00. smooth or grainy surface

01. uneven surface

2. blunt tip

b. outer edge curved

1. acute tip

00. smooth surface

01. uneven surface*

02. grainy surface*

c. cone-shaped

1. small with widely flaring base*

2. small to moderate size; no base or small base

3. small, rounded base; irregular conical shape; interior space; spherical, verrucose cystolith inside (Bombacaceae, *Pseudobombax millei*, genus level diagnostic)

40III. hairs (slender; elongated; double or single outline; with or without "base")

40IIIA. unicellular

- a. short to medium length. (Most of these are thin relative to length, there are examples that are "long" by our definition)

- 1. straight edges

- 00. rounded tip

- A. rough surface

- B. original 40IIIAa100

- 01. acute tip

- A. interior space*

- B. no interior space

- a. armed (Fabaceae, *Dalium guianense*, genus level diagnostic)
 - b. non-armed

- 2. curving

- 01. interior space [sic: no 00]*

- 02. no interior space

- A. acute tip

- a. smooth surface*

- b. grainy surface*

- B. blunt tip

- a. smooth surface

- 1. angled

- 2. bulbous (Bombacaceae, *Matisia longipes*, species level diagnostic)

- b. grainy surface

- c. scaled surface (*Dalium*, Fabaceae, genus level diagnostic)

- 3. hooked end

- 00. rounded interior space; small

- A. old 40IIIAa300, *Phaseolus* (Fabaceae) hooked hair (genus level diagnostic)

- B. hooked end is sharply recurved (Fabaceae, *Dalium guianense*, genus level diagnostic)

- 01. acute interior space; larger (Poaceae, *Pharus glaber*, not used as diagnostic)

- 02. double interior space (Euphorbiaceae; *Cleidium cf. castaneifolium*, genus level diagnostic)

- b. long (many of these have thick bases)

- 1. armed

- 00. curving (Boraginaceae, *Cordia lutea*, species level diagnostic)

- 01. bent at a right angle from base (Moraceae, *Artocarpus altilis*, family level diagnostic)

- 2. non-armed

- 00. smooth surface

- A. no base, or base seen as separate cell

- a. interior space

- 1. double interior space (Flacourtiaceae,

- Pleuranthodendron lindenii*, family level diagnostic)

- 2. old 40IIIAb200Aa

- b. no interior space

- 1. long to very long

- 2. relatively short (Bombacaceae, *Matisia longipes*, species level diagnostic)

- B. base occurs as part of same cell
 - a. base flat
 - b. Attachment of hair to base "v"-shaped
(Ulmaceae, *Trema* spp., genus level diagnostic)
 - c. base spherical (Boraginaceae, *Lithospermum carolinense*).
Tips also break off, acute inner space
 - d. attachment of base to hair is rounded (*Watteria*, Sterculiaceae)
- 01. grainy surface (Boraginaceae, *Heliotropium angiospermum*,
genus level diagnostic)

40IIIB. multicellular hairs

- a. segmented hairs
 - 1. armed, large, no interior space NEED TO REVIEW--MOST HAVE THIS.
Check overlap with *Piper aduneum* hairs. (Asteraceae diagnostic)
 - 2. non-armed
 - 00. small, smooth
 - 01. large, smooth, no interior space
(diagnostic to Asteraceae/Cucurbitaceae, *Cucurbita*)
CHECK TO SEE IF CAN SEPARATE THESE BASED ON SHAPES:
DATABASE PHOTO IS WRONG PLANT
 - 02. large with interior space
 - A. can have roughened edges (Euphorbiaceae, *Croton fraseri*,
species level diagnostic)
 - B. *Piper* type, smooth edges, elongated acute tip,
restricted interior spaces
 - 03. tip blunt
 - A. tip blunt and broad (Bombacaceae, *Quariba cf. grandifolia*,
genus level diagnostic)
 - B. tip blunt, rounded elongated tip, grainy surface texture,
individual segments broad and squarish . (*Piper aduneum*)
 - b. radiating or stellate hairs

40IV. bases (epidermal cells)

40IVA. radiating appendages

- a. discernable center
 - 1. many irregular appendages; obtuse
 - 2. long, regular appendages; acute
 - 00. no surrounding epidermal cells
 - A. old 40IVAA2, flat base
 - B. central cell overlaid with small cells; tall in side view
 - a. Large, 30-50 μ (Burseraceae, *Trattinnickia peruviana*,
genus level diagnostic)
 - b. Small, constricted at center: <25 μ (*Casearia sylvestris*)
(Flacourtiaceae)
 - 01. surrounding epidermal cells attached to form disk;
appendages relatively short
 - A. darkened
 - a. small (Bombacaceae, *Quarariba cf. grandifolia*,
genus level diagnostic)
 - b. large, with quadrilateral surrounding cells; tall in side view
(Fabaceae, *Inga densiflora*, genus level diagnostic)

- B. center has concentric pattern; tall in side view (Burseraceae,
Trattinnickia peruviana, genus level diagnostic)
- C. surrounding cells are angled (polyhedral) (Flacourtiaceae,
Pleuranthodendron lindenii, family level diagnostic)
02. lightly silicified surrounding cells; appendages long; large open circular center (Sterculiaceae, *Guazuma ulmifolia*, genus level diagnostic)
(Also in *Erythrina Amazonica* and *Lithospermum Carolinense* Boraginaceae CHECK)
03. long appendages and 7 attached cells; large polyhedral center (Lauraceae, *Aniba hostmanniana*, family level diagnostic)
3. short, regular appendages, angular rim
00. rim adjoins circular center (Bombacaceae, *Pachira aquatica*, genus level diagnostic)
01. rim is external to another ring around the center (Flacourtiaceae, *Tetrathyllum macrophyllum*, family level diagnostic)
- b. non-discernable center
- 40IVB. comprised of rounded cells
- a. large central cell with smaller surrounding epidermal cells
1. central cell not clearly defined
2. central cell rounded or elliptic; undivided; surrounded by small, elongated cells
00. old 40IVBa2A, B, multiple rows of attached cells (Boraginaceae, *Cordia lutea*, species level diagnostic)
01. single row of attached cells
- a. side view has raised central area (Fabaceae, *Dalium guianense*, genus level diagnostic)
- b. side view shows 2 layers of cells (Fabaceae, *Brownea ucayalina*, genus level diagnostic)
- c. side view shows single flat layer of cells (Bombacaceae, *Huberodendron patinoi*, genus level diagnostic)
3. central cell “isodiametric”; undivided; surrounded by small, rounded cells (Ulmaceae, *Trema* spp., genus level diagnostic)
4. central cell rounded with clear divisions or rings that appear inside of base
00. central cell is divided around the perimeter. Compare to 3: trema
01. central cell has multiple clear divisions (*Pachira aquatica* type, stomata, moved to 120IIA)
02. concentric ring pattern in central cell
- A. rugulose/grainy surface; sinuous outline
1. non-discernable center
2. discernable center (Boraginaceae, *Heliotropium angiospermum*, genus level diagnostic)
- B. smooth outline
1. without projections
2. with projections in a regular pattern (Boraginaceae, *Cordia hebeclada*, species level diagnostic)
- C. smooth; with surrounding epidermis
- b. multiple cells; rounded; more uniform size
1. highly silicified multiple central cells; appears darkened (*Cordia cf. polyantha*, species level diagnostic).
2. amorphous central cells, difficult to distinguish from surrounding epidermal cells
3. small, multiple central cells; 2 layers thick in side view (Fabaceae, *Brownea ucayalina*, genus level diagnostic)

4. Central cell is distinctive in being more highly silicified, sometimes 2 cells, 4 μ
(Piper) CHECK

c. Very 3-D, uniform rounded cells, 3-D in shape comprising 3-D mass, sometimes concave
(*Piper aduneum*)

40IVD. [sic: no C] spherical hair base; smooth (no rings) (Asteraceae/Cucurbitaceae diagnostic)
Central spherical (large) cell surrounded by rounded cells. May form a large 3-D mass of
rounded cells RECHECK SLIDE RE OVERLAP Q

40IVE. tear-drop shaped hair base; rough surface

40IVF. stellate center

- a. projections short, or mere points; may have crystalline inclusions (Bignoniaceae,
Tecoma gandichiandi, genus level diagnostic)
- b. projections medium length; with or without surrounding epidermis
- c. long projections; with attached peripheral epidermis (Moraceae, *Ficus americana*,
family level diagnostic)
- d. very small stellate center embedded in a well silicified body; 1 more ephemeral ring
(Moraceae, *Artocarpus altilis*, family level diagnostic)

40IVG. triangular shape

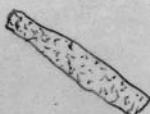
40IVH. quadrilateral shape

40IVN. flared shape [sic: no I-M]

*No card in MU card file

no epidermal appendage

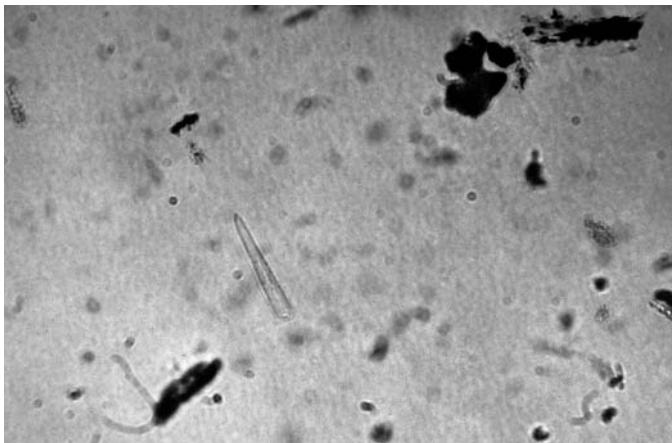
Duryeaene 40III Aa 100A



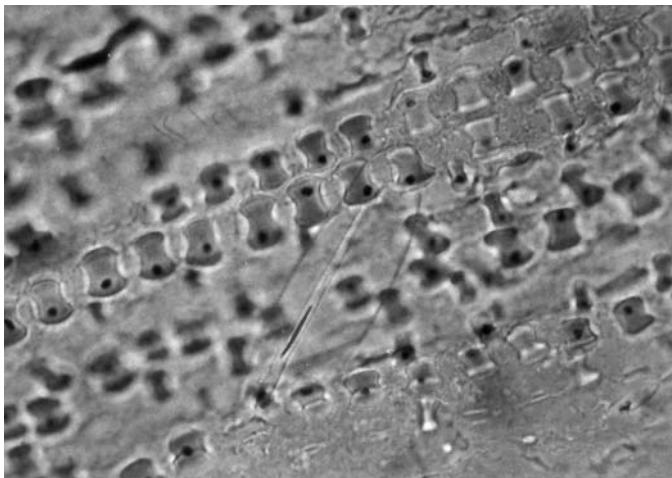
- unicellular hair
- short to medium in length
- straight edges
- rounded or blunt tip
- rough surface
- no interior space

2134a *Trattinnickia peruviana* leaf
2135 *Bursera graveolens* leaf } Burseraceae

40IIIAa100A card 1.JPG



40IIIAa100B photo 1f.JPG



40IIIAa100B photo 2f.JPG

40 Epidermal Appendage

40III Aa 101

(cannot determine if
has interior space or not)



- unicellular hair
- short to medium length
- straight edges
(may be slightly curving)
- pointed tip (acute tip)

Was: 40IIAa101

40IIIAa101 card 1.JPG

to Epidermal Appendage

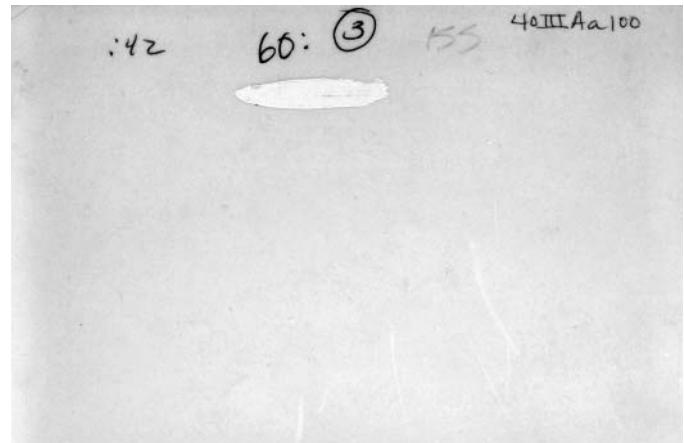
40III Aa 100
[new #: 40III Aa 100B]



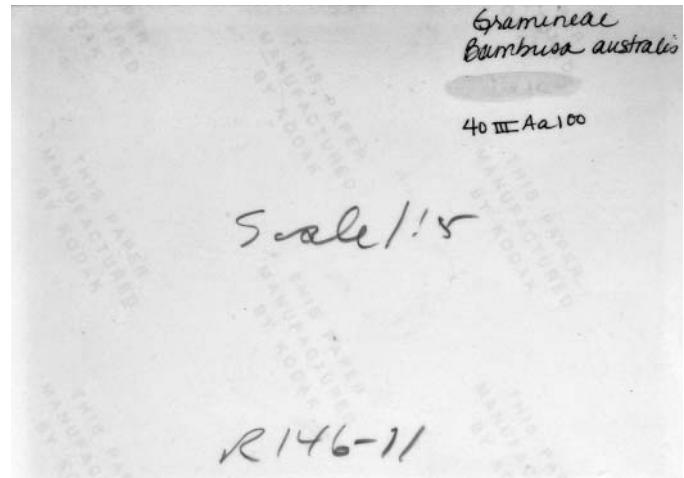
- unicellular hair
- short to medium length
- straight edges
- rounded tip

Was: 40IIAa100

40IIIAa100B card 1.JPG



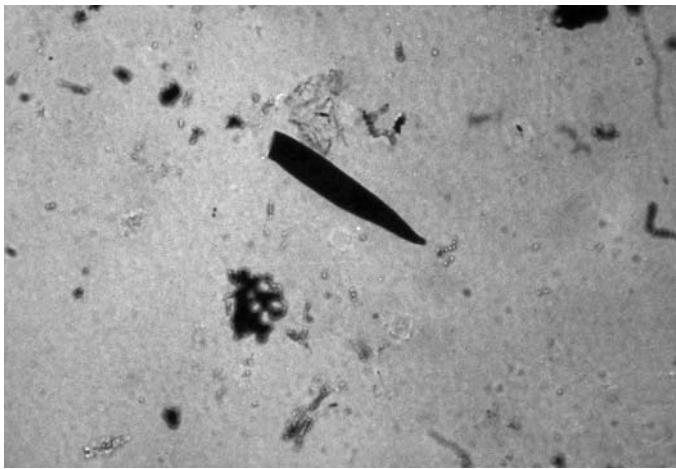
40IIIAa100B photo 1b.JPG



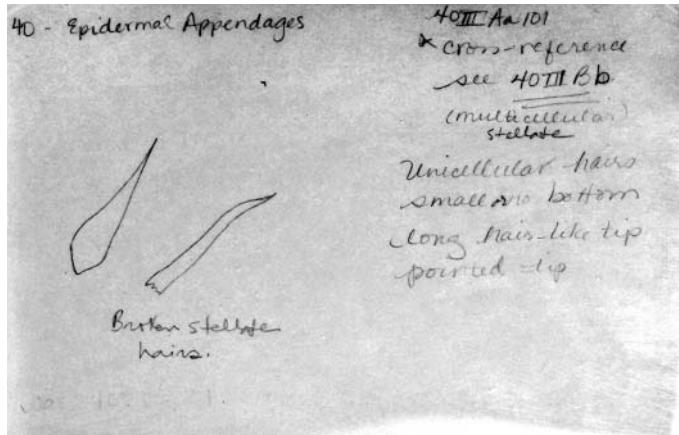
40IIIAa100B photo 2b.JPG



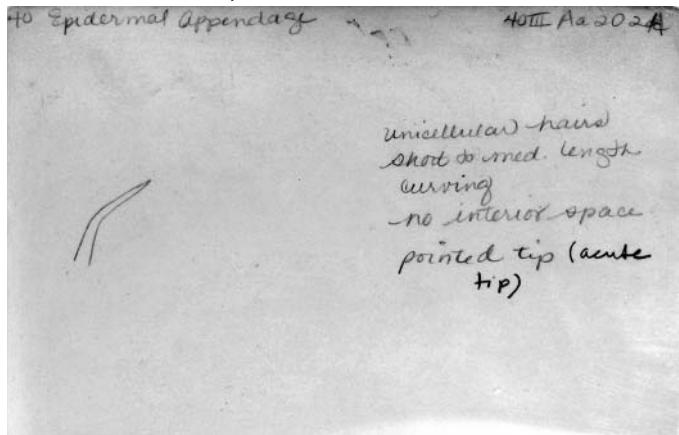
40IIIAa101 photo 1f.JPG



40IIIAa101 photo 2f.JPG

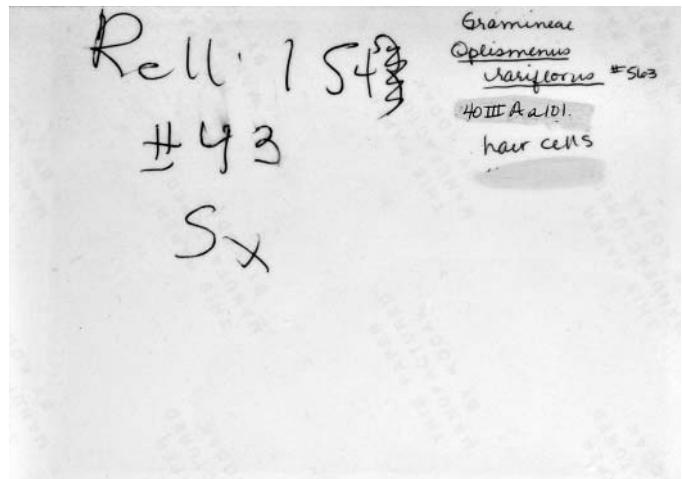


40IIIA101 card 1.JPG

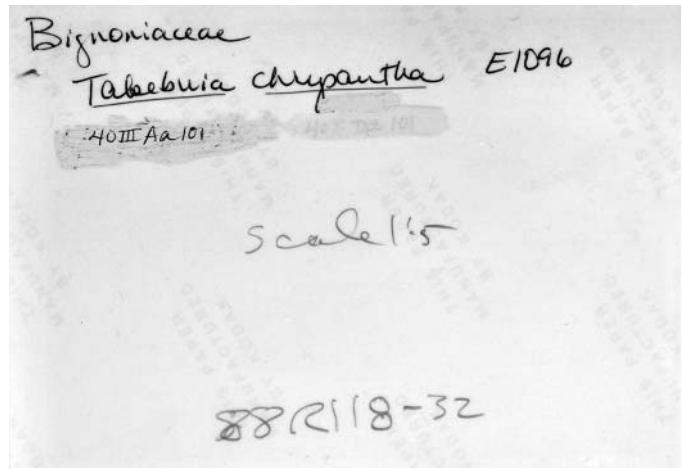


was: 40IIIA202

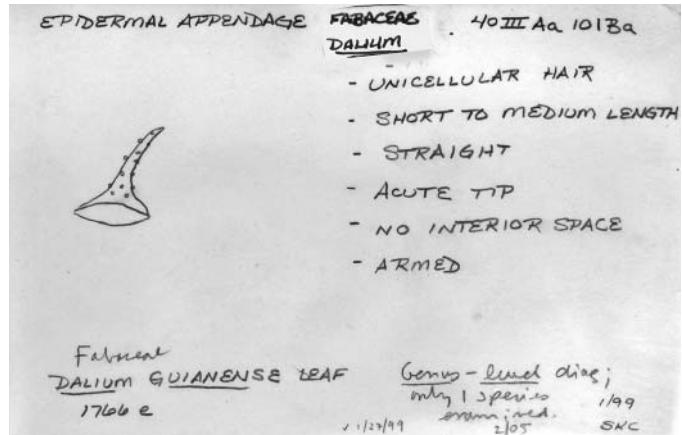
40IIIAa202A card 1.JPG



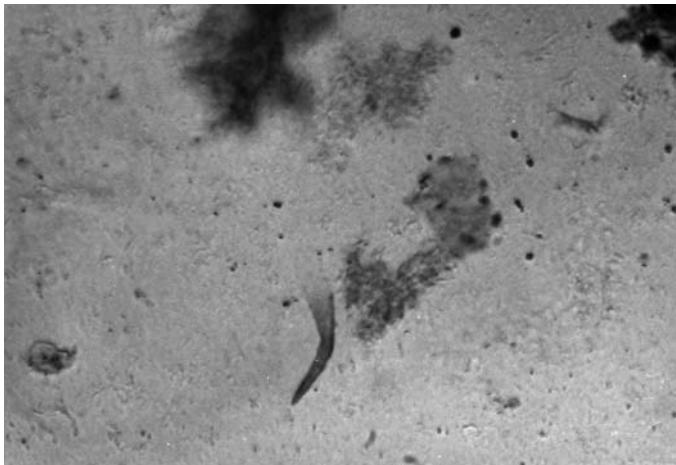
40IIIAa101 photo 1b.JPG



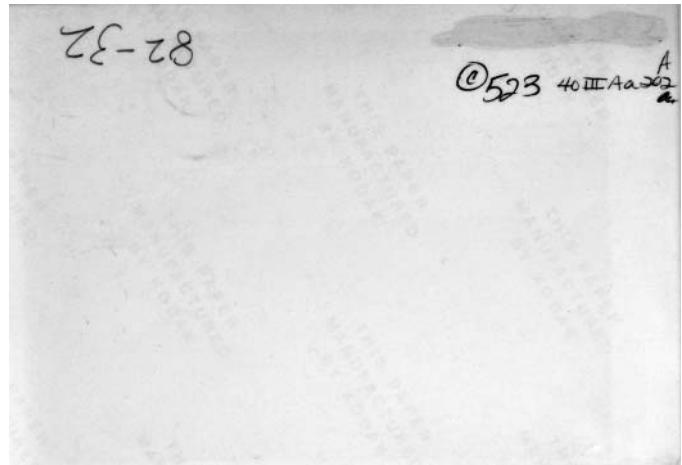
40IIIAa101 photo 2b.JPG



40IIIAa101Ba card 1.JPG



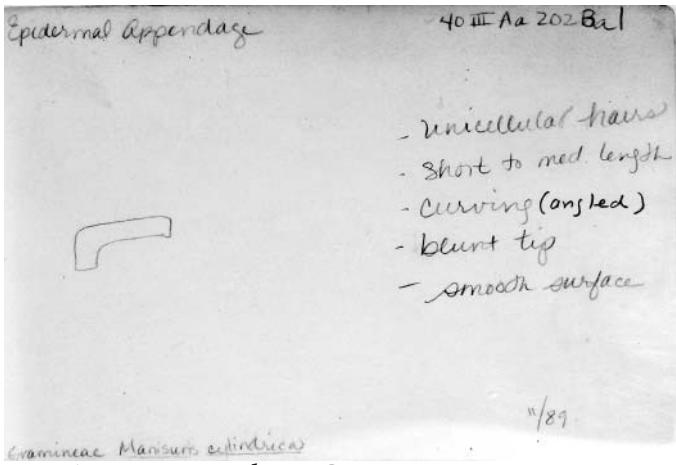
40IIIAa202A photo 1f.JPG



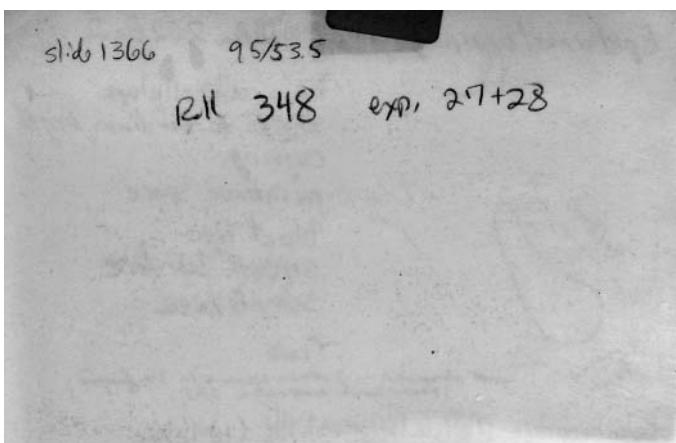
40IIIAa202A photo 1b.JPG



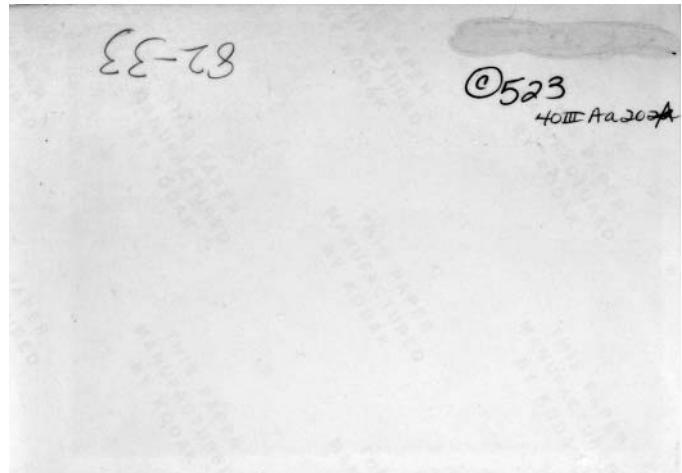
40IIIAa202A photo 2f.JPG



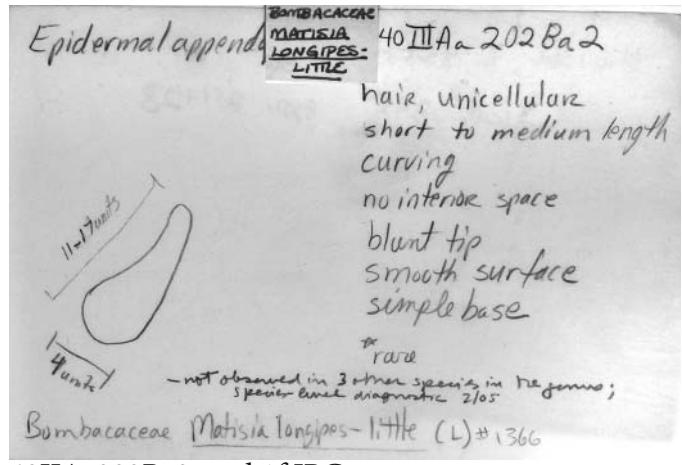
40IIIAa202Ba1 card 1.JPG



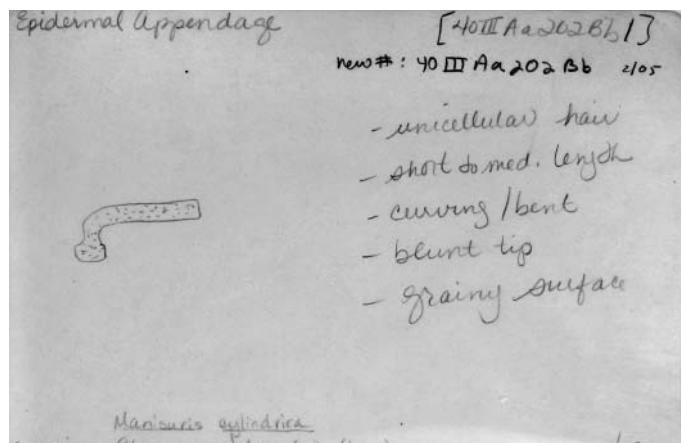
40IIIAa202Bb card 1b.JPG



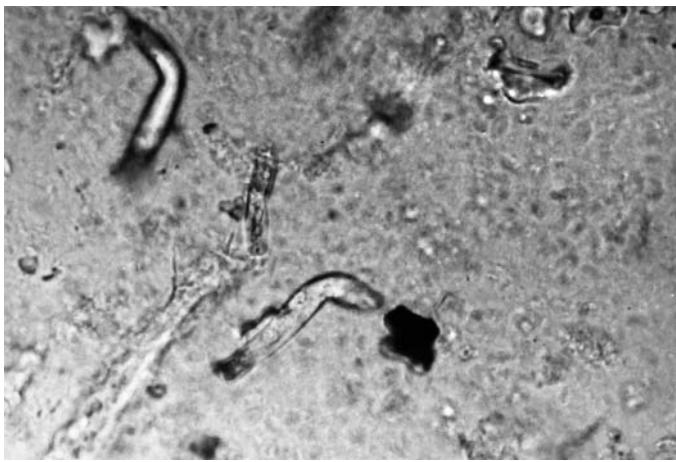
40IIIAa202A photo 2b.JPG



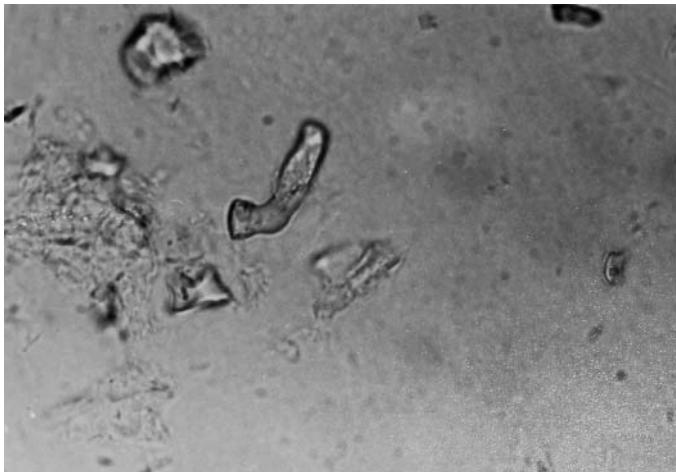
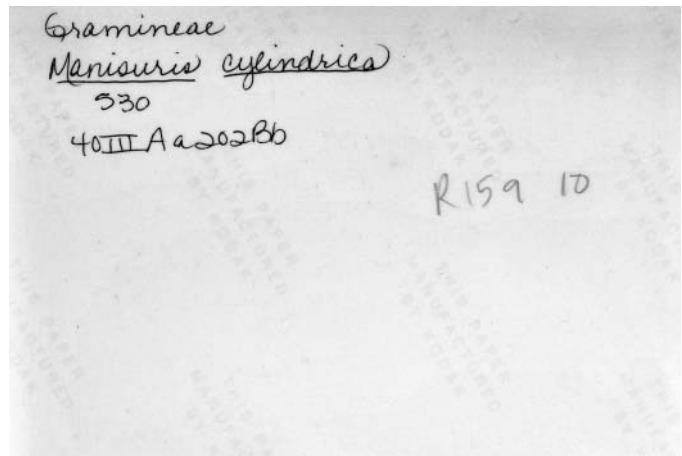
40IIIAa202Bb card 1f.JPG



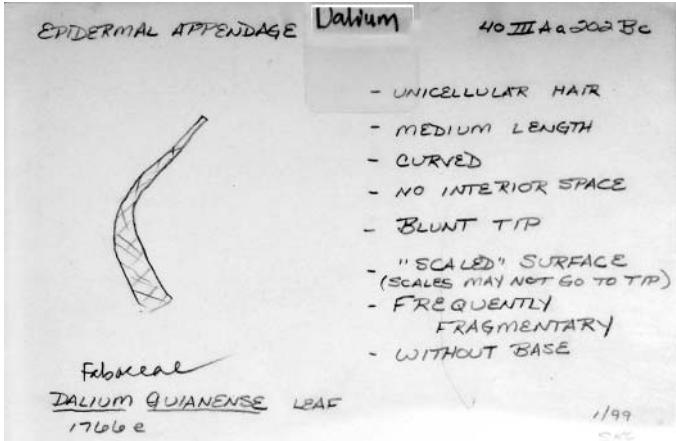
40IIIAa202Bb card 1.JPG



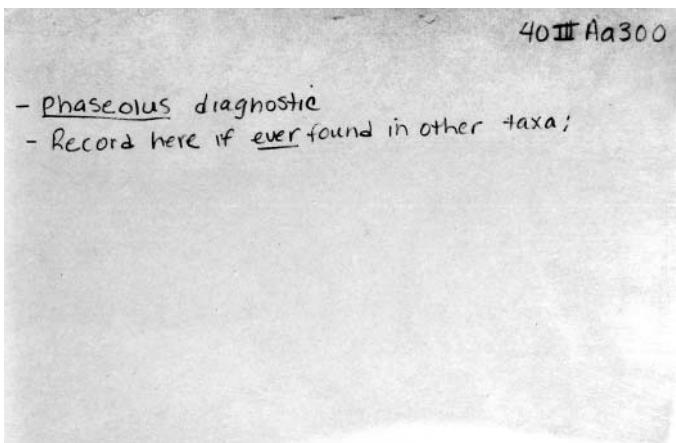
40III Aa202Bb photo 1f.JPG



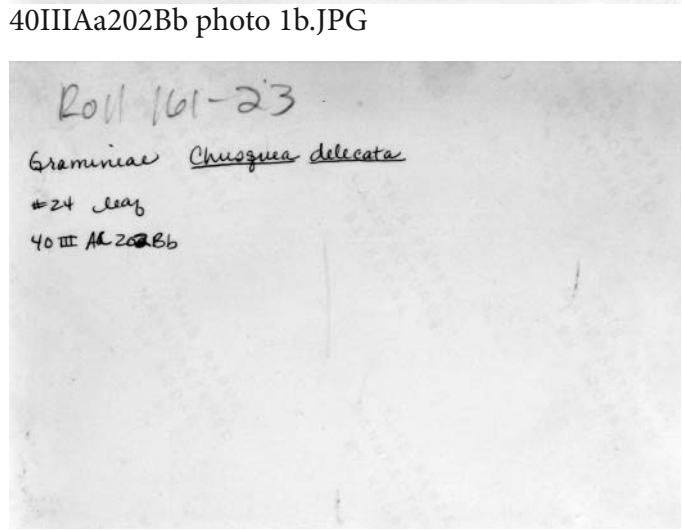
40III Aa202Bb photo 2f.JPG



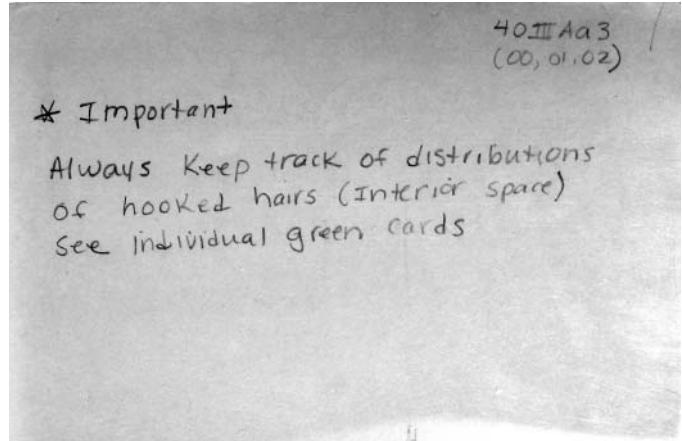
40III Aa202Bc card 1.JPG



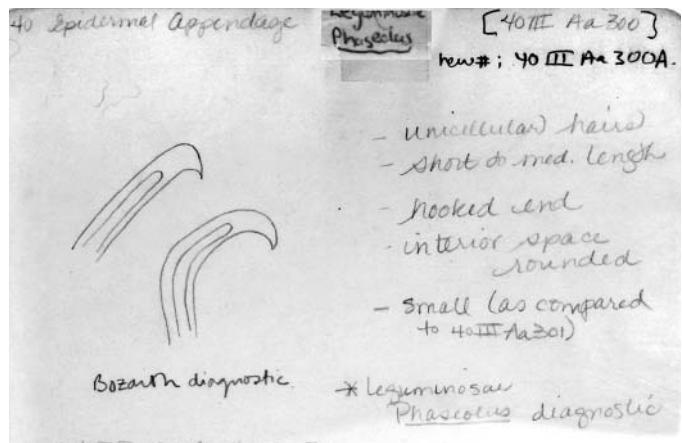
40III Aa300 card 1.JPG



40III Aa202Bb photo 2b.JPG



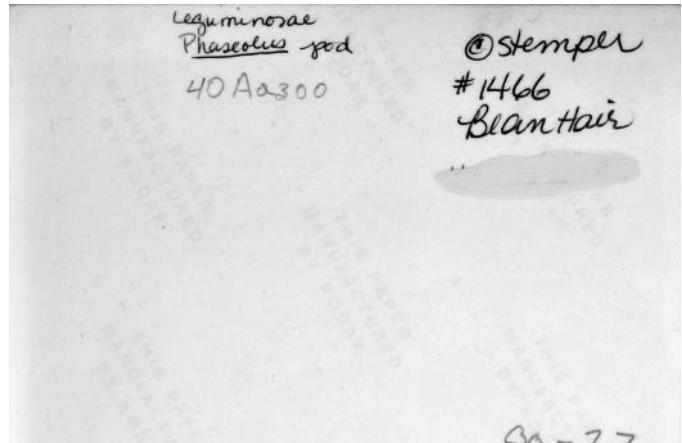
40III Aa3 card 1.JPG



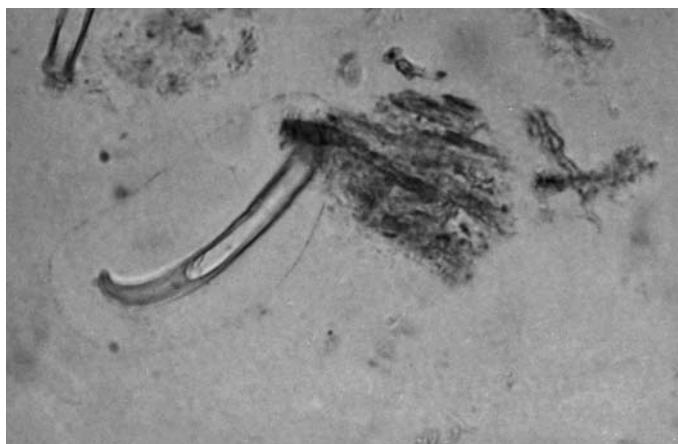
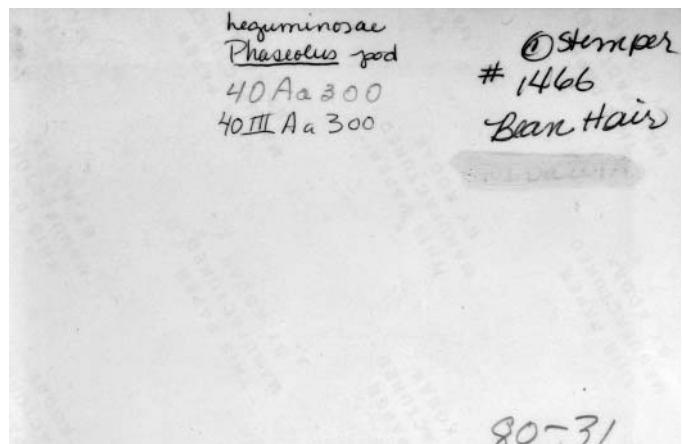
was: 40II Da201A, 40II Da300
40III Aa300A card 1.JPG



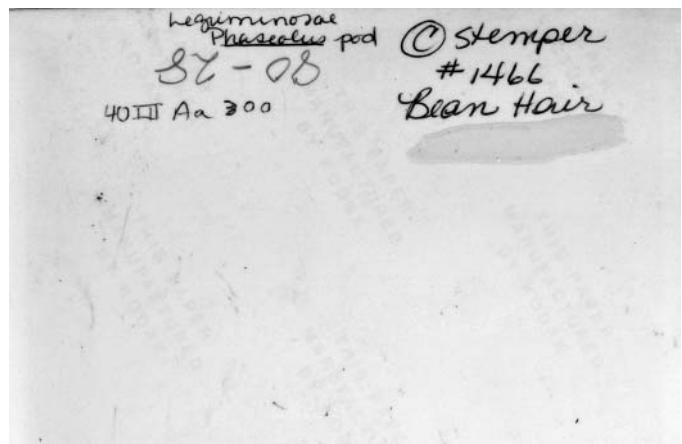
40IIIAa300A photo 1f.JPG



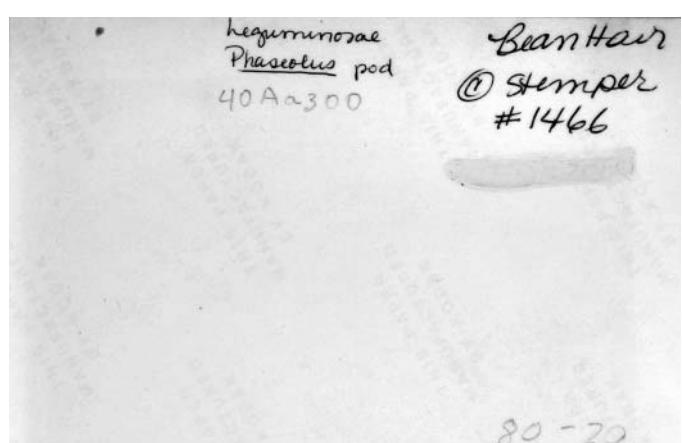
40IIIAa300A photo 2f.JPG



40IIIAa300A photo 3f.JPG



40IIIAa300A photo 4f.JPG



40IIIAa300A photo 4b.JPG

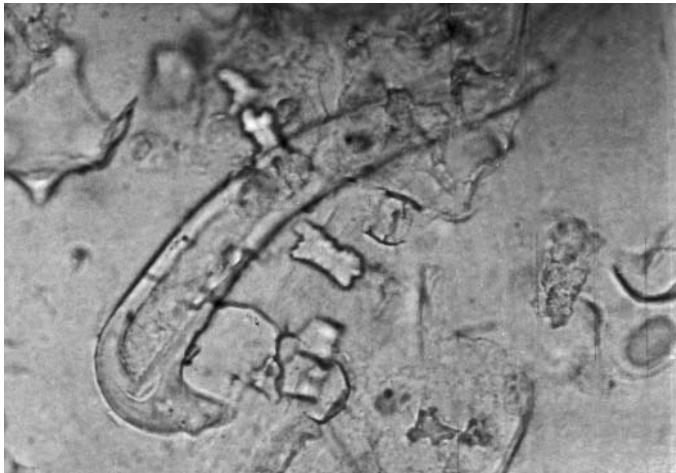
40 epidermal appendage

40III Aa 301

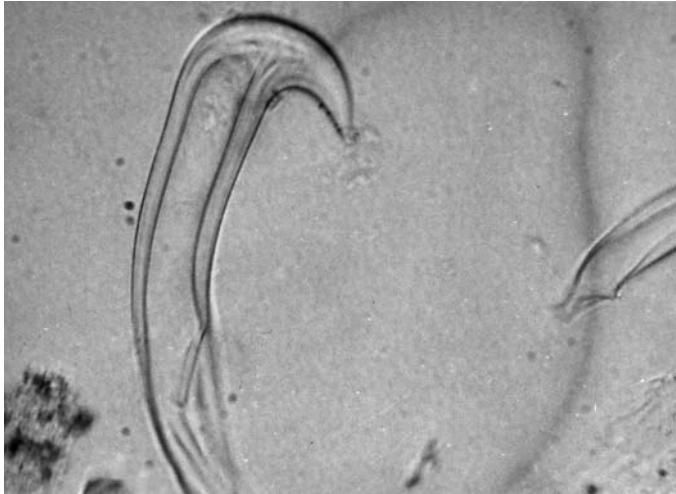


- unicellular hair
short to med. length
hooked end
interior space pointed
- large (as compared
to 40.II Aa 300)

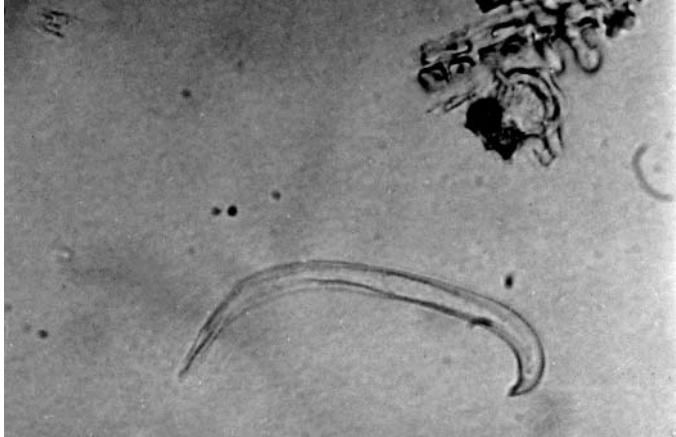
was: 40I Aa 301B, 40II Aa 301
40IIIAa301 card 1.JPG



40IIIAa301 photo 1f.JPG



40IIIAa301 photo 2f.JPG



40IIIAa301 photo 3f.JPG

40III Aa 301

- occurs in Pharus glaber (Gramineae),
Diagnostic?

40IIIAa301 card 2.JPG

Gramineal Pharus glaber
① 597 40IIIAa301

83-32

40IIIAa301 phtot 1b.JPG

Gramineal Pharus glaber
① 597
40IIIAa301

82-35

40IIIAa301 photo 2b.JPG

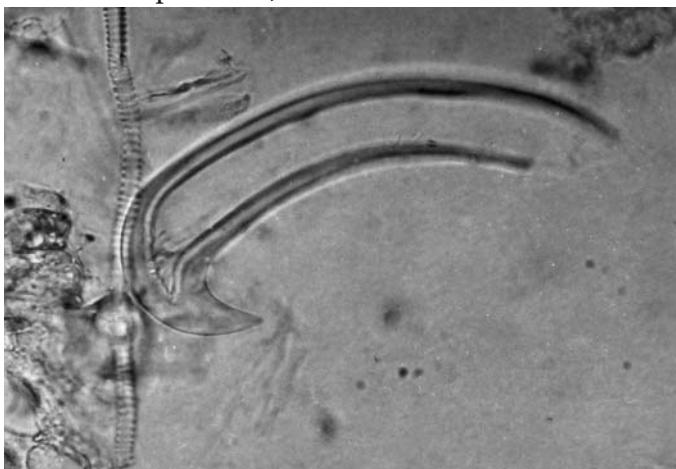
82-38

Gramineal Pharus glaber
① 597 40IIIAa301

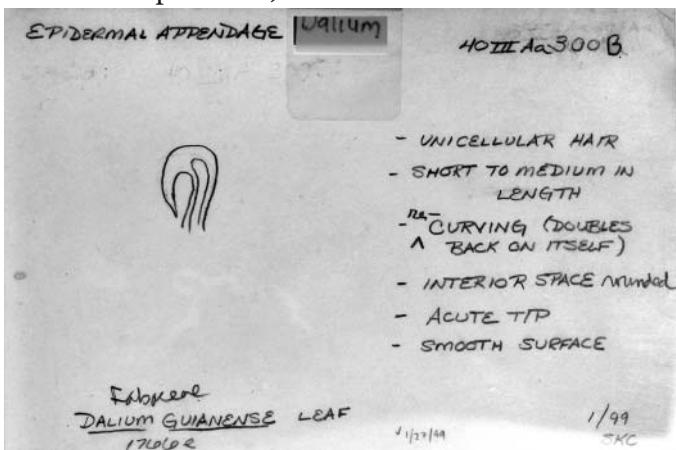
40IIIAa301 photo 3b.JPG



40IIIa301 photo 4f.JPG



40IIIa301 photo 5f.JPG



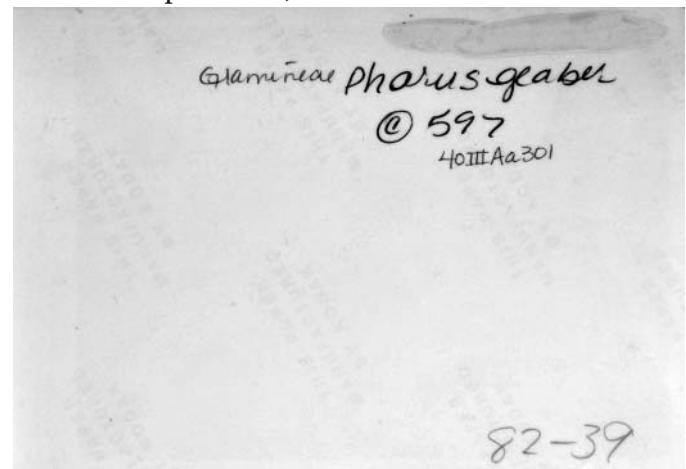
40III Aa300B card 1.JPG



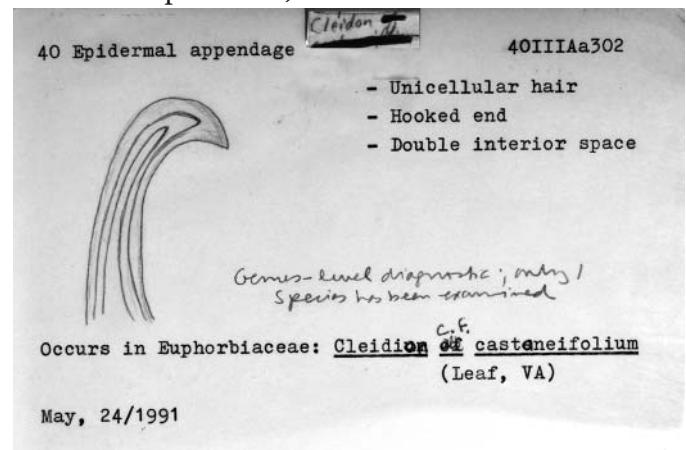
40IIIa302 photo 1f.JPG

Gramineapharus glaber
⑦ 597
40 IIIA a 301

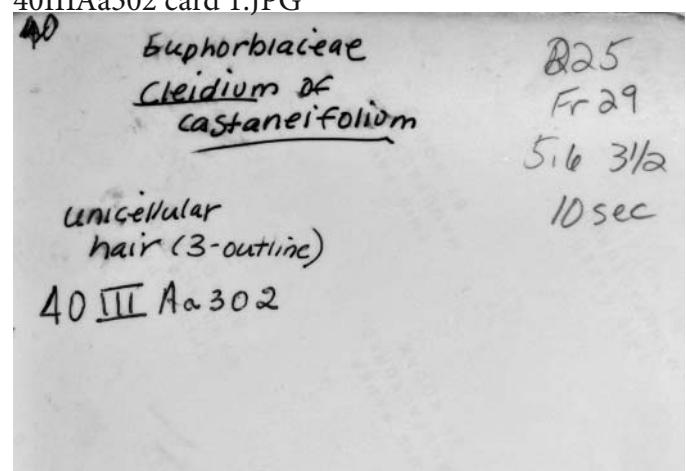
40IIIa301 photo 4b.JPG



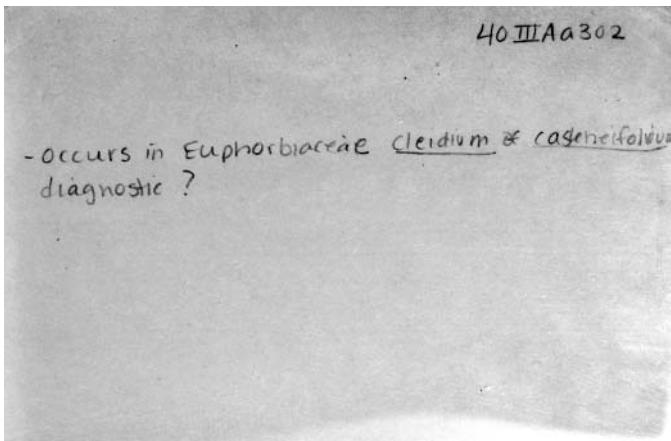
40IIIa301 photo 5b.JPG



40III Aa302 card 1.JPG



40III Aa302 photo 1b.JPG



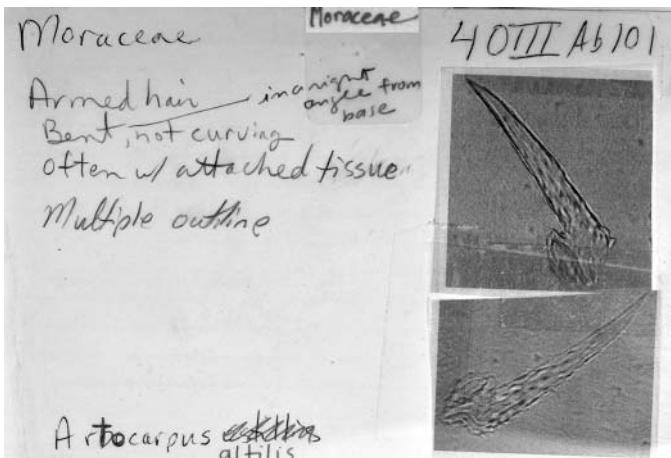
40IIIAb100 card 1.JPG



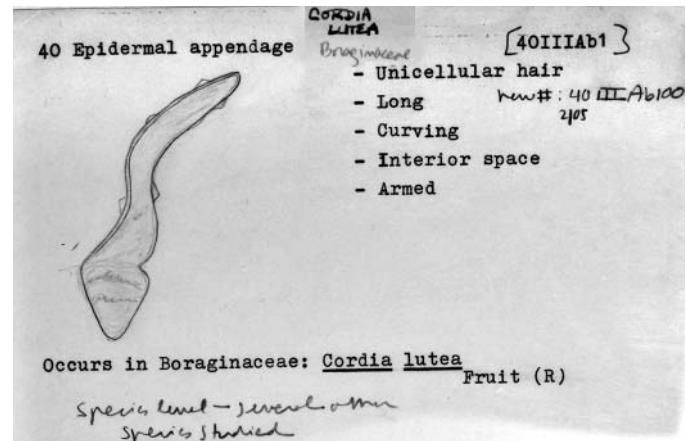
40IIIAb100 photo 1f.JPG



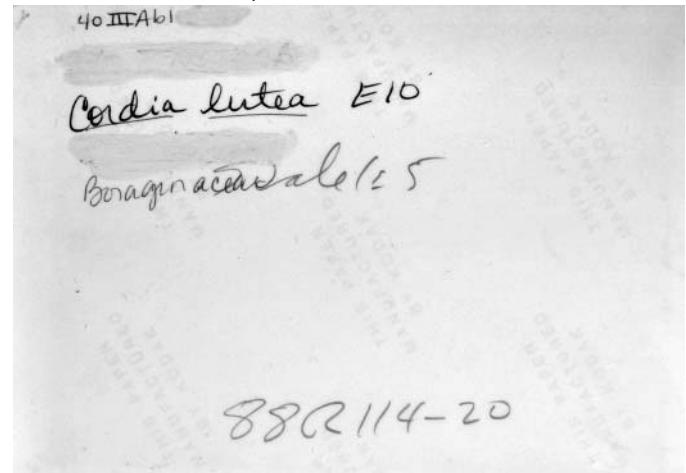
40IIIAb100 photo 2f.JPG



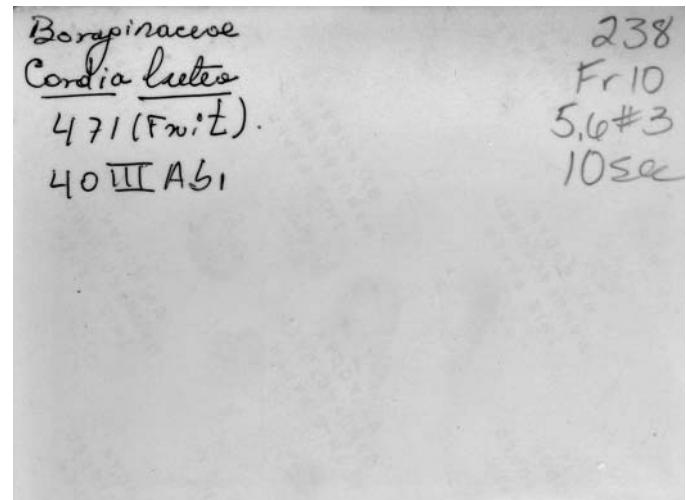
40IIIAb101 card 1.JPG



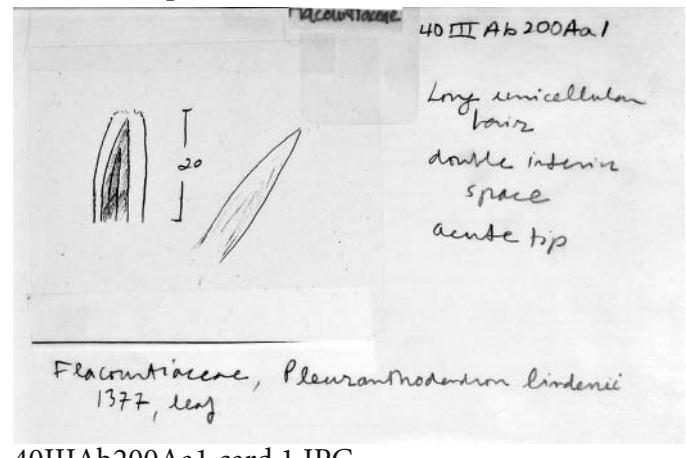
40IIIAb100 card 1.JPG



40IIIAb100 photo 1b.JPG



40IIIAb100 photo 2b.JPG



40IIIAb200Aa1 card 1.JPG

40 - Dermal Appendage



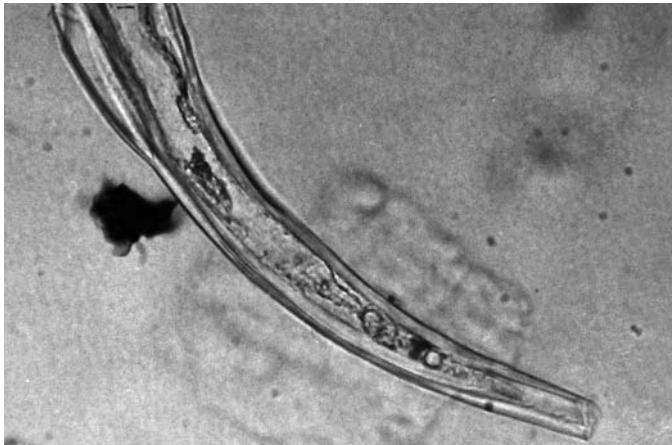
- [40IIIAb200Aa2]
Inv# : 40 III Ab 200 Aa 2
 - non-segmented
 - hair cell
 - Long
 - non-armed
 - smooth surface
 - no base, or occurs as separate cell
 - interior space

- observed in Flacourtiaceae, Gramineae

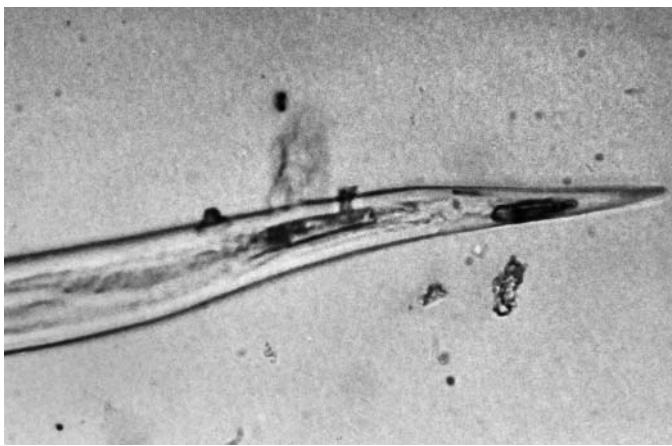
9/89

was: 40IIAb100Aa

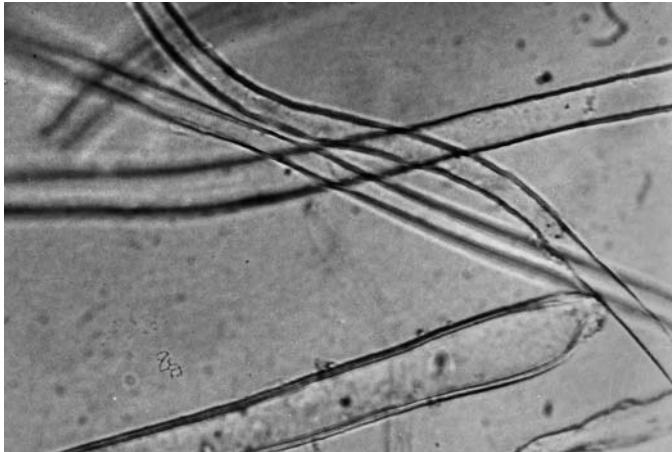
40IIIAb200Aa2 card 1.JPG



40IIIAb200Aa2 photo 1f.JPG



40IIIAb200Aa2 photo 2f.JPG



40IIIAb200Aa2 photo 3f.JPG

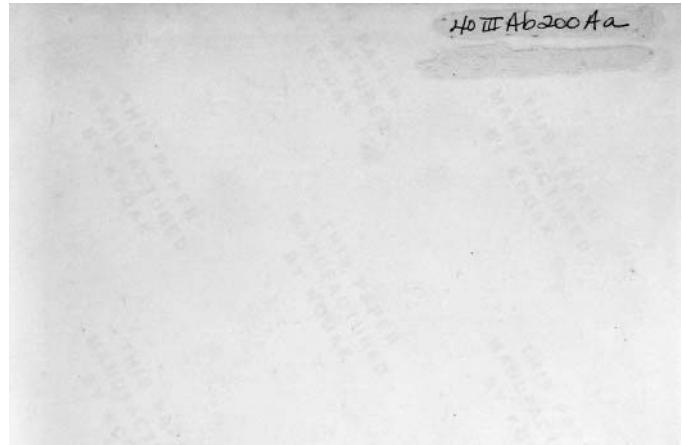
40 - Epidermal Appendage



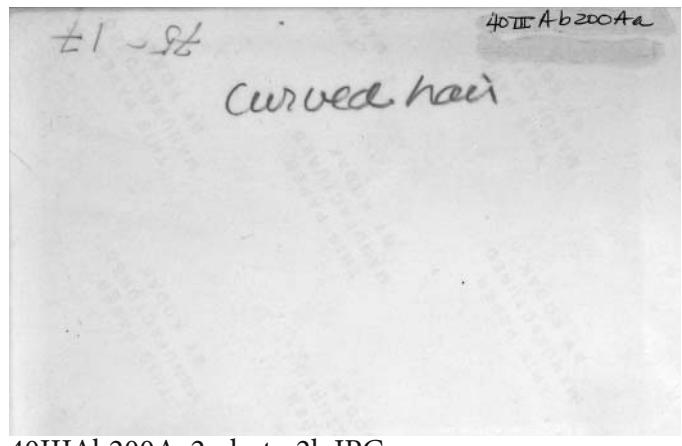
40IIAb200Aa2

* See hair base
40IIIN

40IIIAb200Aa2 card 2.JPG



40IIIAb200Aa2 photo 1b.JPG



40IIIAb200Aa2 photo 2b.JPG

Gramineae
Oplismenus hirtellus
Slc 2
40II Ab 200Aa

R159 14

40IIIAb200Aa2 photo 3b.JPG

40 Epidermal Appendage

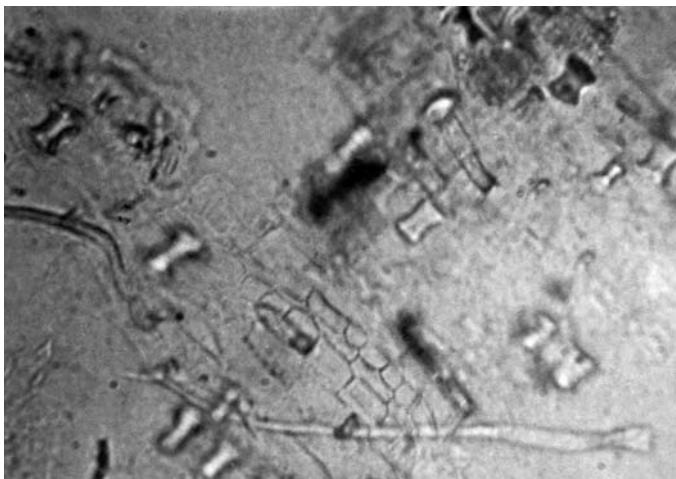
40IIIAb200Ab1



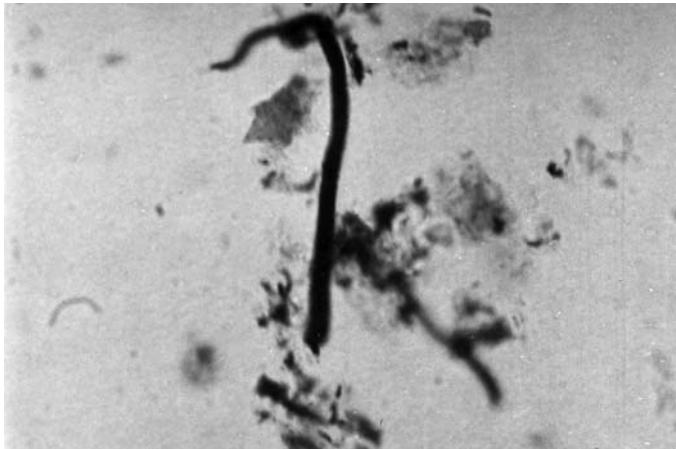
- unicellular hair
- long
- non-armed
- smooth surface
- no base, or occurs as separate cell
- no interior space

Was: 40IDb200, 40IDb201

40IIIAb200Ab1 card 1.JPG



40IIIAb200Ab1 photo 1f.JPG



40IIIAb200Ab1 photo 2f.JPG



40IIIAb200Ab1 photo 3f.JPG

40 Epidermal Appendage

40IIIAb200Ab

40IIIH



* see hair cell
base associated
with these hair
cells

40IIIAb200Ab1 card 2.JPG

Gramineae
Bambusa
australis

40IIIAb200Ab

Scale 1.5

R 147-21

40IIIAb200Ab1 photo 1b.JPG

Malvaceae
Sosseypium
40IIIAb200Ab

86-17

40IIIAb200Ab1 photo 2b.JPG

R 147-21 S43

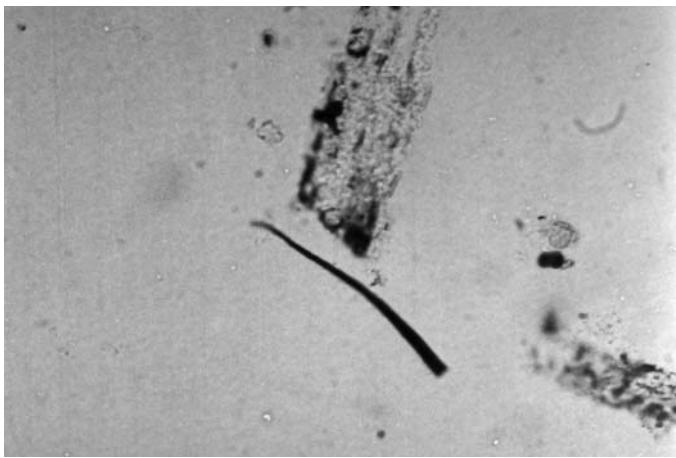
#7

S2

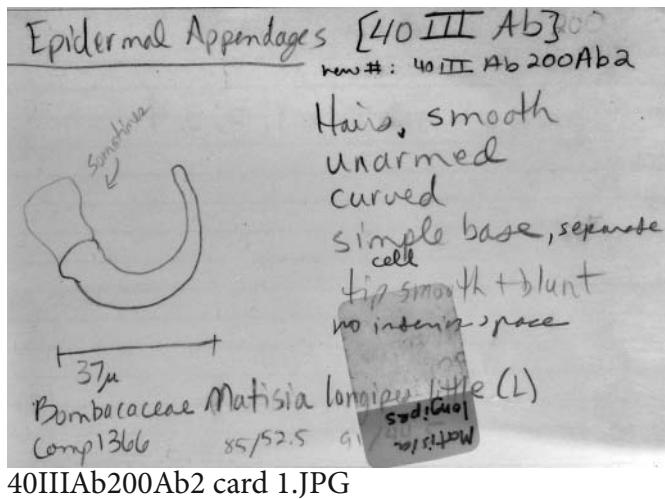
Gramineae
Setaria tenacissima
#599

40IIIAb200Ab

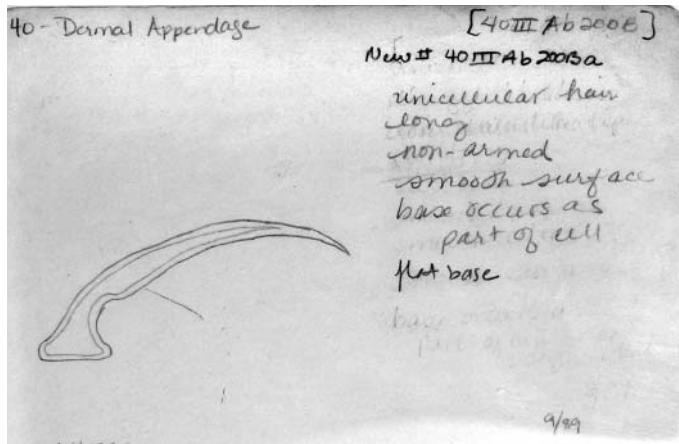
40IIIAb200Ab1 photo 3b.JPG



40IIIAb200Ab1 photo 4f.JPG



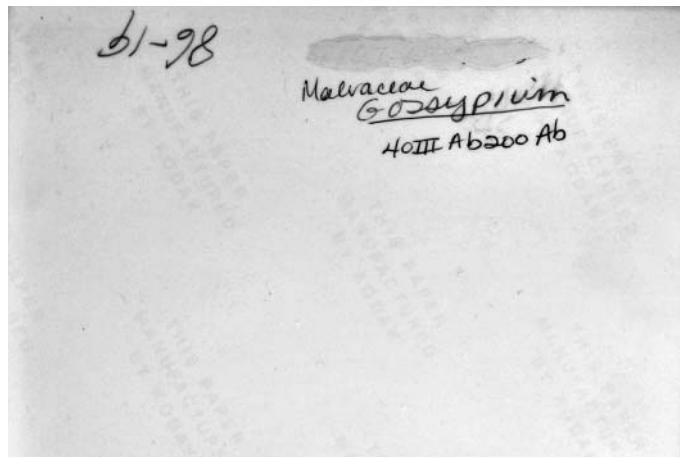
40IIIAb200Ab2 card 1.JPG



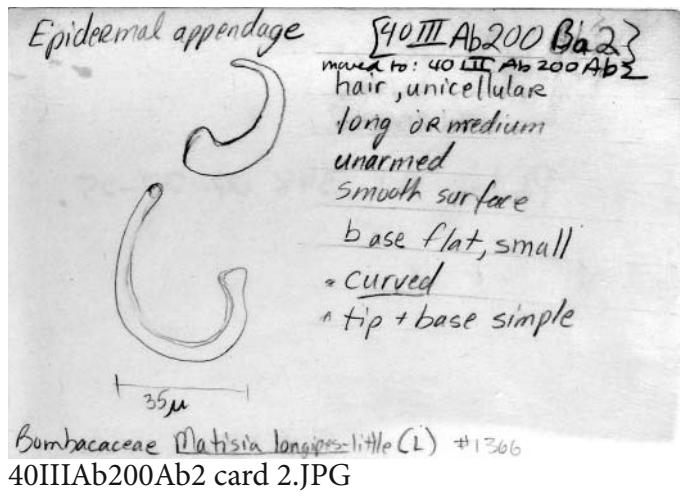
was: 40IBa
40IIIAb200Ba card 1.JPG



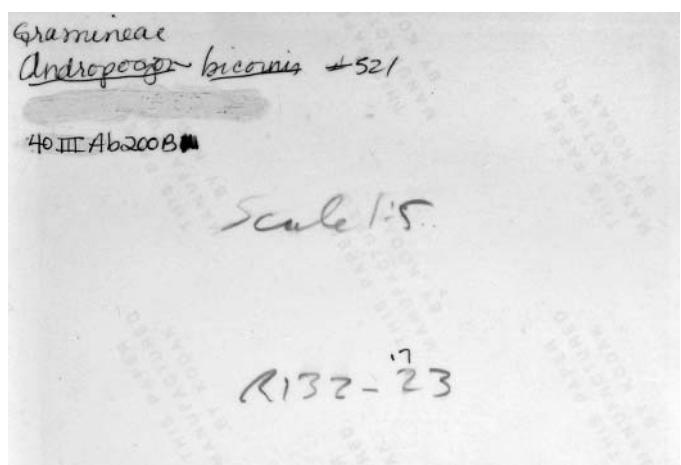
40IIIAb200Ba photo 1f.JPG



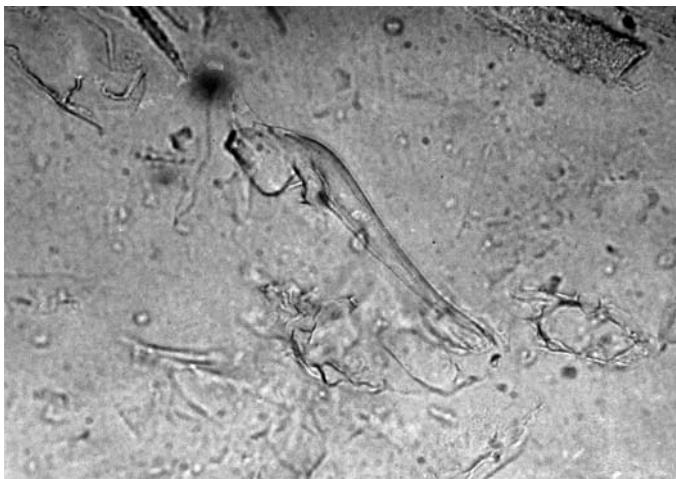
40IIIAb200Ab1 photo 4b.JPG



40IIIAb200Ab2 card 2.JPG



40IIIAb200Ba photo 1b.JPG



40IIIAb200Ba photo 2f.JPG

Gramineae
Andropogon bicornis #521

40IIIAb200Ba
hair

Scale 1:5

R132 - 21¹⁵



40IIIAb200Ba photo 3f.JPG

Gramineae
Andropogon bicornis #521
22-2812

40IIIAb200Ba

1:5 scale



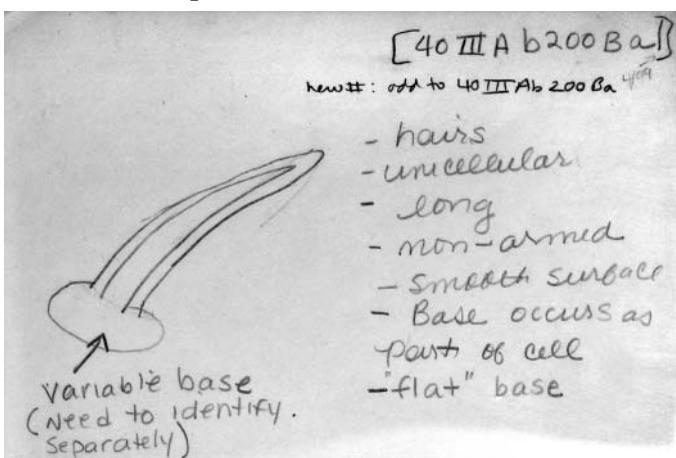
40IIIAb200Ba photo 4f.JPG

40IIIAb200Ba photo 3b.JPG

Gramineae
Soliun temuleratum
674

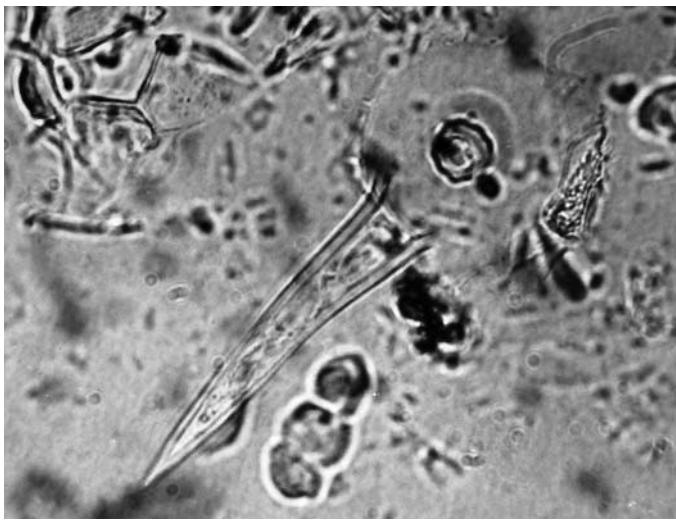
40IIIAb200Ba

R159 3



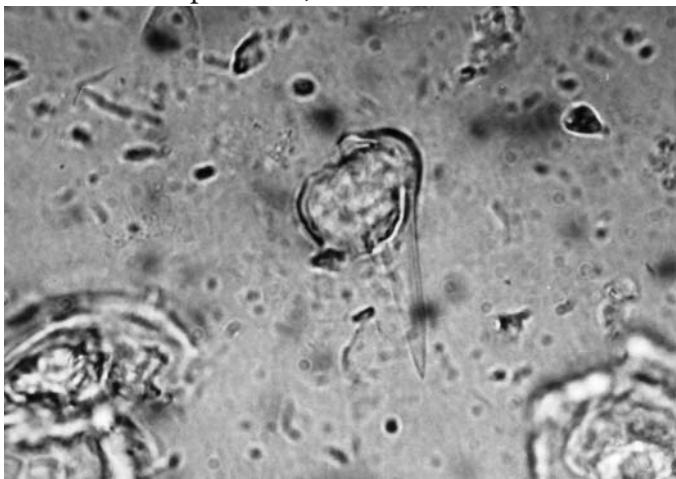
40IIIAb200Ba card 2.JPG

40IIIAb200Ba photo 4b.JPG



40IIIAb200Ba photo 5f.JPG

Ulmaceae
Trema integrifolia #464 (leaf) Fr 13
40 III Ab 200Ba 9sec 237



40IIIAb200Ba photo 6f.JPG

40IIIAb200Ba photo 5b.JPG

Ulmaceae
Trema integrifolia
464 (Leaf)
40 III Ab 200Ba 237
Fr 11
9sec



40IIIAb200Ba photo 7f.JPG

40IIIAb200Ba photo 6b.JPG

Ulmaceae
Trema integrifolia
464 (Leaf)
40 III Ab 200Ba 237
Fr 12
10sec

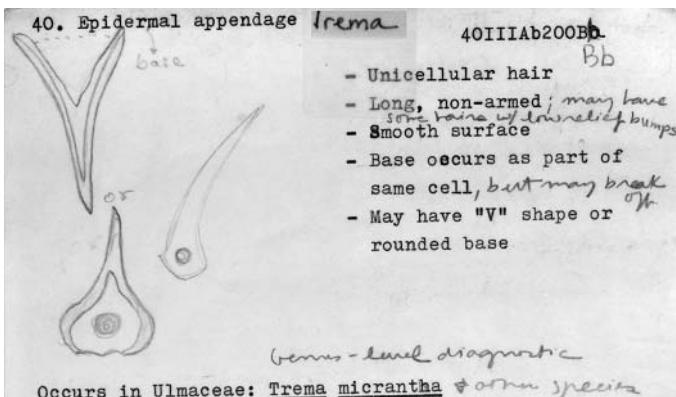


40IIIAb200Ba photo 8f.JPG

40IIIAb200Ba photo 7b.JPG

Ulmaceae
Trema integrifolia
466 L.
40 III Ab 200Ba 323
43

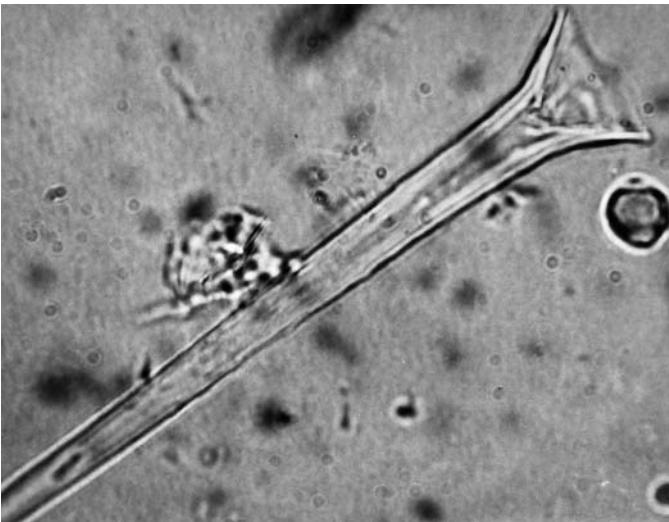
40IIIAb200Ba photo 8b.JPG



40IIIAb200Bb card1.JPG



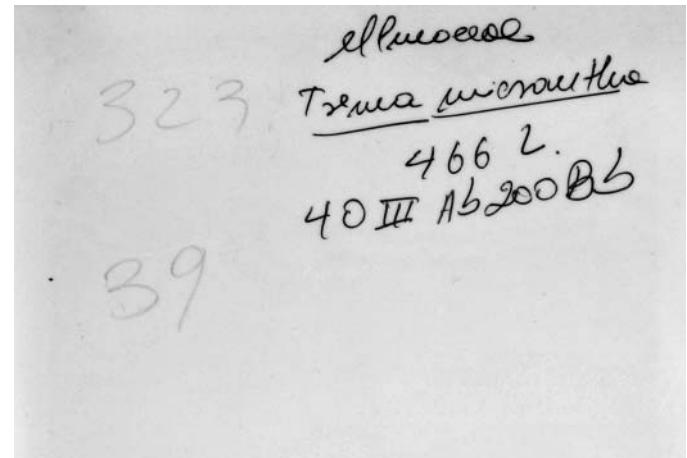
40IIIAb200Bb photo 1f.JPG



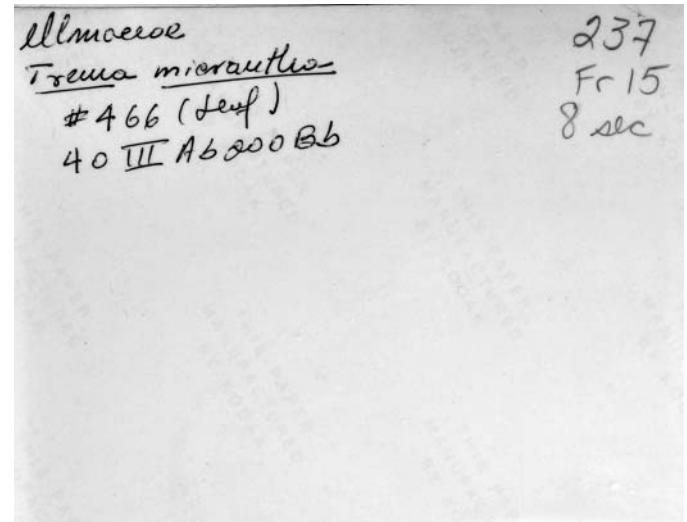
40IIIAb200Bb photo 2f.JPG



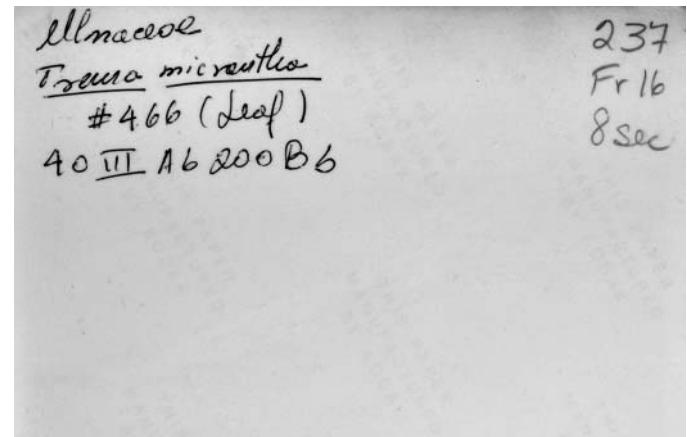
40IIIAb200Bb photo 3f.JPG



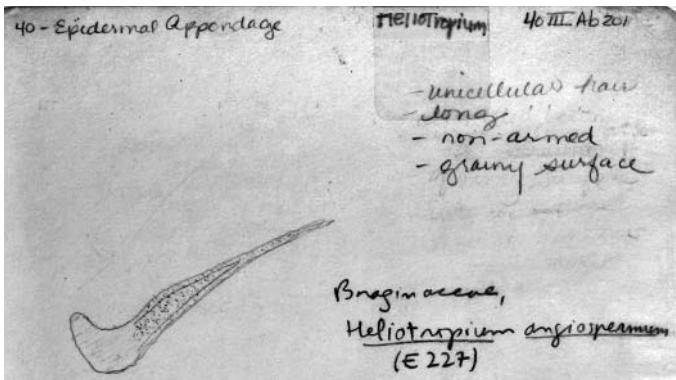
40IIIAb200Bb photo 1b.JPG



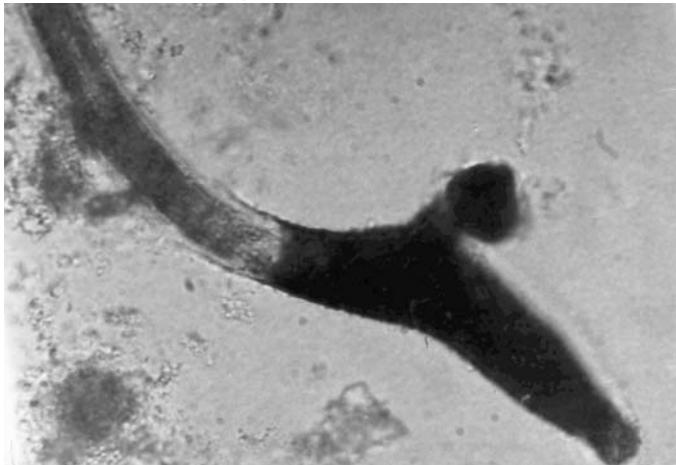
40IIIAb200Bb photo 2b.JPG



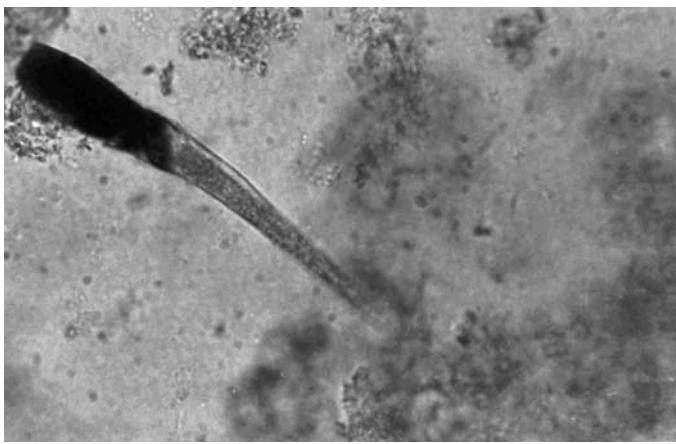
40IIIAb200Bb photo 3b.JPG



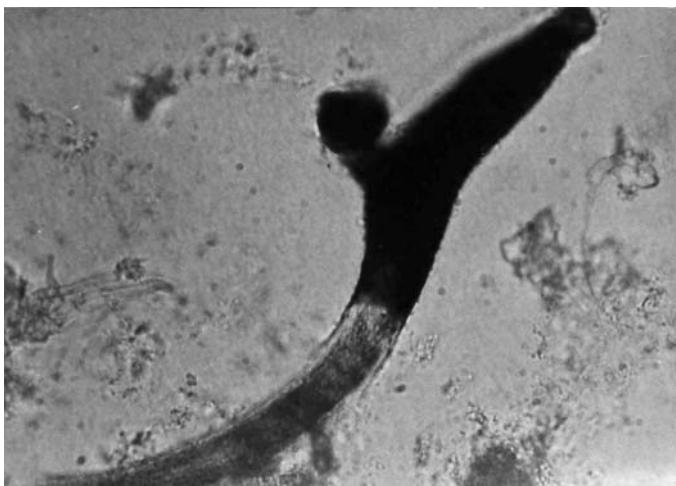
Was: 40IDb10Ab, 40Ib6
40IIIAb201 card 1.JPG



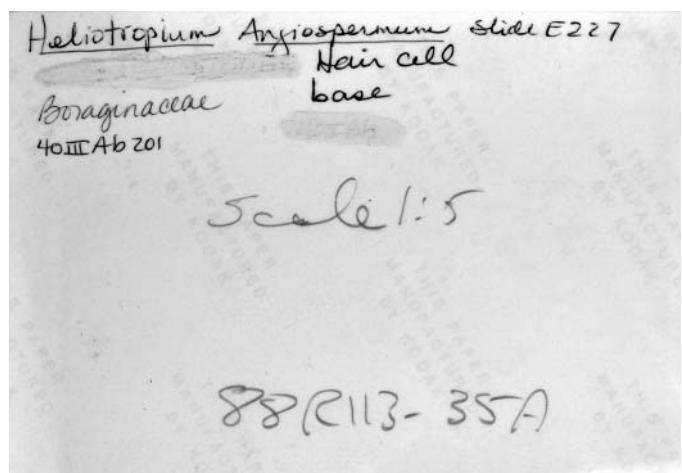
40IIIAb201 Photo 1f.JPG



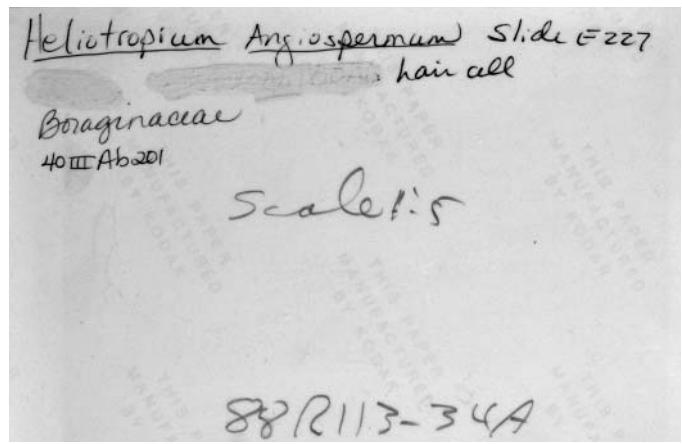
40IIIAb201 photo 2f.JPG



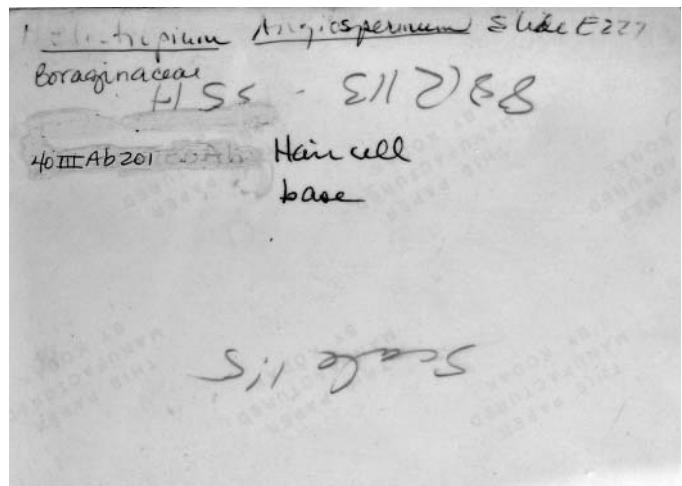
40IIIAb201 photo 3f.JPG



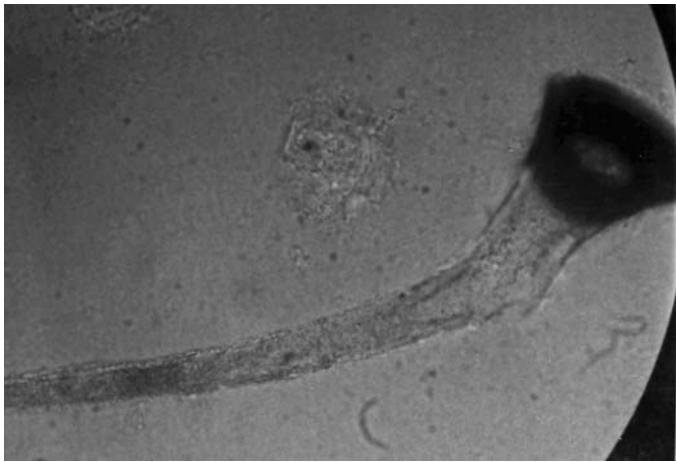
40IIIAb201 photo 1b.JPG



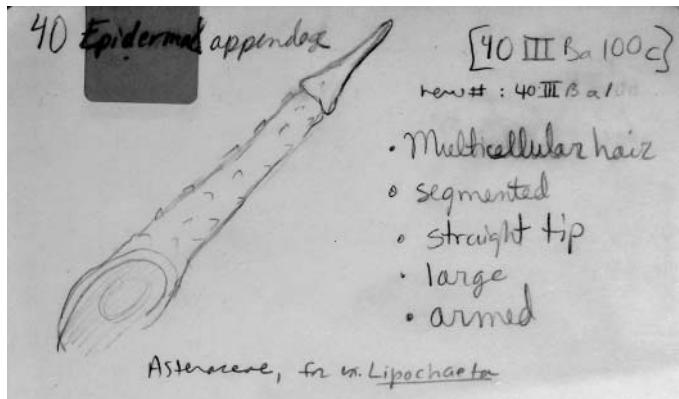
40IIIAb201 photo 2b.JPG



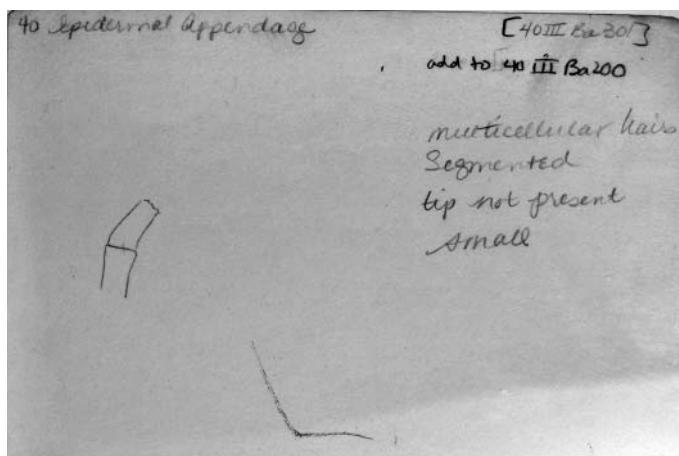
40IIIAb201 photo 3b.JPG



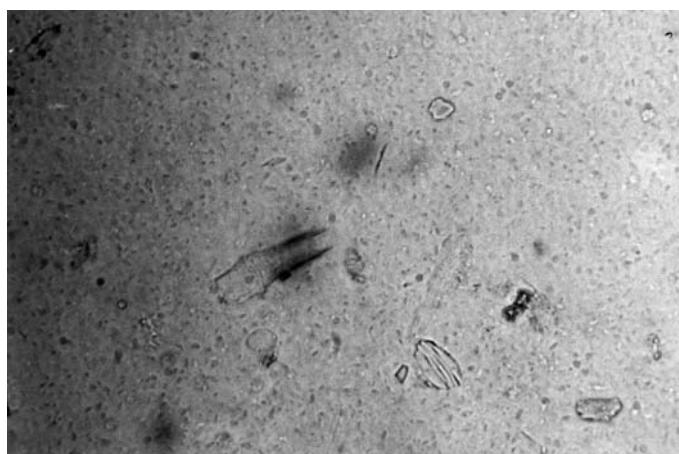
40IIIAb201 photo 4f.JPG



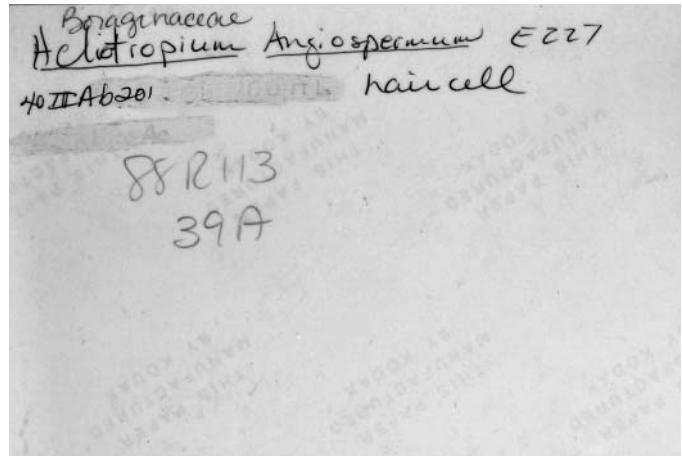
40IIIBa1 card 1.JPG



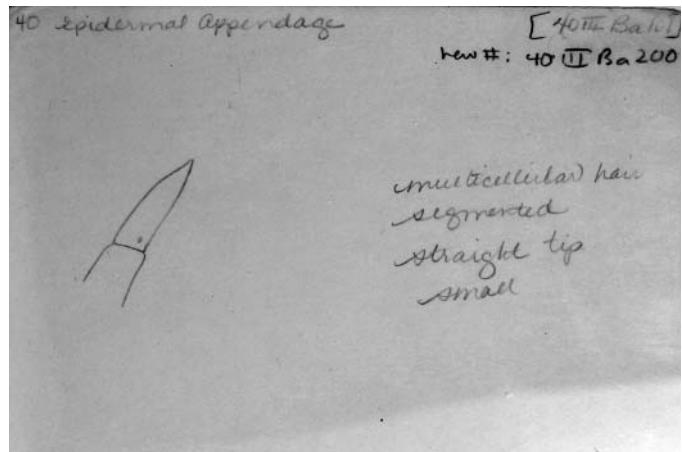
40IIIBa200 Card 2.JPG



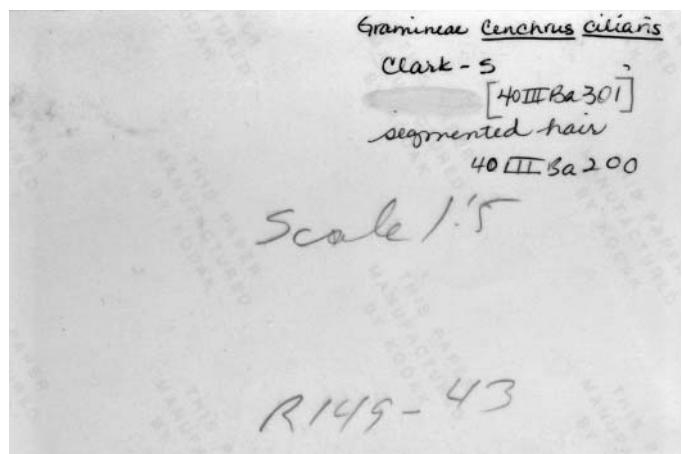
40IIIBa200 photo 1f.JPG



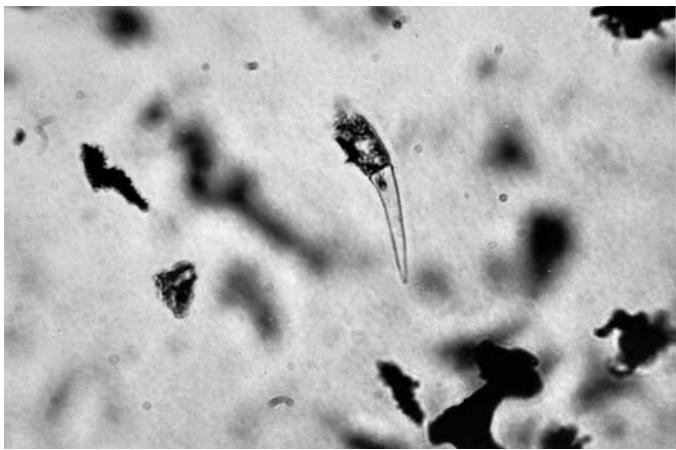
40IIIAb201 photo 4b.JPG



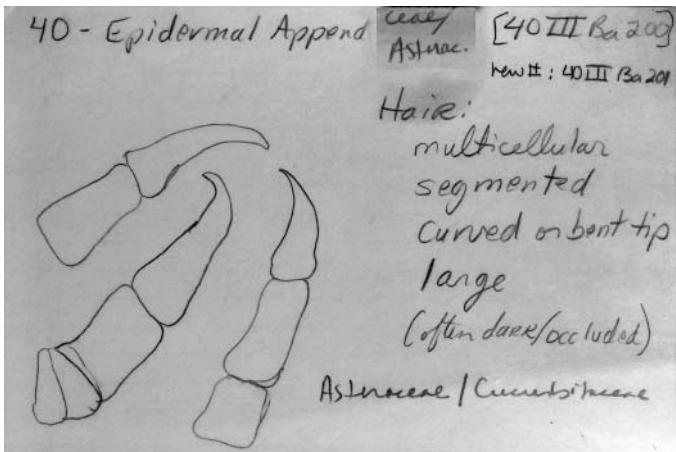
40IIIBa200 card 1.JPG



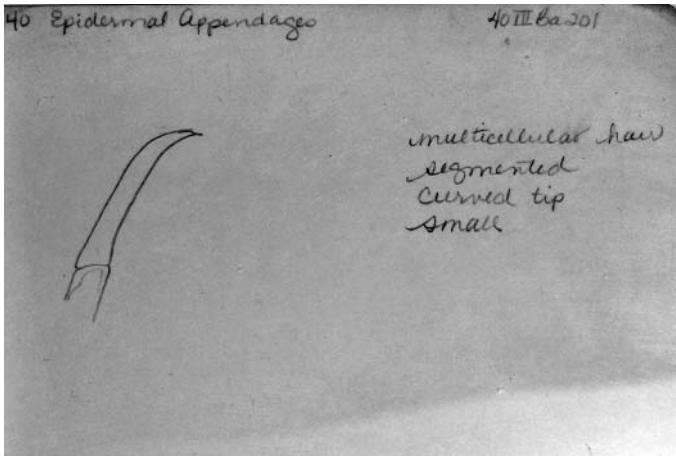
40IIIBa200 photo 1b.JPG



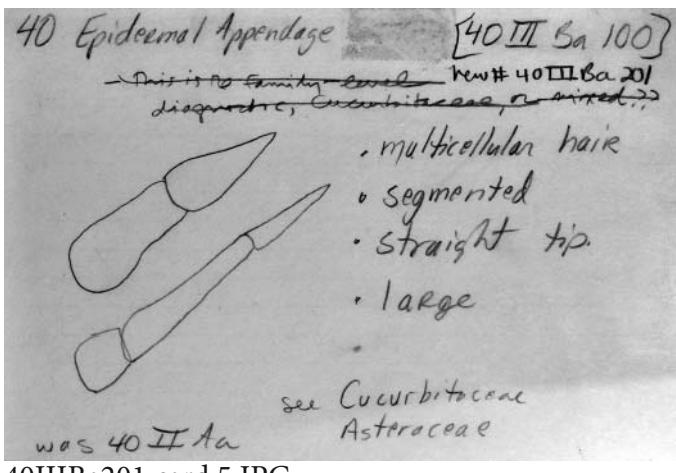
40IIIBa200 photo 2f.JPG



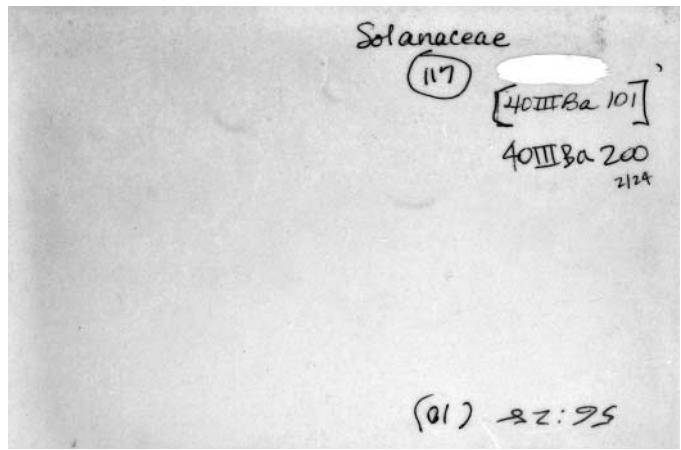
40IIIBa201 card 1.JPG



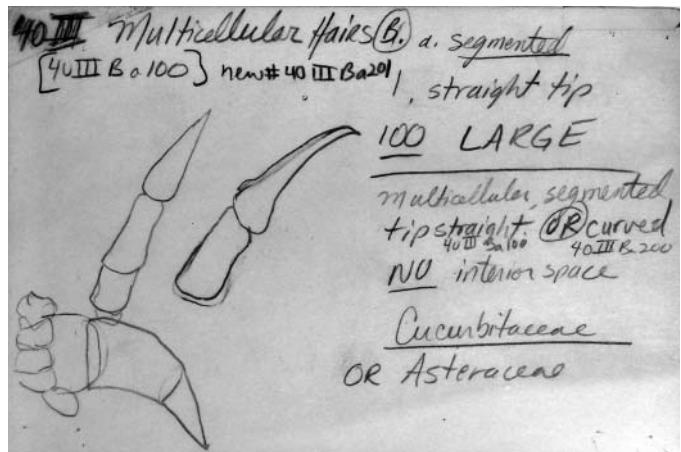
40IIIBa201 card 3.JPG



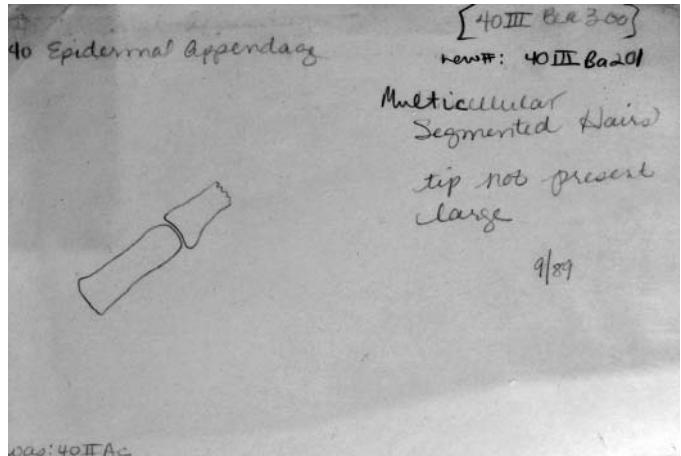
40IIIBa201 card 5.JPG



40IIIBa200 photo 2b.JPG



40IIIBa201 card 2.JPG



40IIIBa201 card 4.JPG



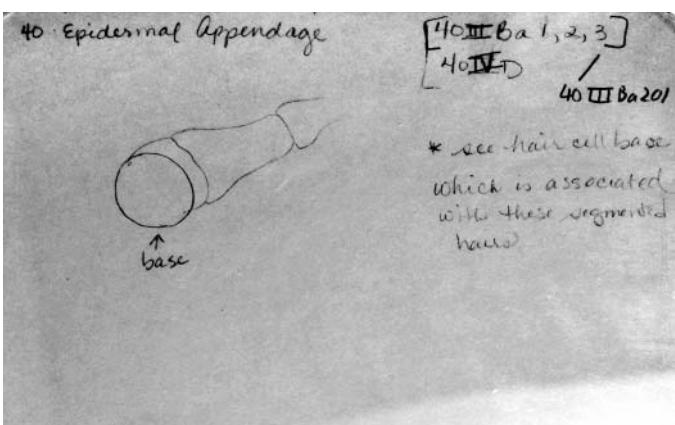
40IIIBa201 photo 1f.JPG



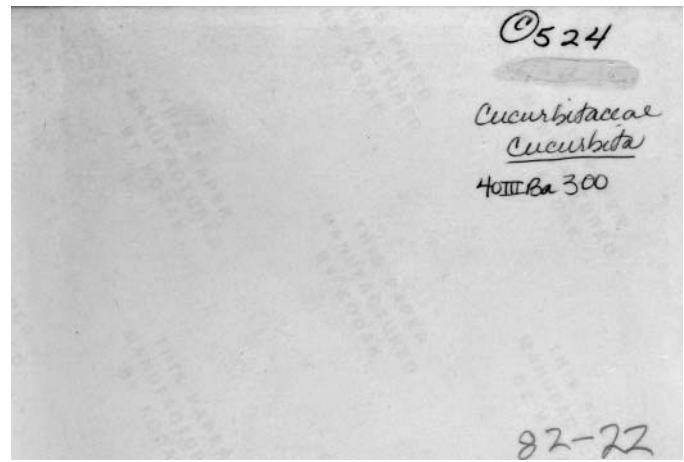
40IIIBa201 photo 2f.JPG



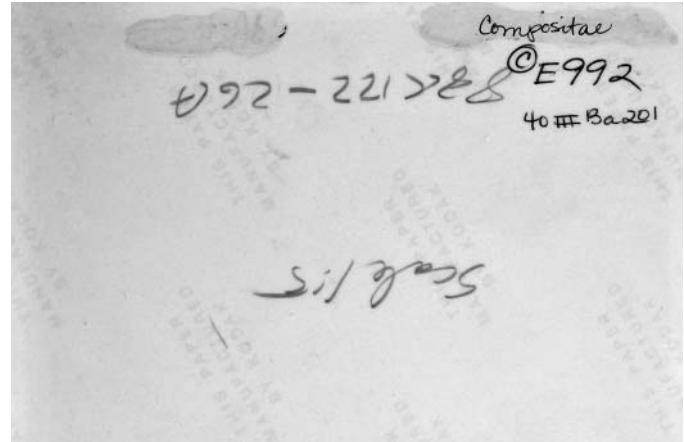
40IIIBa201 photo 3f.JPG



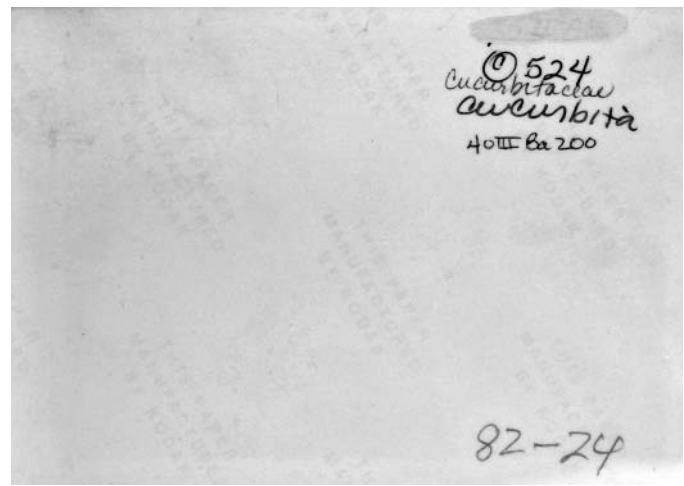
40IIIBa201 card 6.JPG



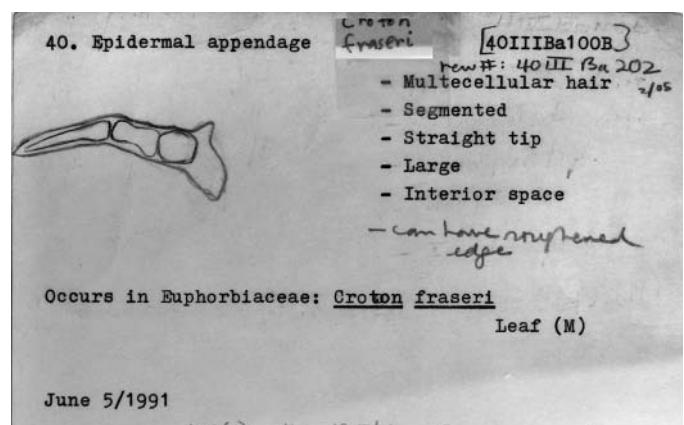
40IIIBa201 photo 1b.JPG



40IIIBa201 photo 2b.JPG



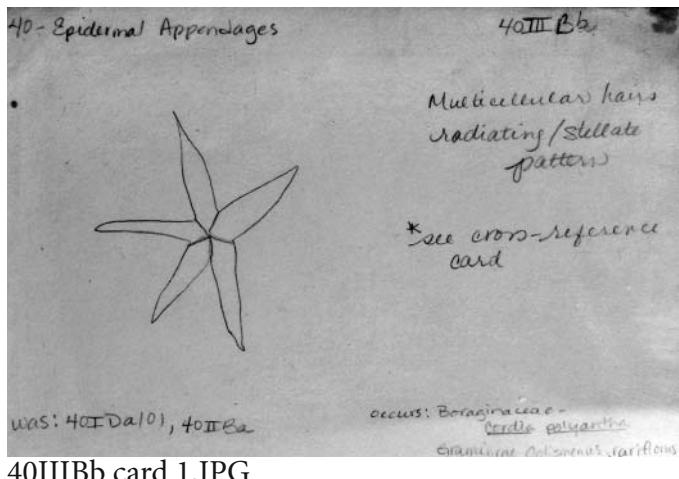
40IIIBa201 photo 3b.JPG



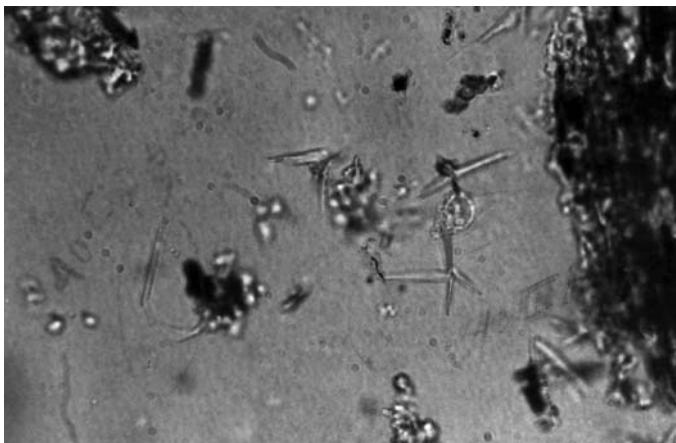
40IIIBa202 card 1.JPG



40IIIBa202 photo 1f.JPG



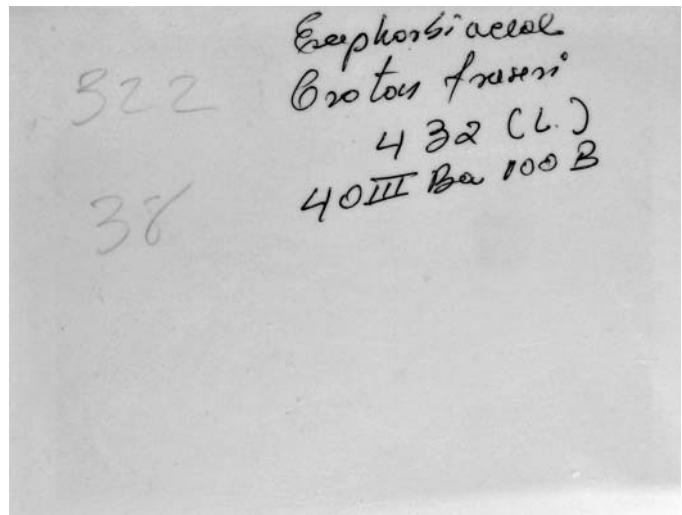
40IIIBb card 1.JPG



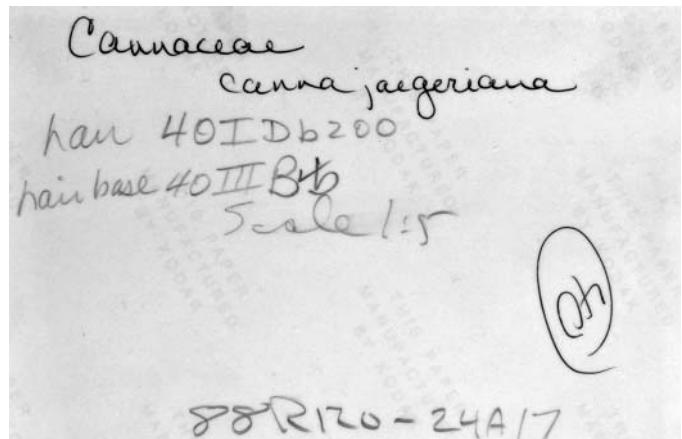
40IIIBb photo 1f.JPG



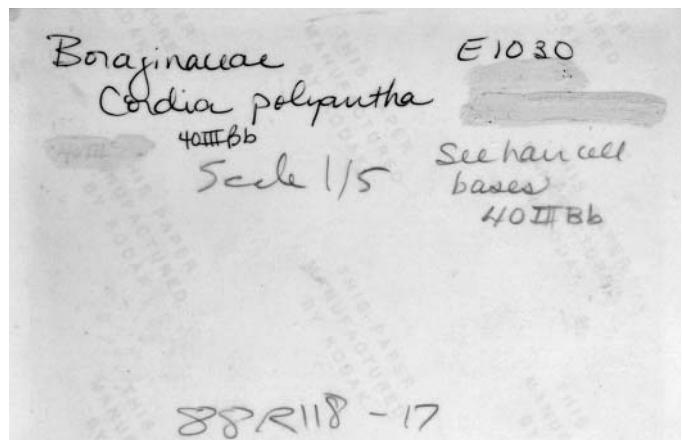
40IIIBb photo 2f.JPG



40IIIBa202 photo 1b.JPG



40IIIBb photo 1b.JPG



40IIIBb photo 2b.JPG