

# 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, *Lithospermium 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, *Quarariba 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  $\mu$  (Burseraceae, *Trattinnickia peruviana*,  
genus level diagnostic)

b. Small, constricted at center: <25 $\mu$  (*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 (Bursaceae, *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, *Tetrathylacium 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 $\mu$   
(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)

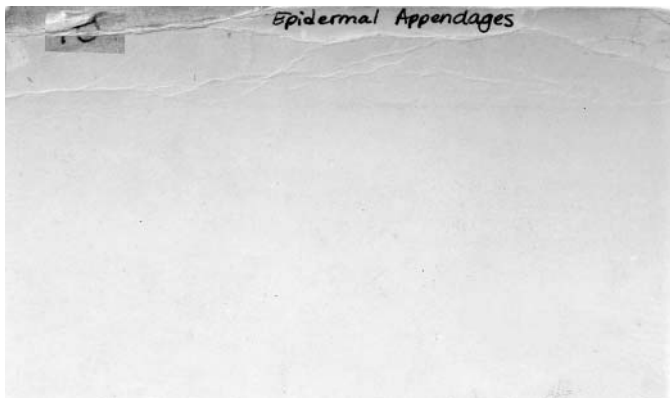
d. very small stellate center embedded in a well silicified body; 1 more ephemeral ring  
(Moraceae, *Artocarpus altilis*, family level diagnostic)

40IVG. triangular shape

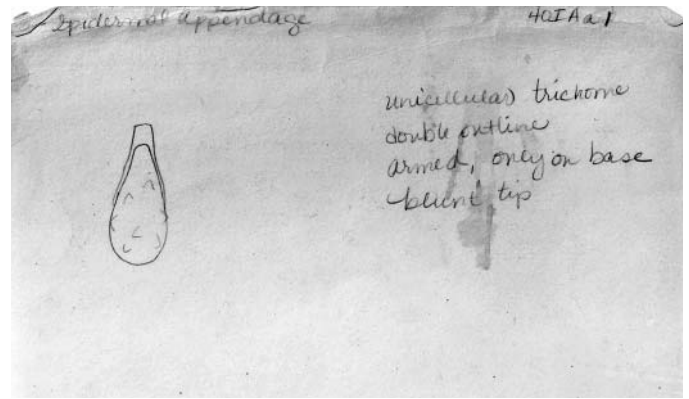
40IVH. quadrilateral shape

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

\*No card in MU card file



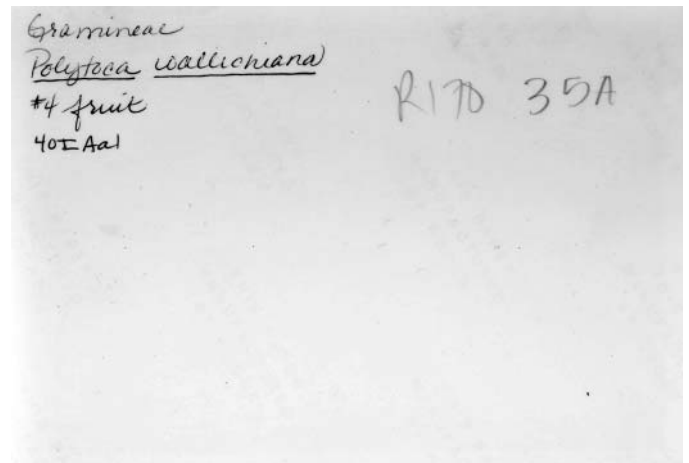
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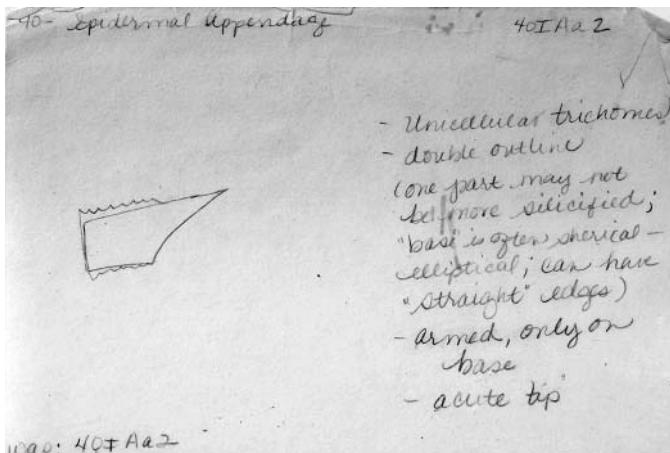
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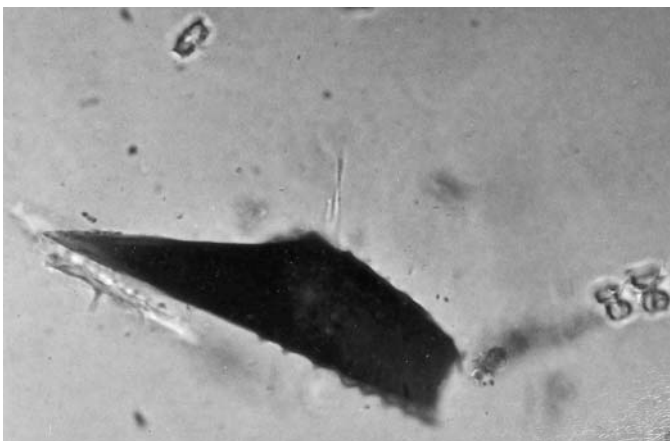
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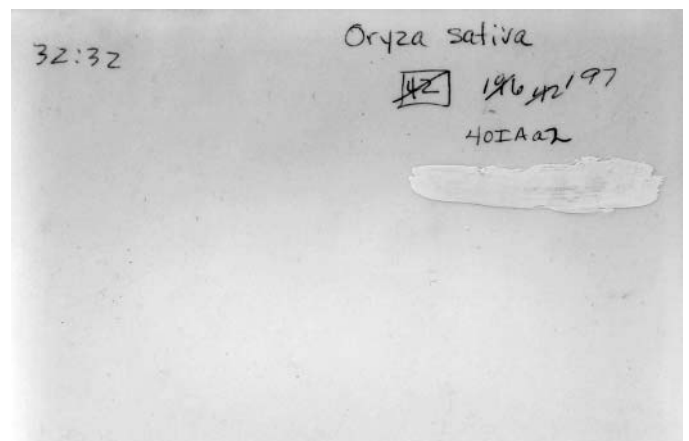
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wao: 40IAa2  
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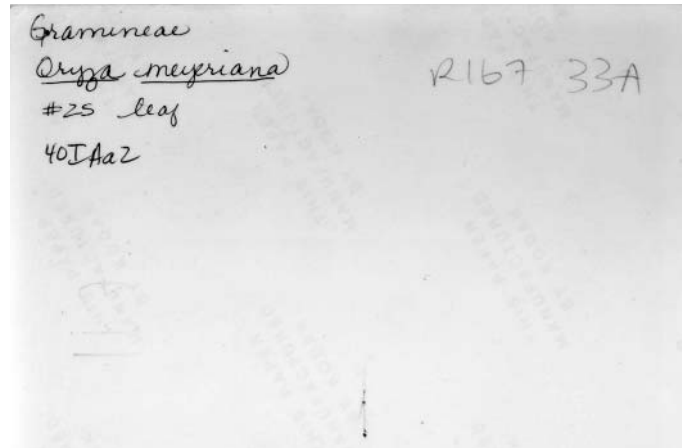
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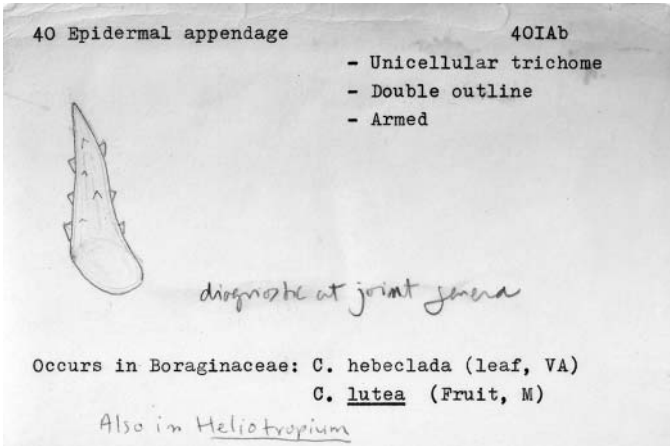
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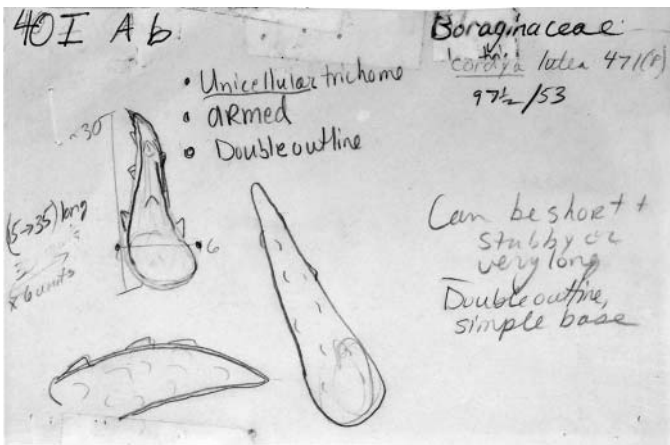
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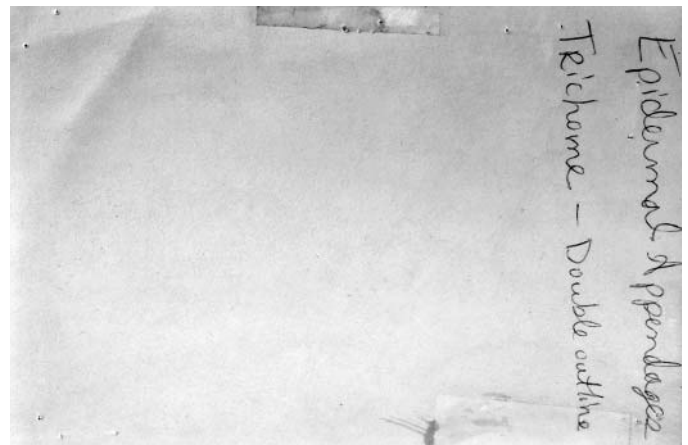
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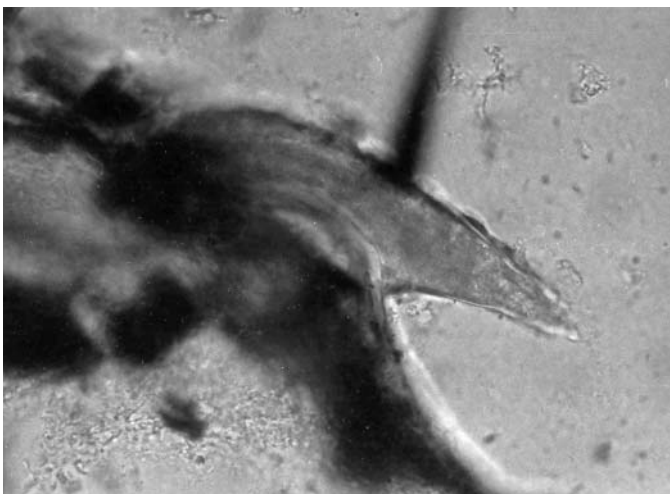
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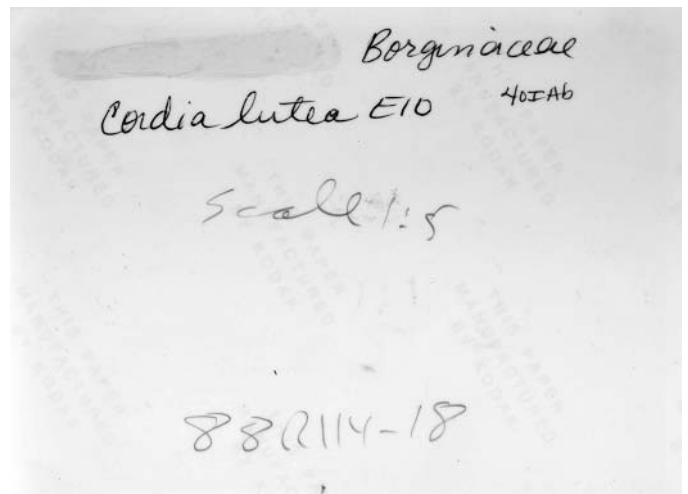
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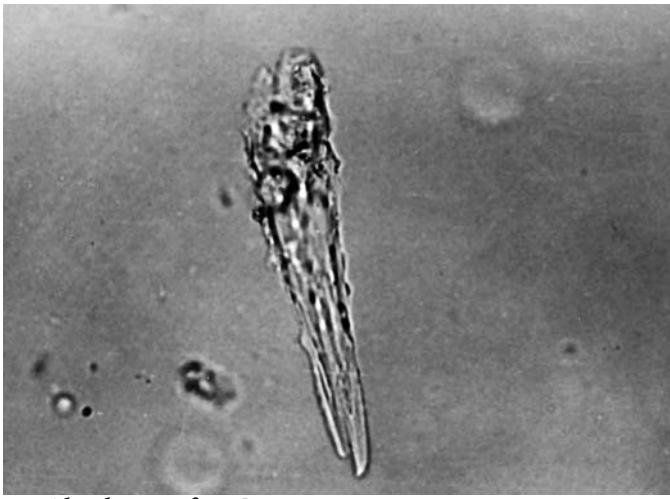
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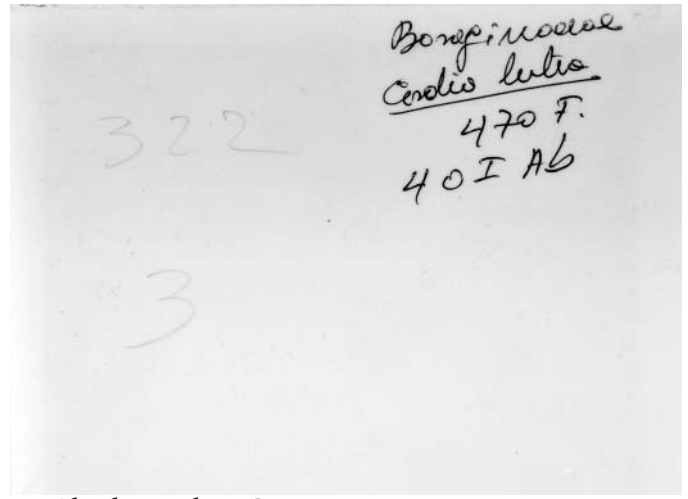
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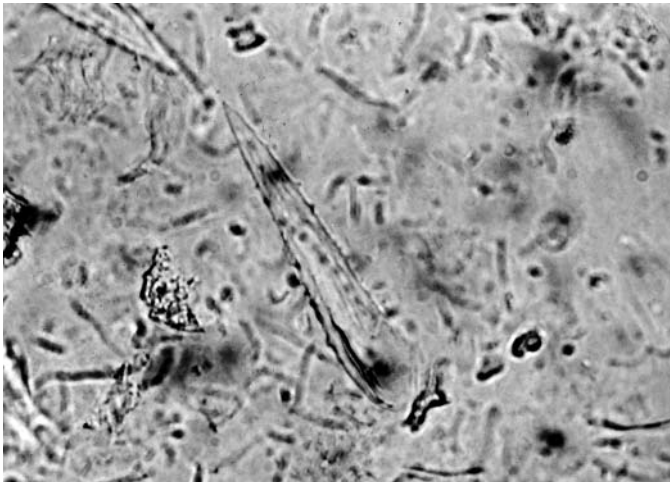
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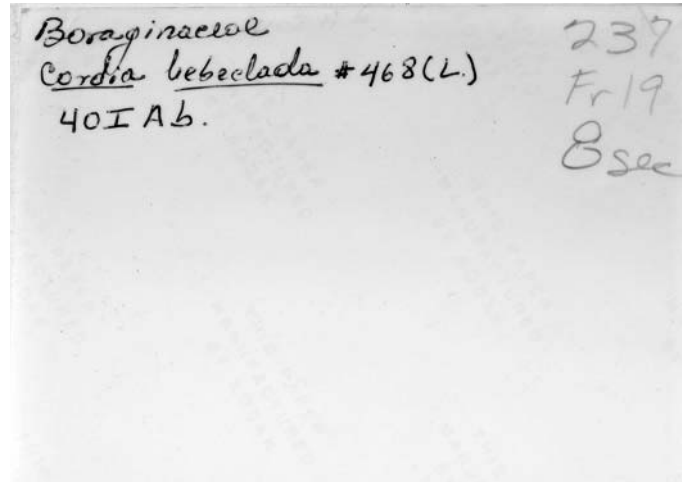
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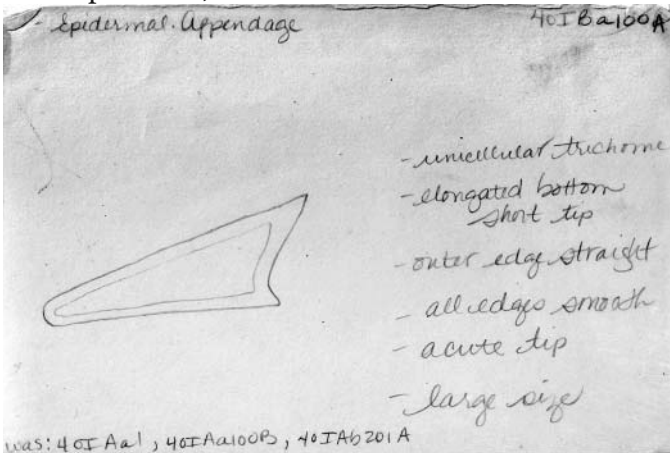
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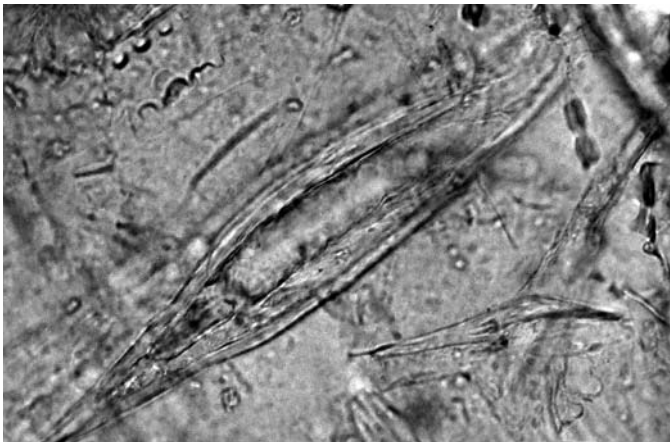
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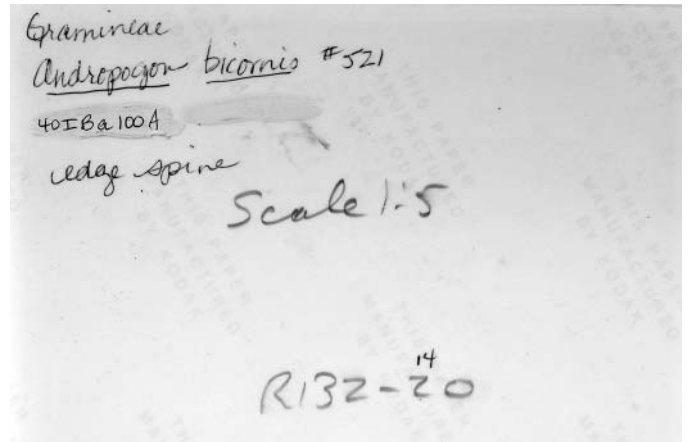
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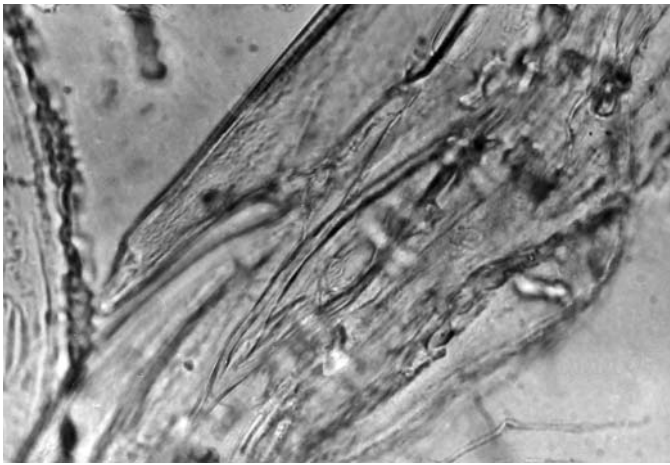


40IBa100A photo 1f.JPG



40IBa100A photo 1b.JPG





40IBa100A photo 2f.JPG

Gramineae  
*Andropogon bicornis* #521  
 40IBa100A  
 large edge spine 1:5  
 R131-34A

40IBa100A photo 2b.JPG



40IBa100A photo 3f.JPG

Gramineae  
*Polytrca wallichiana* R169 15A  
 #4 fruit  
 40IBa100A

40IBa100A photo 3b.JPG

40 - Epidermal Appendage 40IBa100B  
 double outline trichome  
 outer edge straight  
 non-armed  
 large size  
 acute tip  
 base small, "pistol-shaped"  
 tip long  
 about 70 um long at 25x  
 Gramineae Oriza sp. fruits 2/90

40IBa100B card 1f.JPG

40 - Epidermal Appendage 40IB62  
 unicellular trichome  
 double outline  
 non-armed  
 curved tip  
 length of base < 1/2 length of tip  
 "base" angular  
 00 - moderate size - base  
 01 - large size - base "pistol" shaped

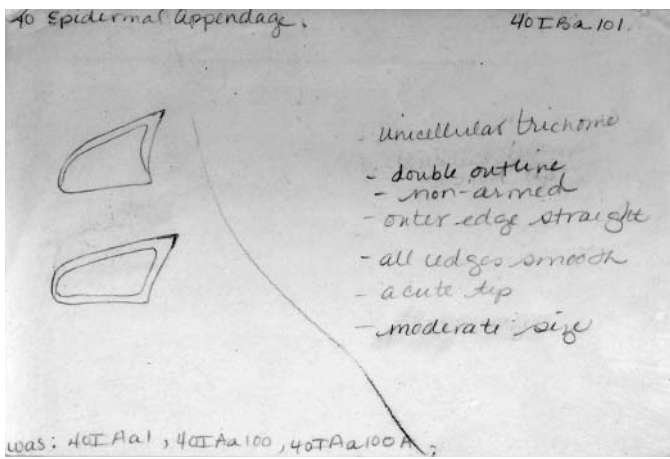
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40IBa100B photo 1f.JPG

Gramineae  
*Oriza sativa*  
 40IBa100B  
 71-7

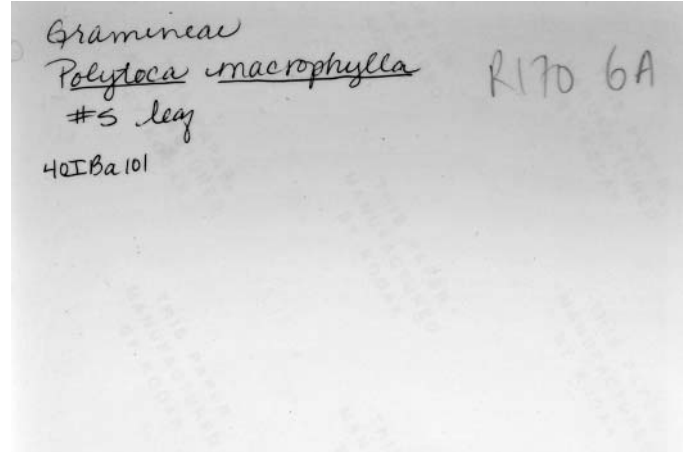
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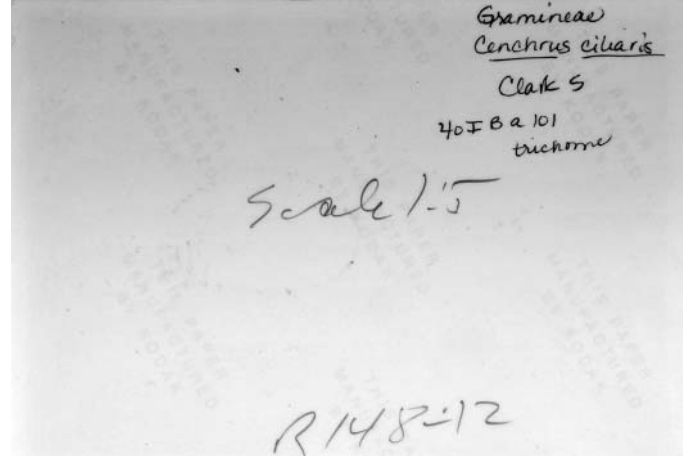
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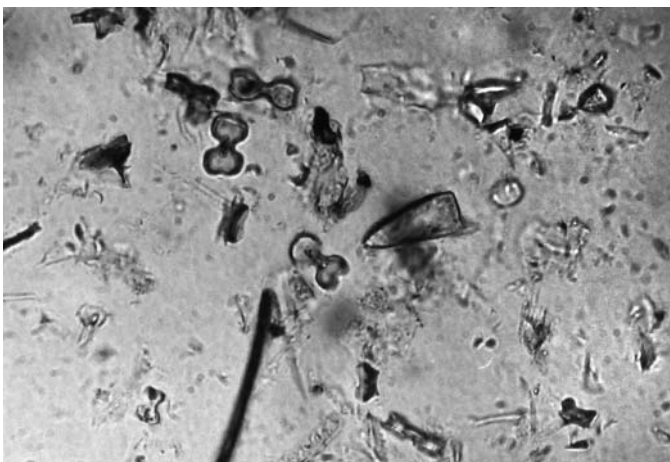
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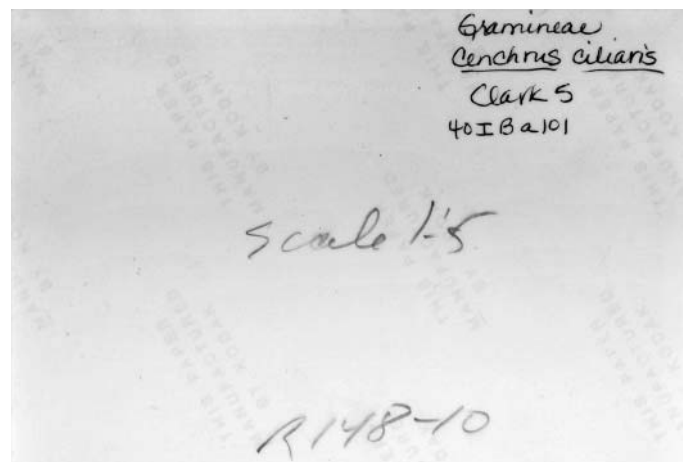
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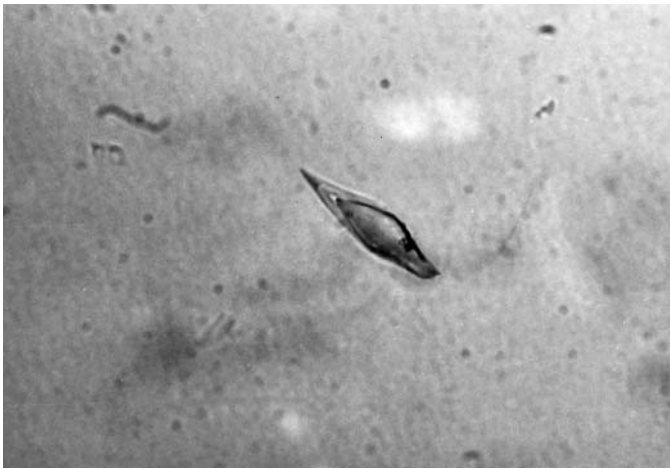
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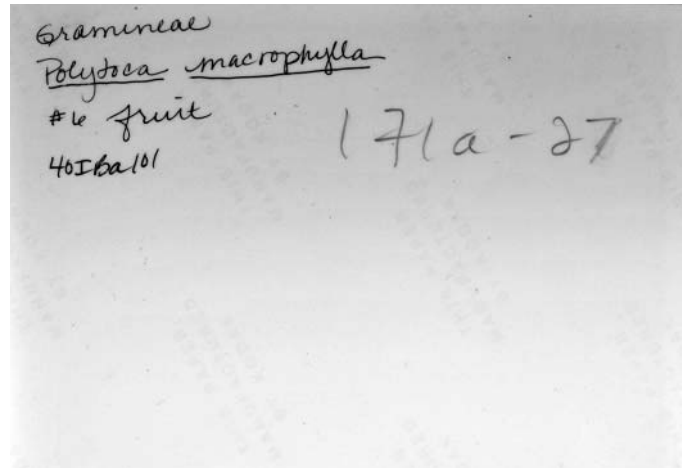
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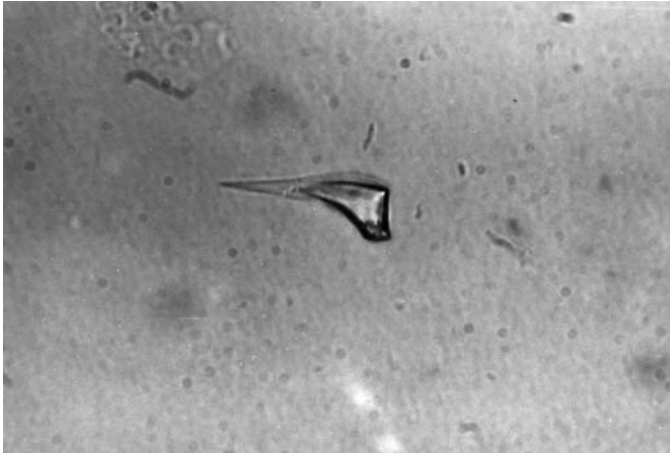
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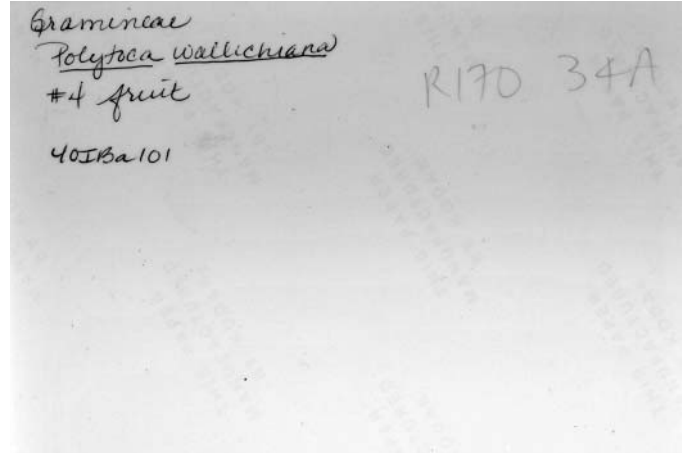
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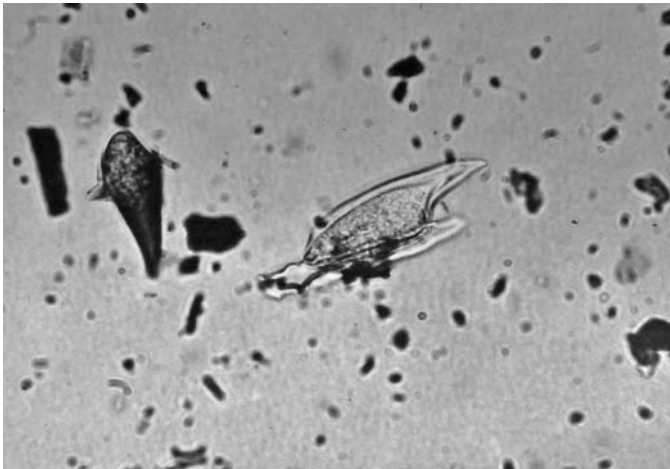
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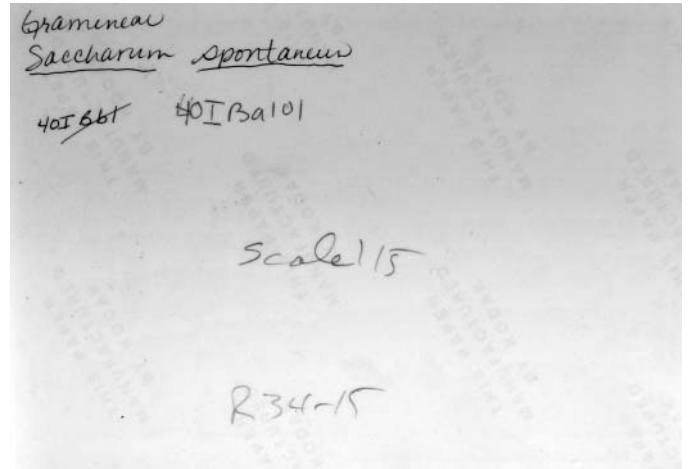
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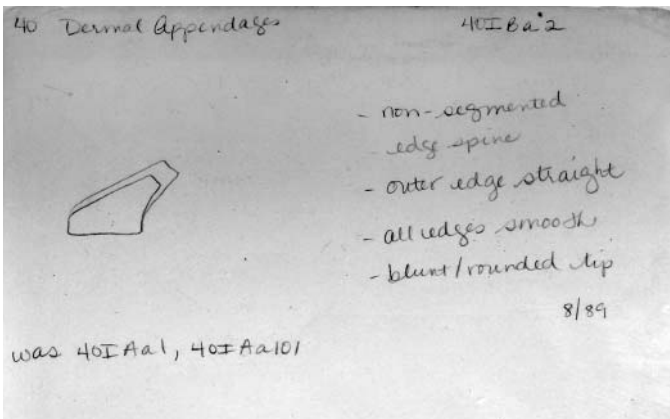
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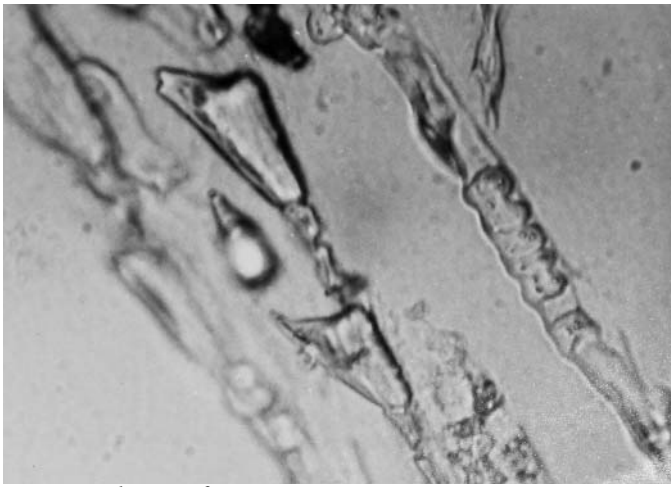
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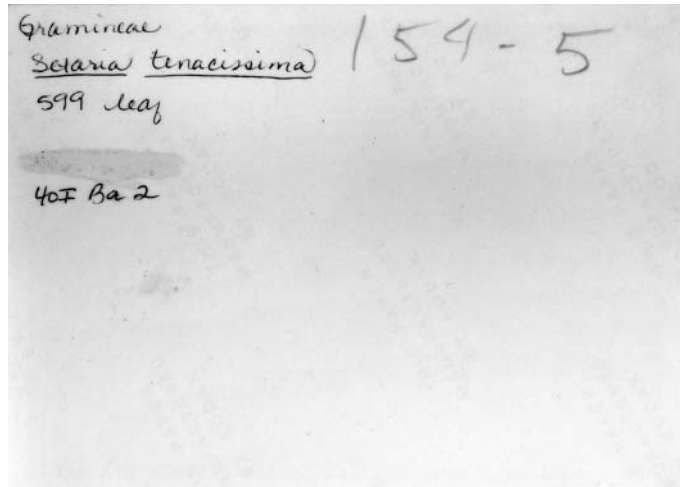
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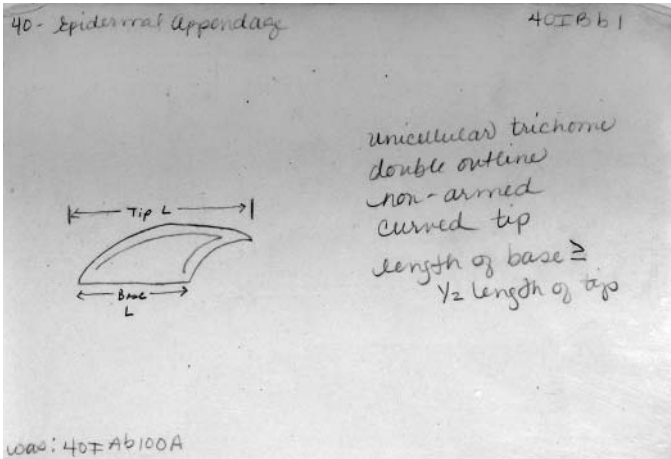
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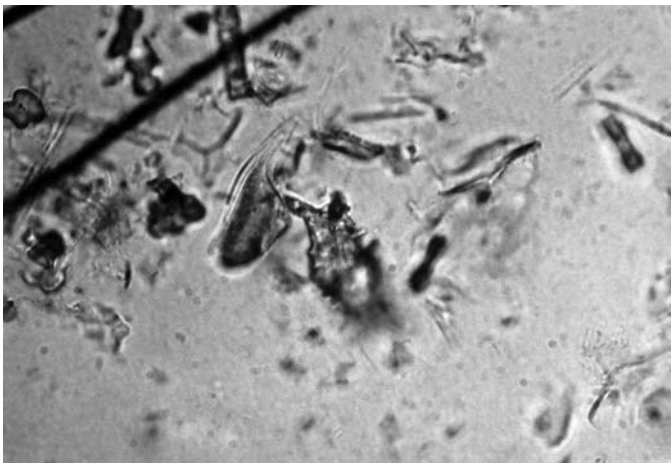
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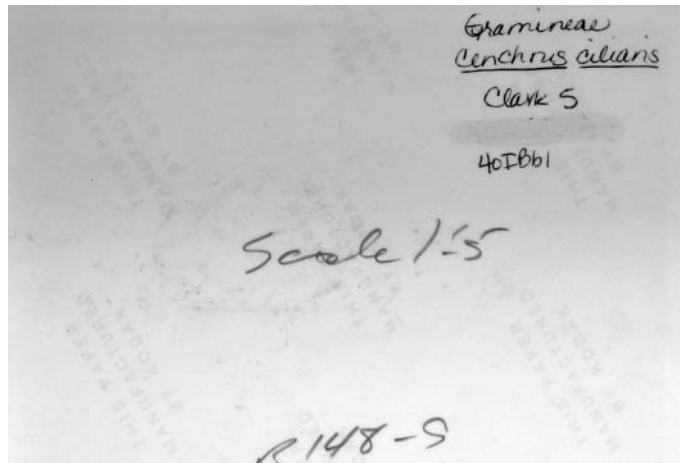
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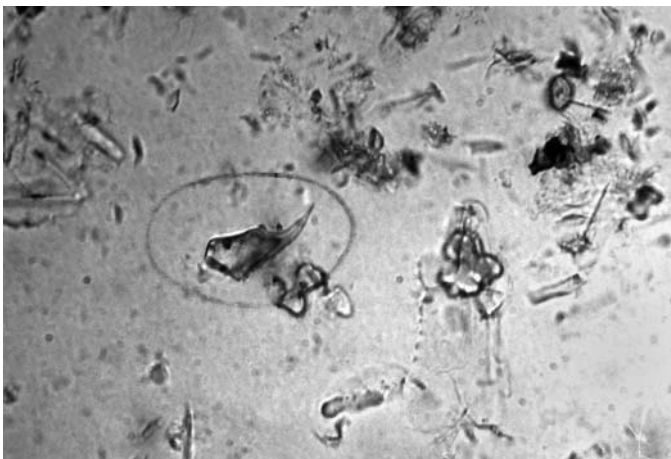
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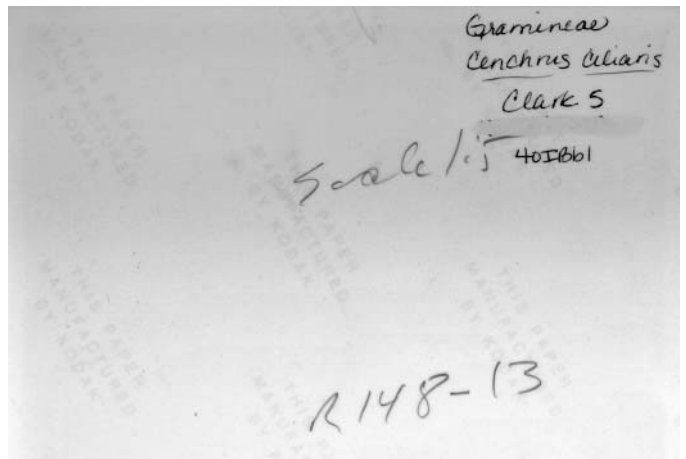
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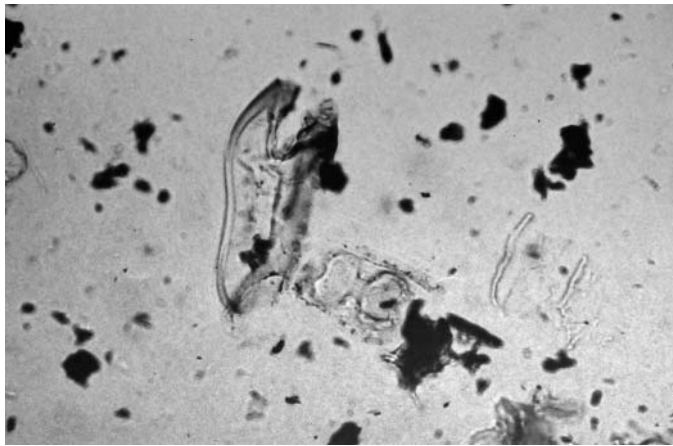
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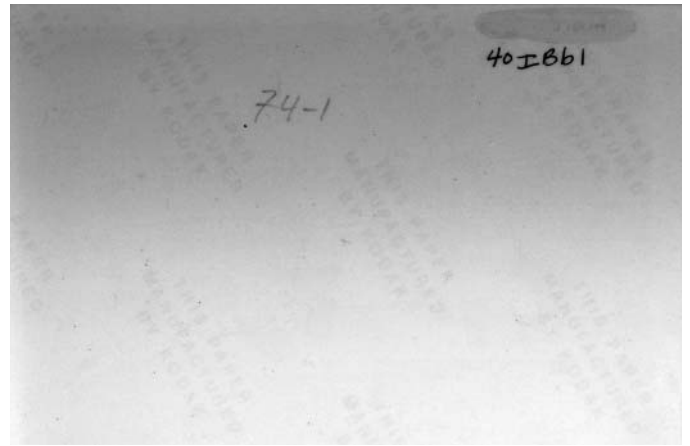
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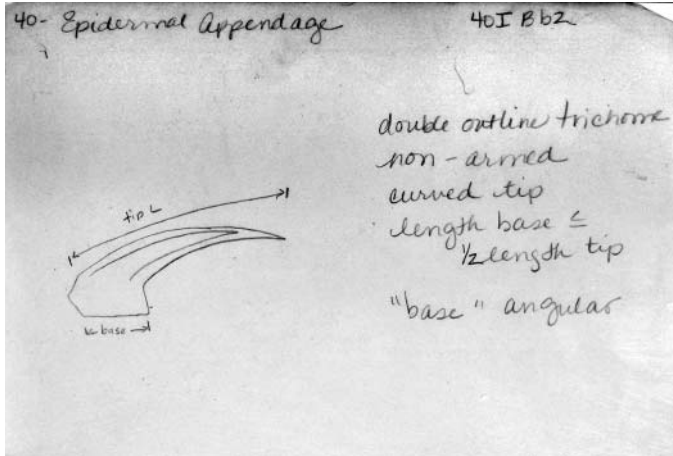
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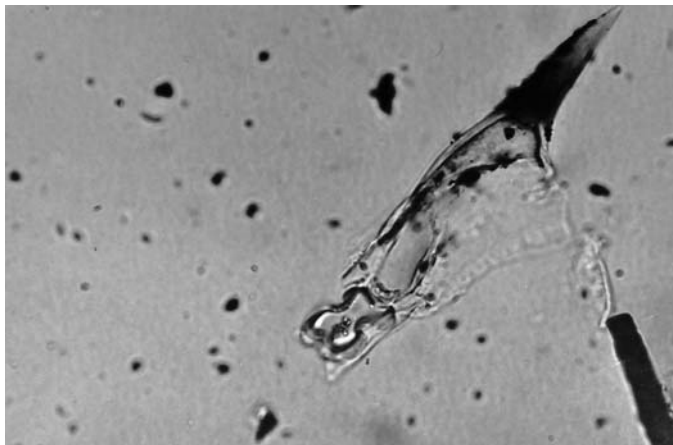
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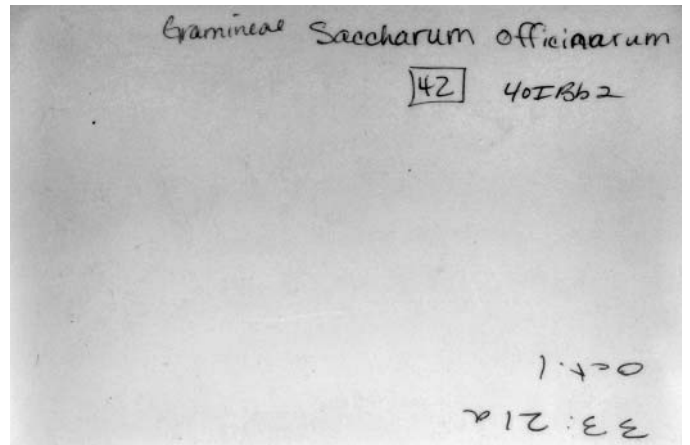
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40IBb2 card 1.JPG



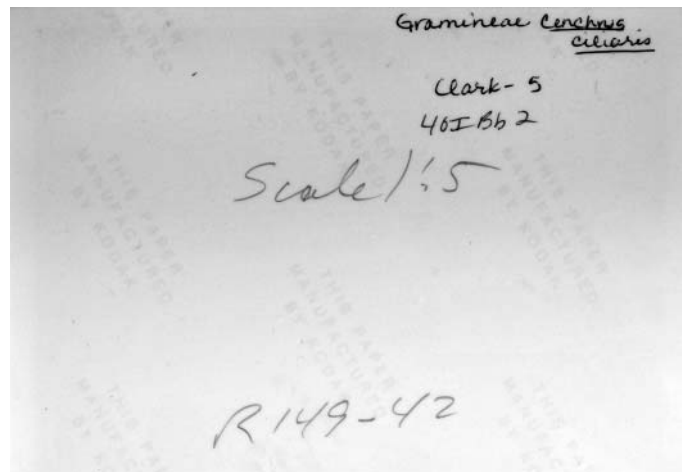
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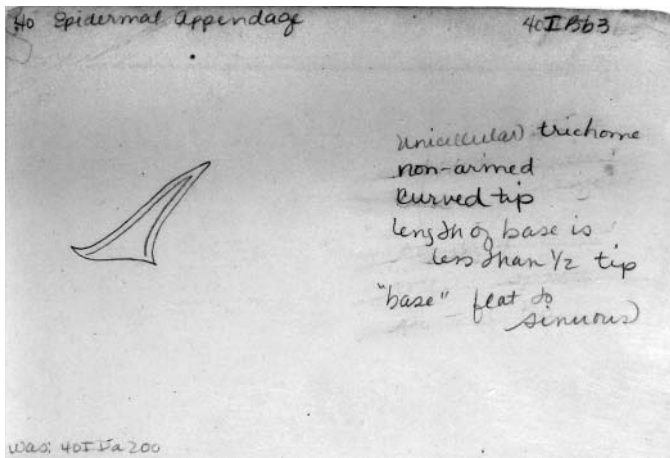
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40IBb2 photo 2f.JPG



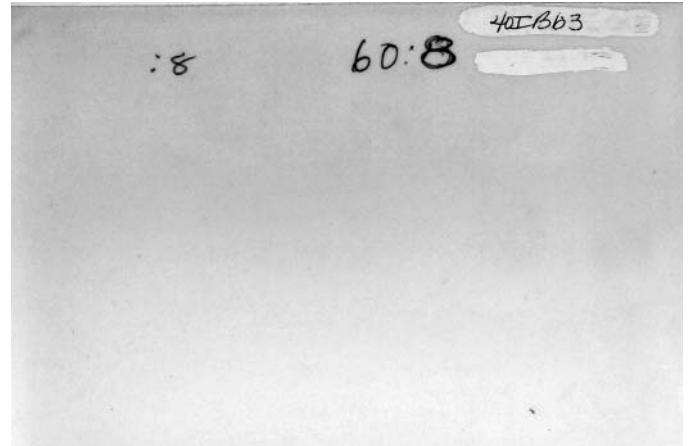
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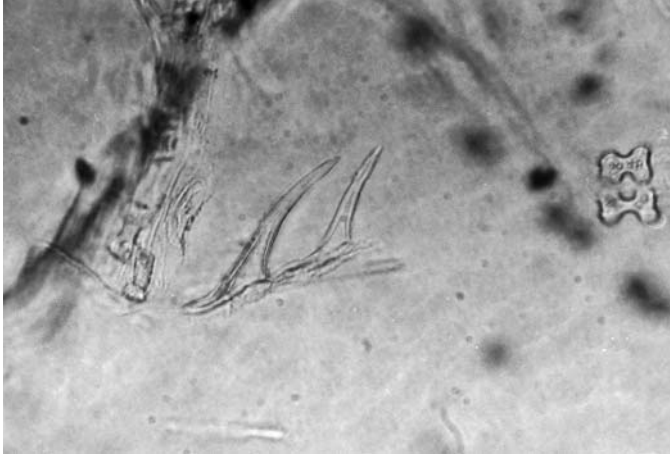
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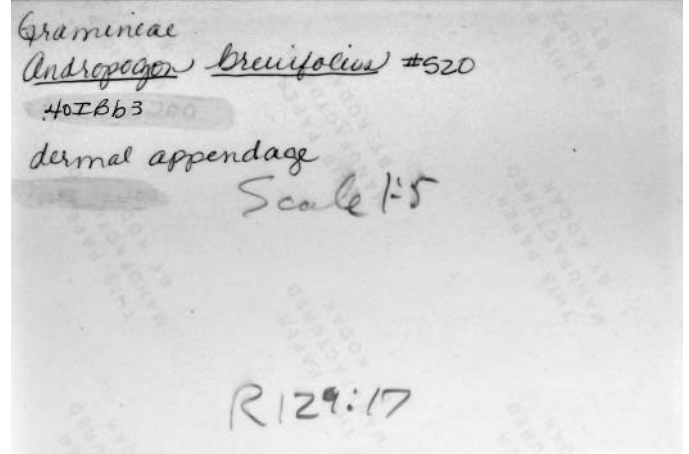
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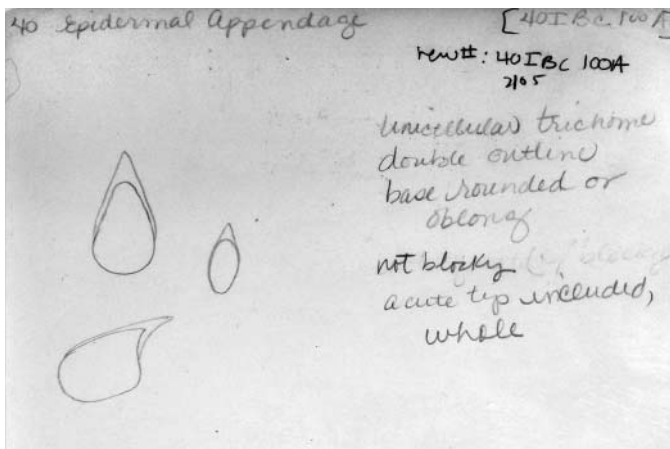
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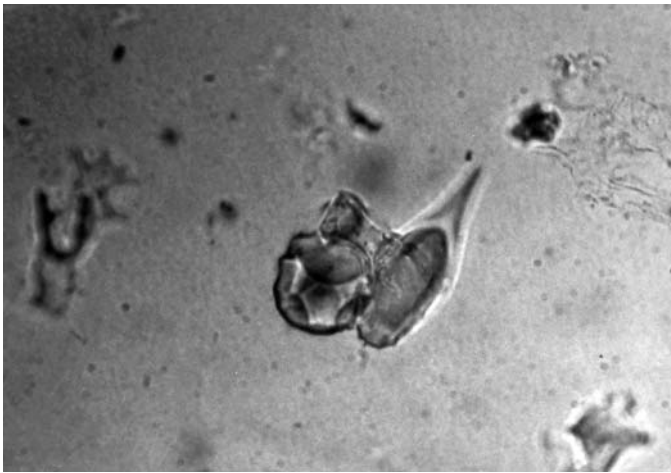
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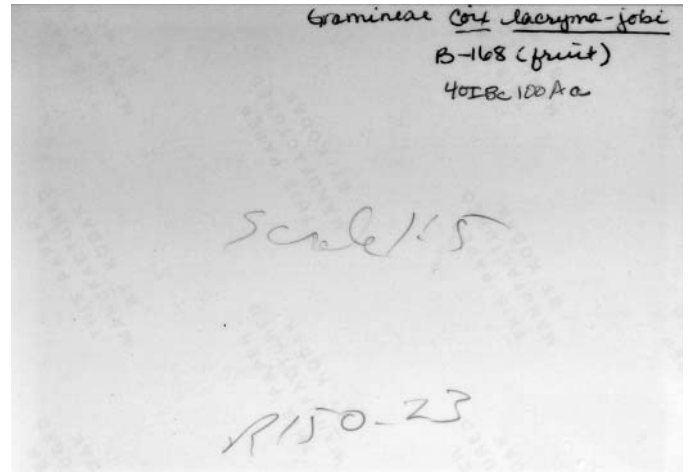
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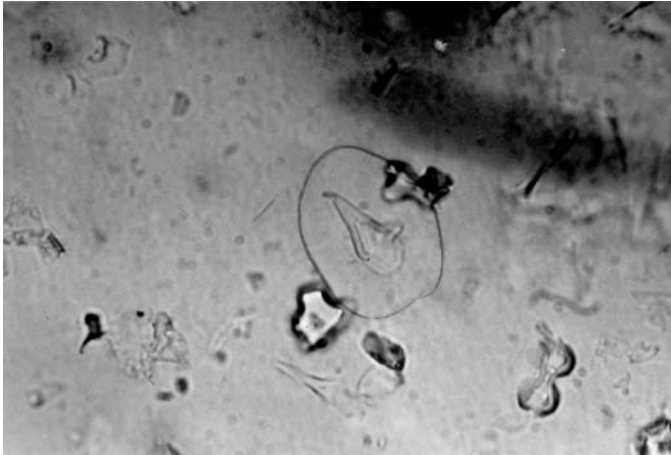
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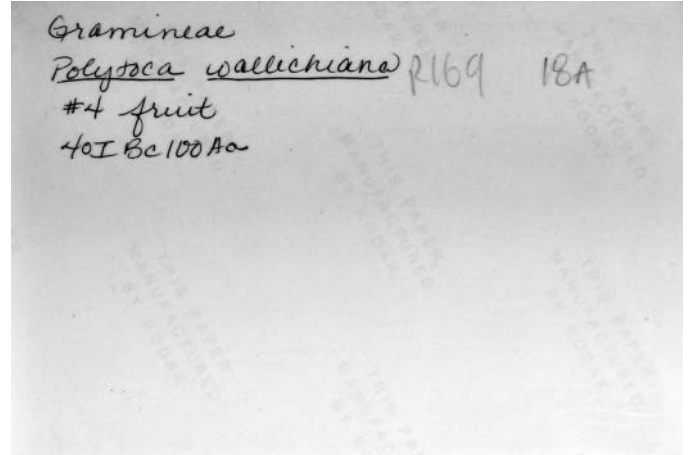
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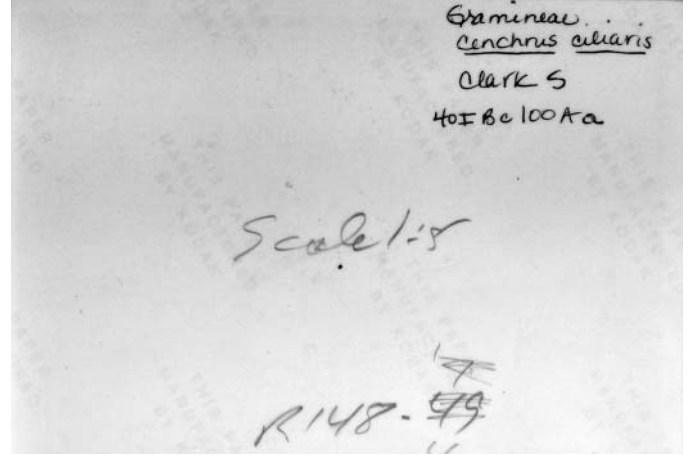
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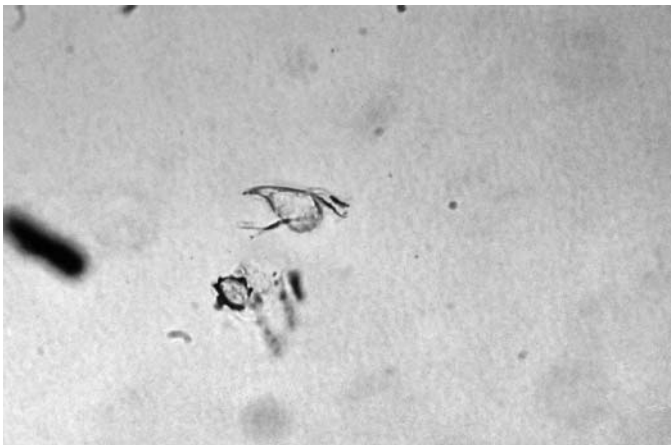
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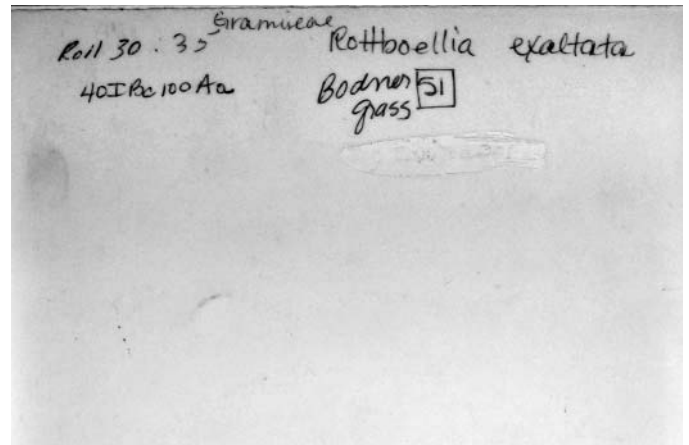
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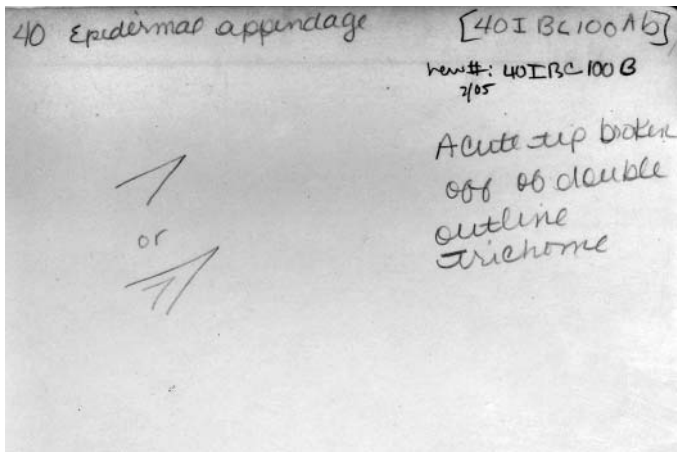
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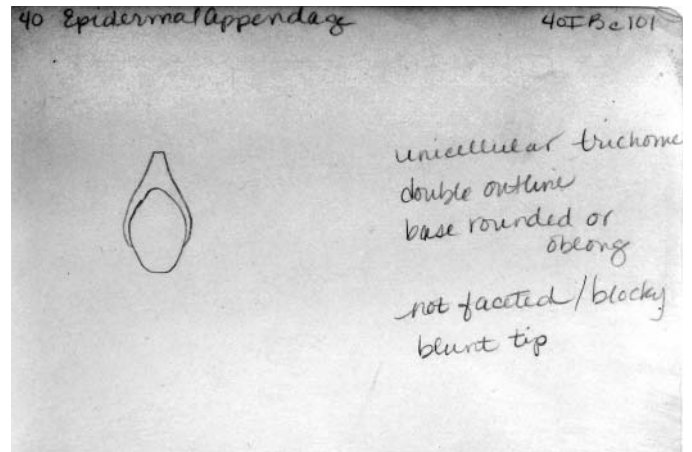
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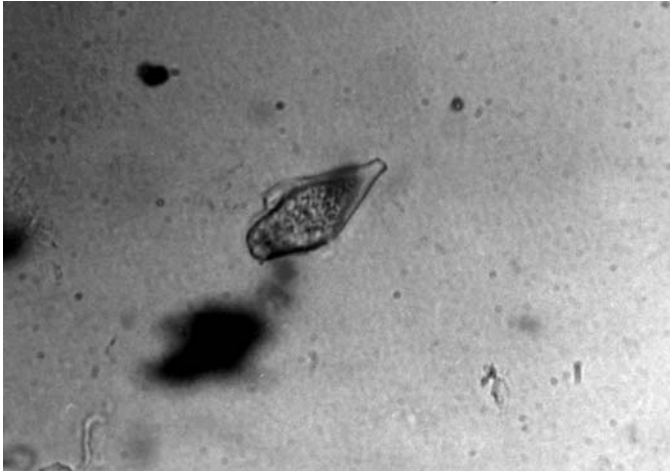
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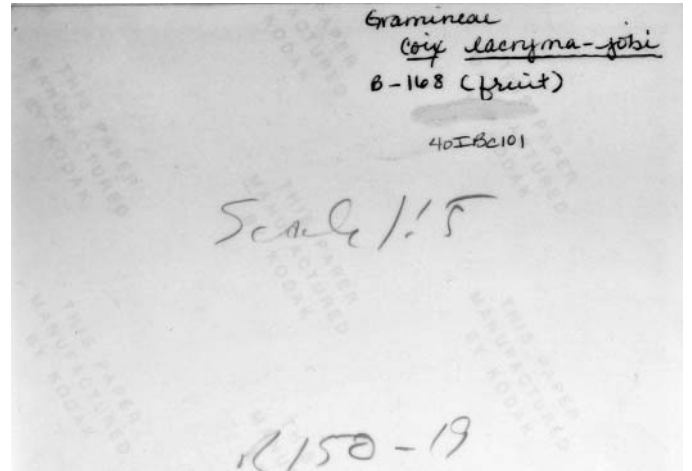
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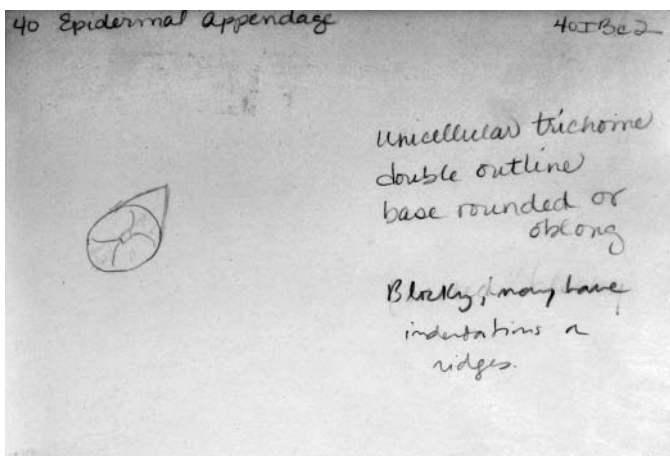
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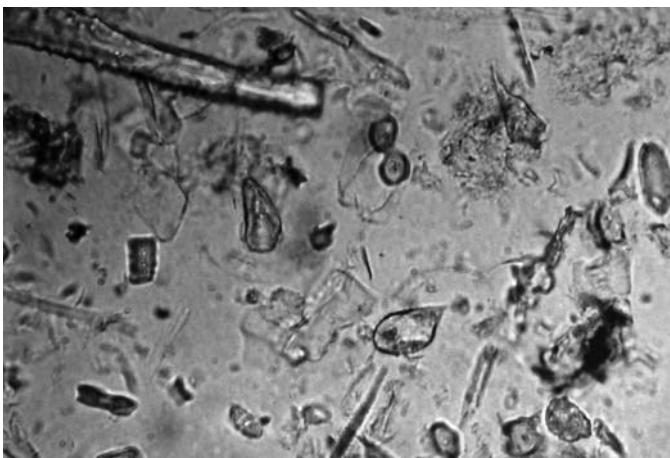
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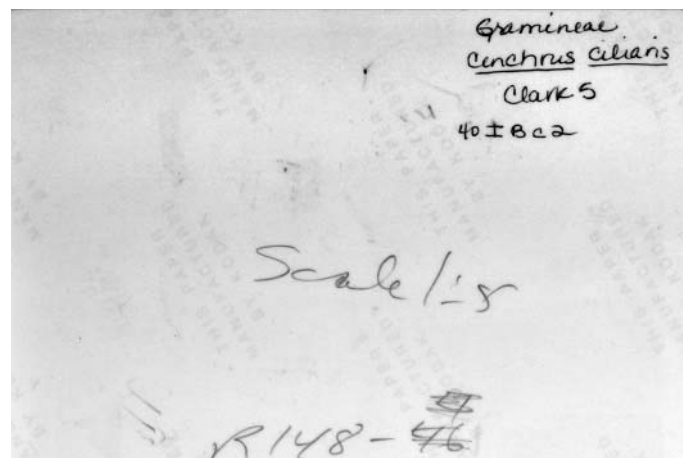
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40IBc2 card 1.JPG

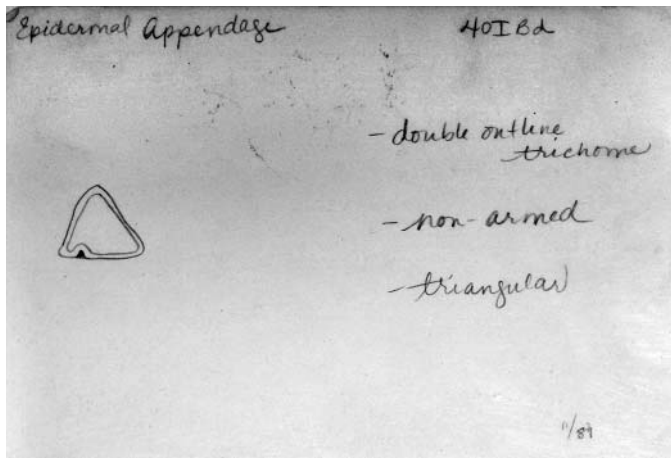


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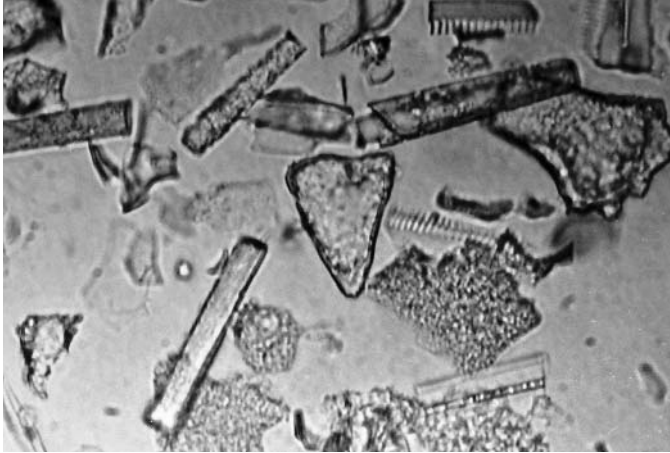


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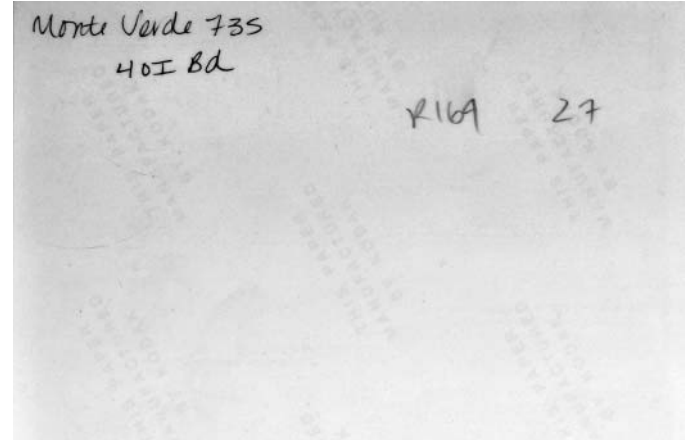




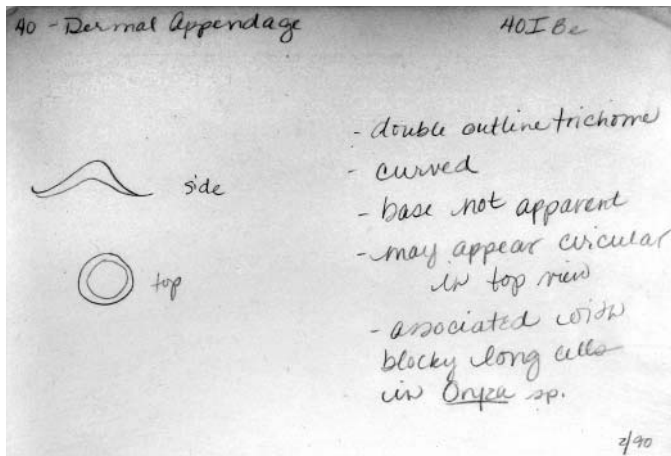
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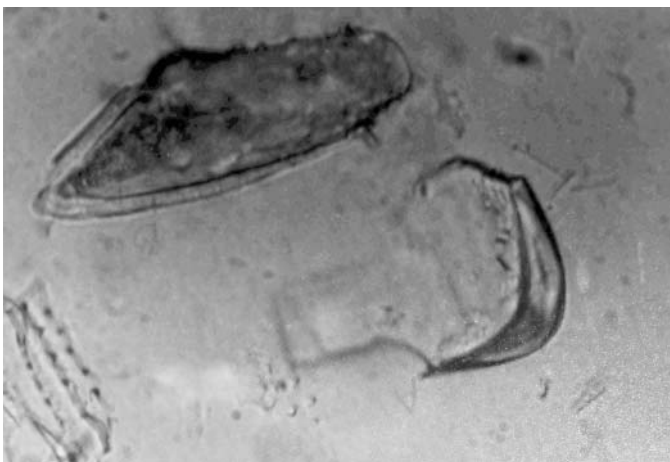
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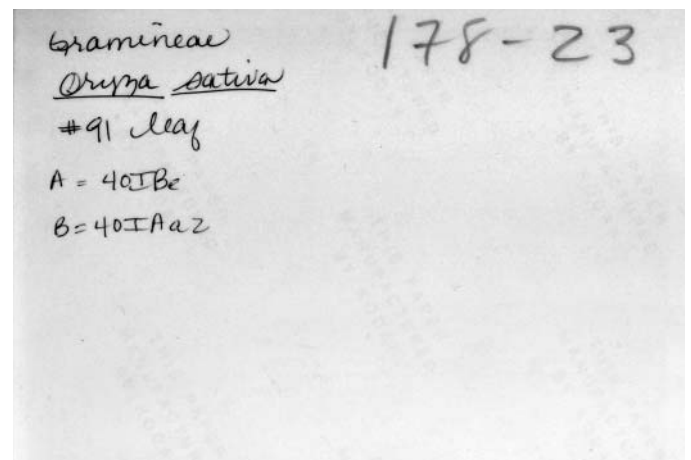
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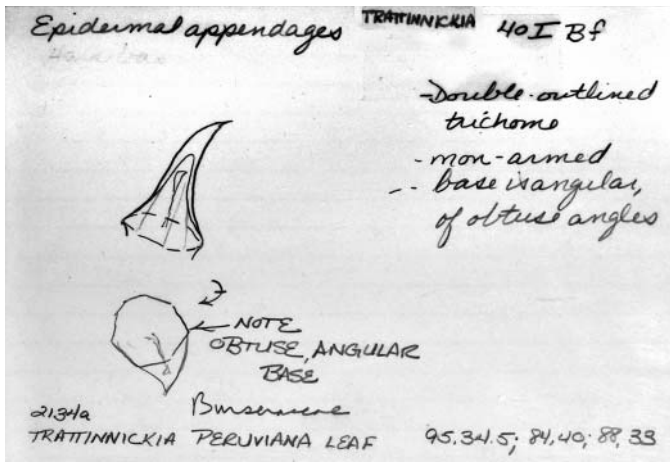
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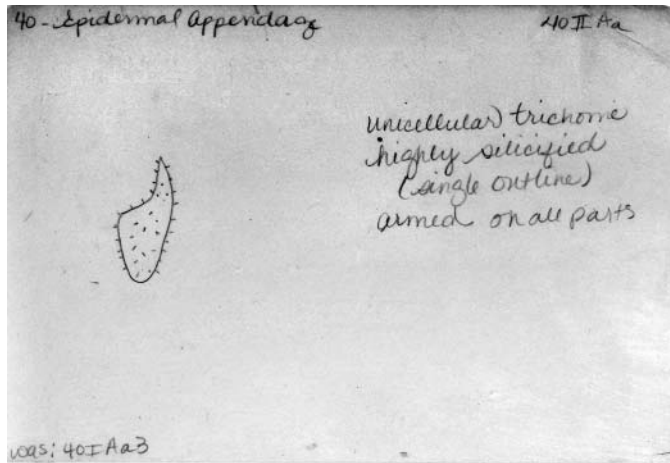
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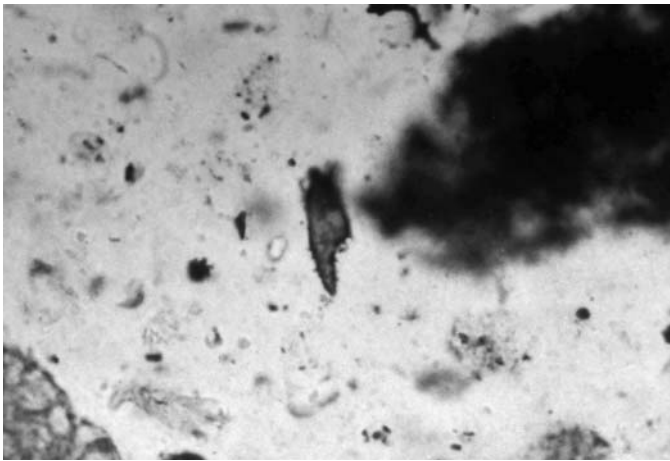
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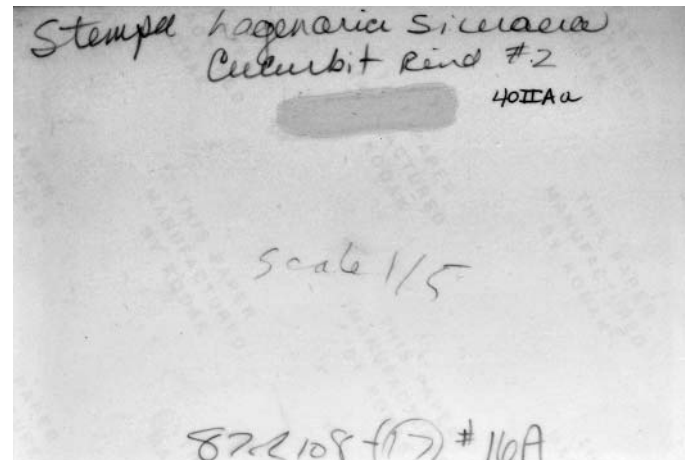
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40IIAa card 1.JPG



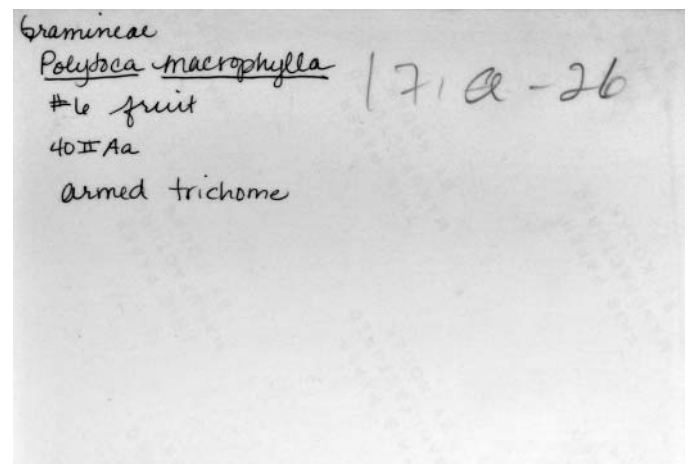
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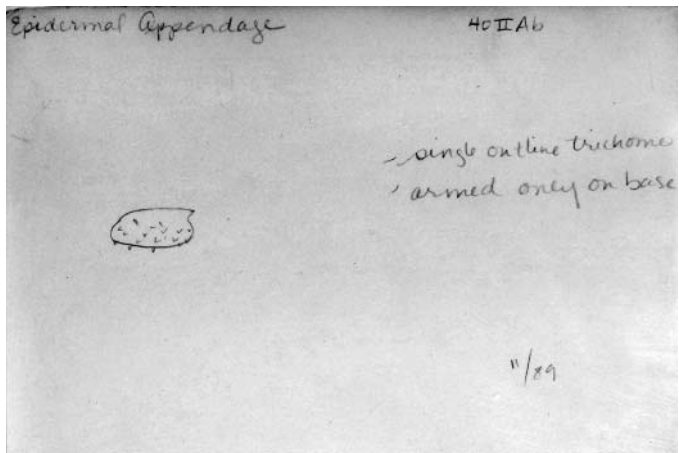
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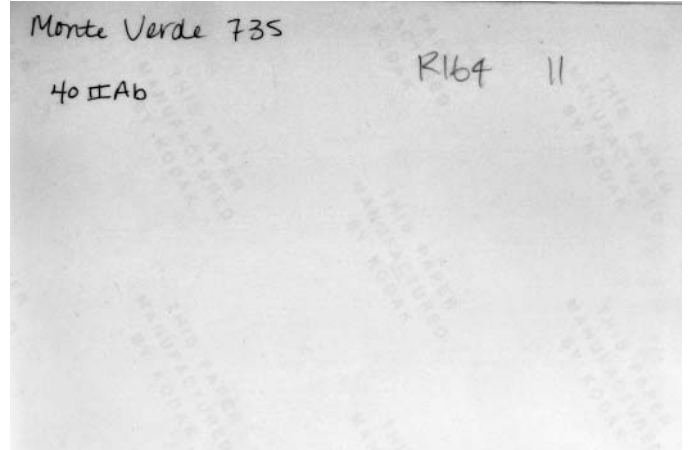
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40IIAb card 1.JPG



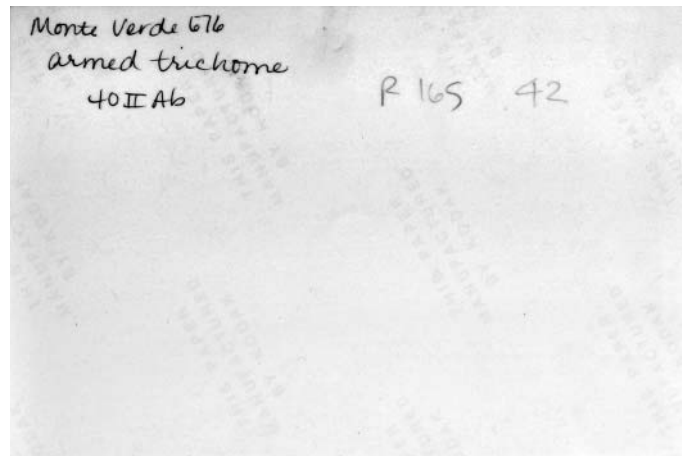
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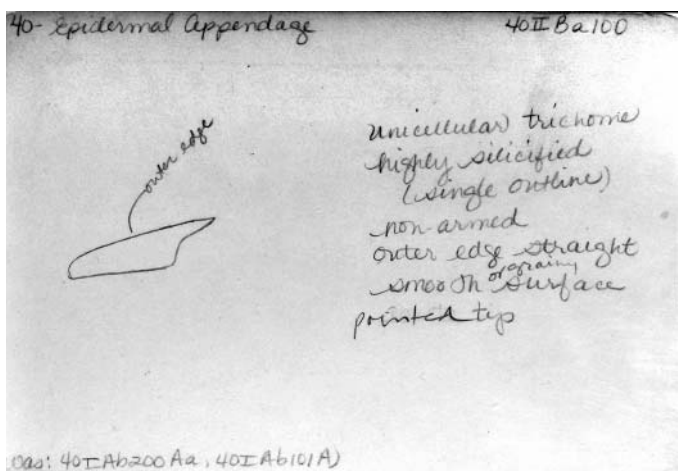
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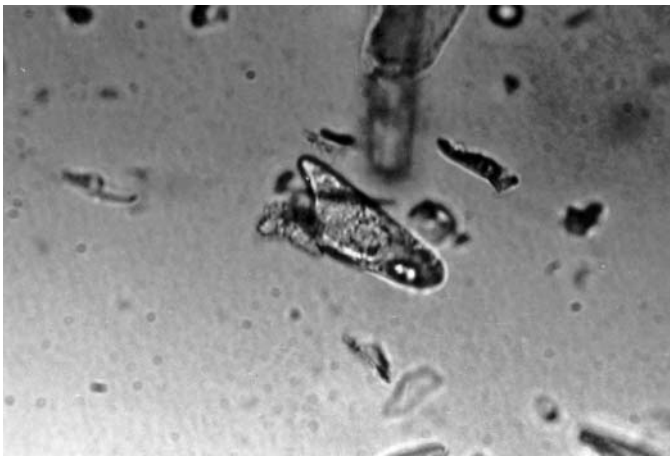
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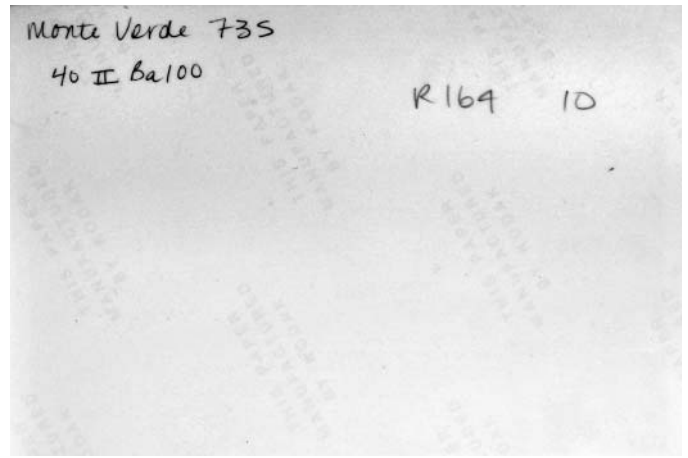
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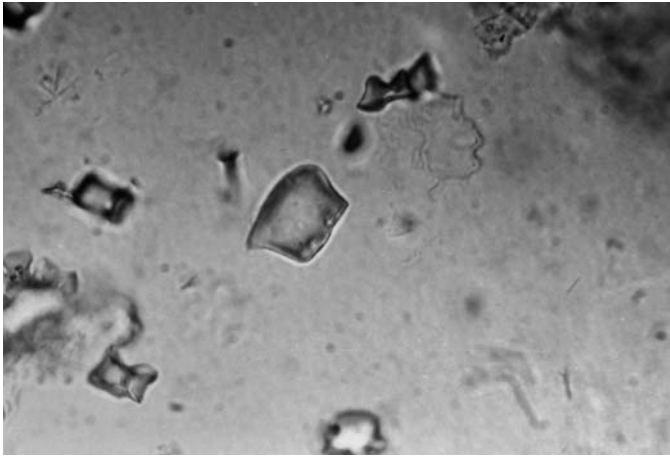
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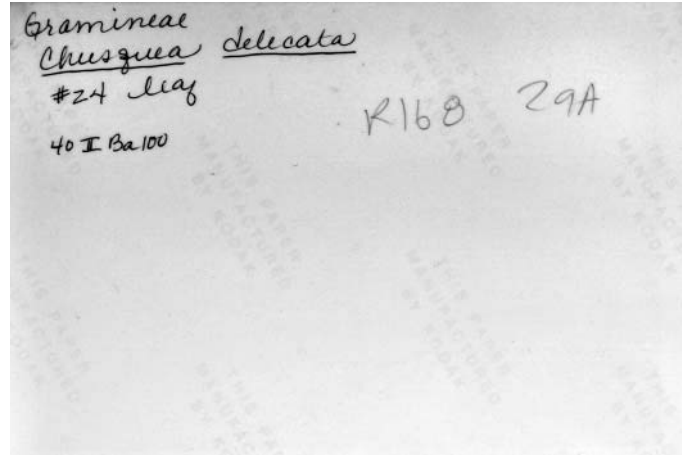
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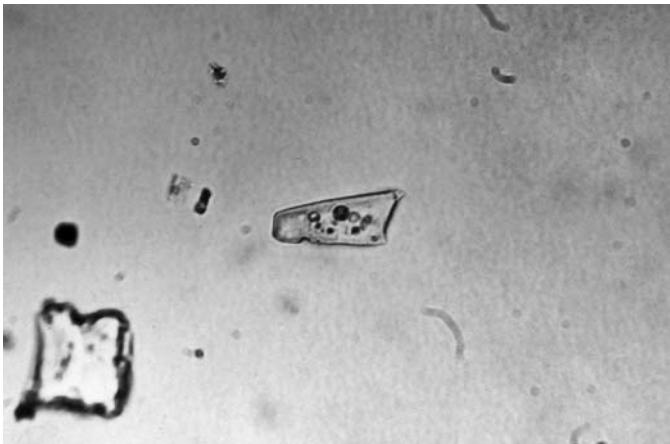
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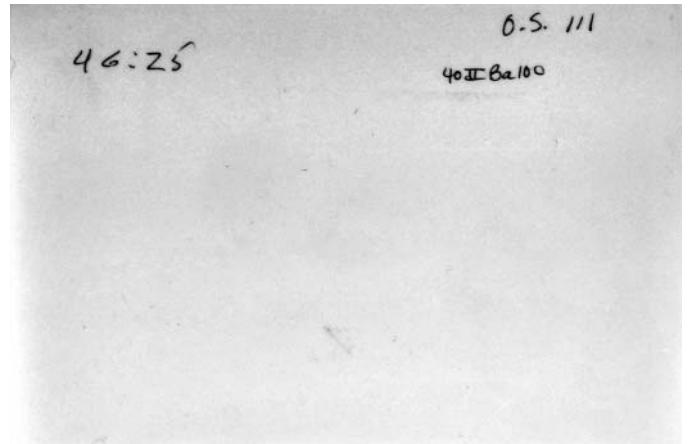
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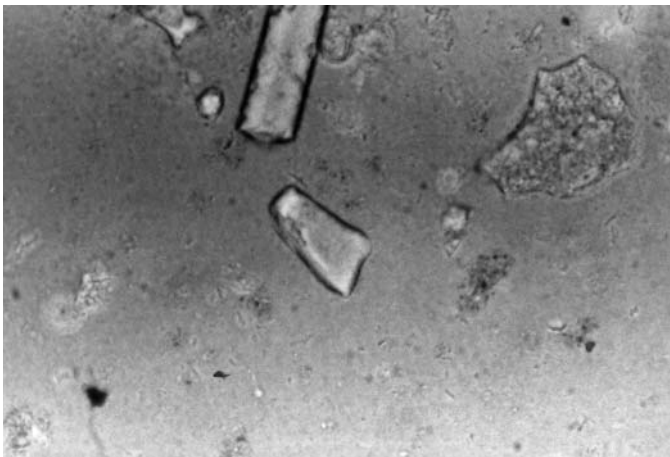
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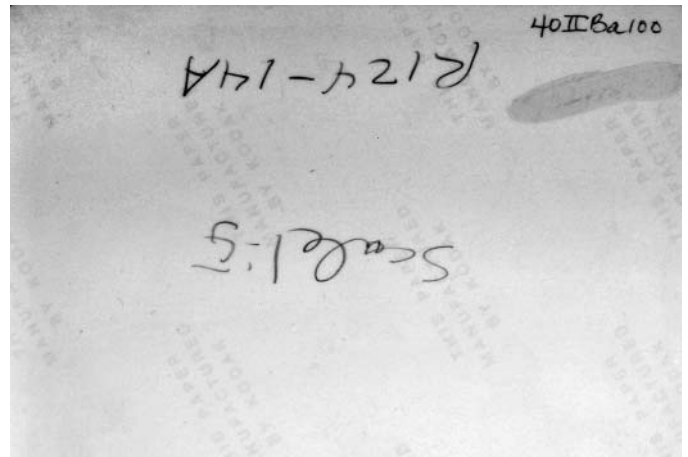
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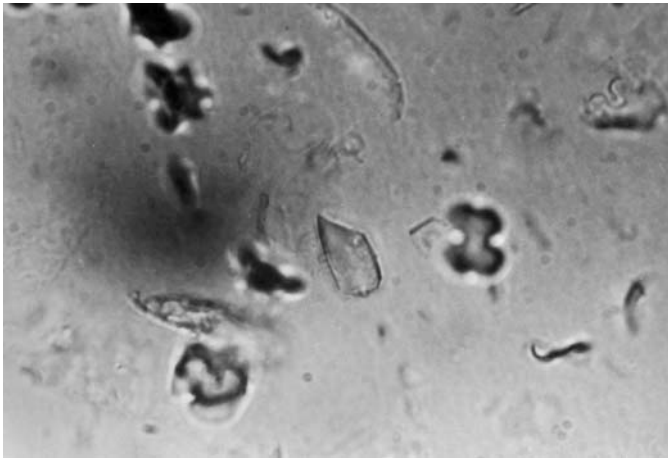
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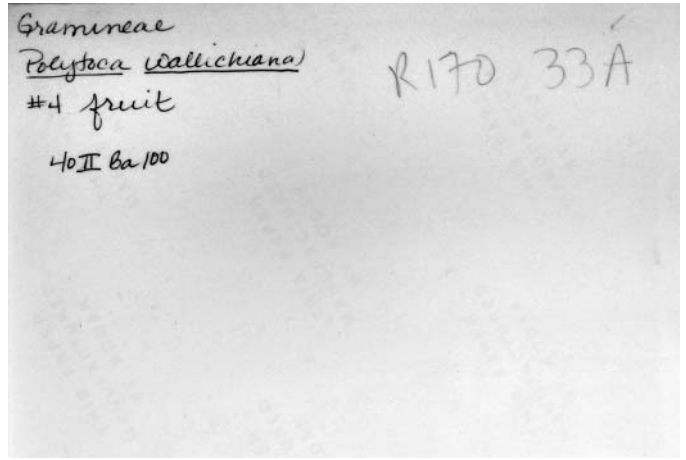
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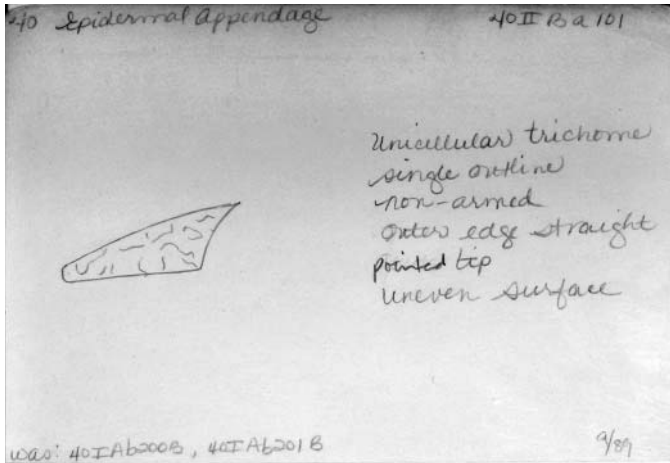
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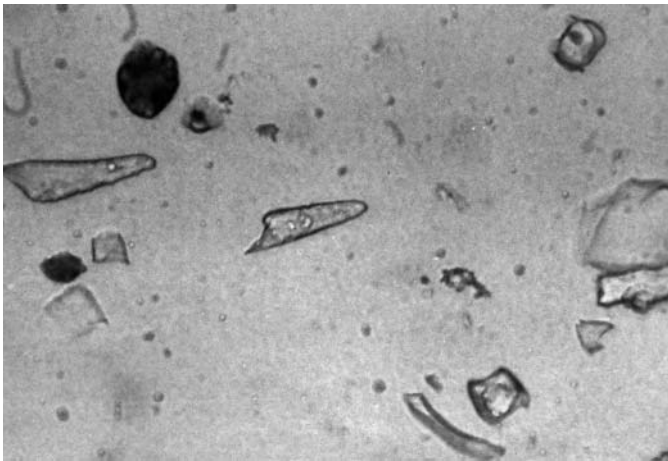
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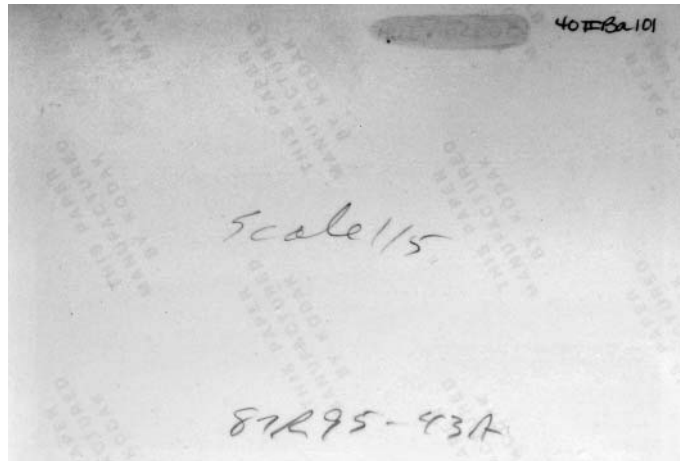
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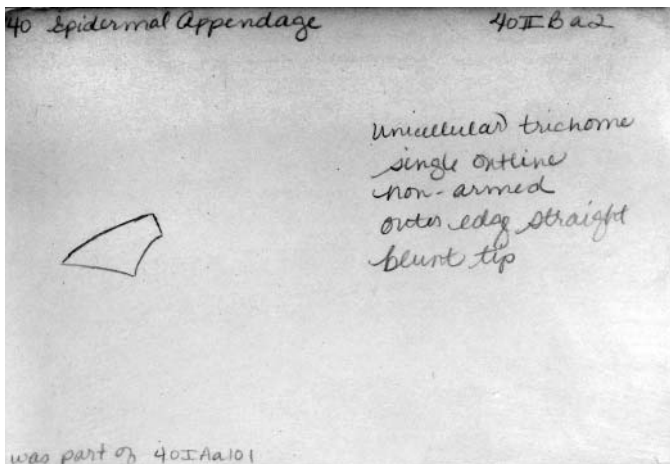
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40IIBa101 photo 1f.JPG



40IIBa101 photo 1b.JPG



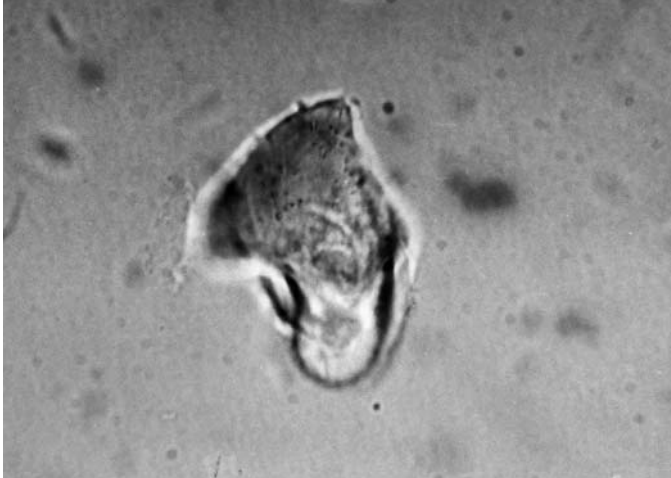
40IIBa2 card 1.JPG



40IIBa2 photo 1f.JPG

Gramineae  
*Andropogon brevifolius* #520  
 40IIBa2  
 dermal appendage  
 Scale 1:5  
 R130-16A

40IIBa2 photo 1b.JPG



40IIBa2 photo 2f.JPG

Gramineae  
*Oryza sativa*  
 #327 f  
 40IIBa2  
 225  
 FR 43  
 5.6 #3 1/2  
 10sec  
 Nikon  
 E

40IIBa2 photo 2b.JPG




40IIBa2 photo 3f.JPG

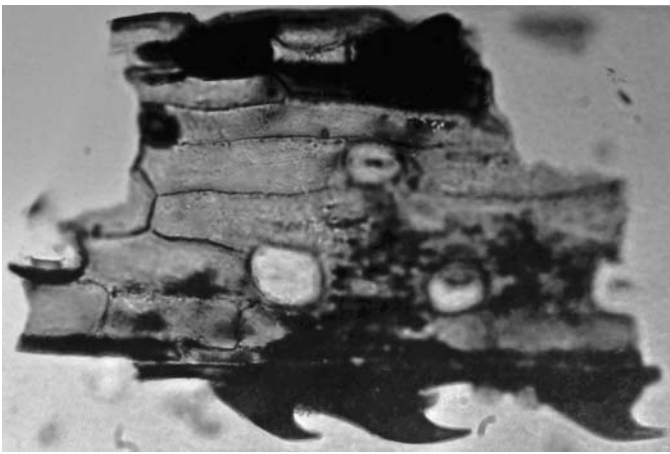
Gramineae  
*Setaria tenacissima*  
 #599  
 edge spine  
 40IIBa2  
 Rev 1543  
 #11  
 52

40IIBa2 photo 3b.JPG

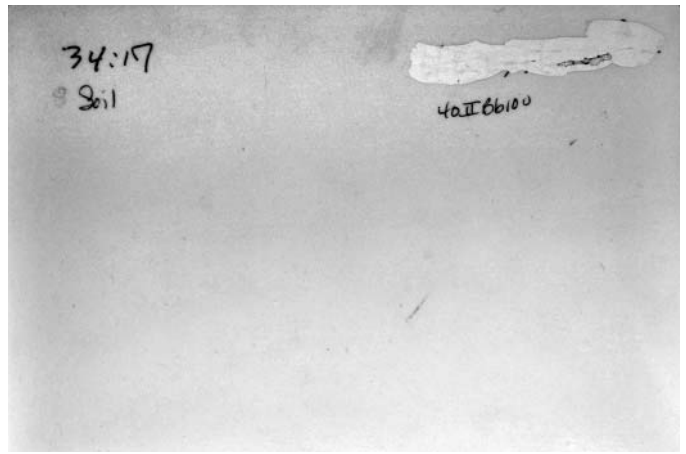
40 Epidermal Appendage  
 40IIBb100  
 unicellular trichome  
 single outline  
 non armed  
 outer edge curved  
 acute tip  
 smooth surface



vas: 40IIBb200Aa  
 40IIBb100 card 1.JPG



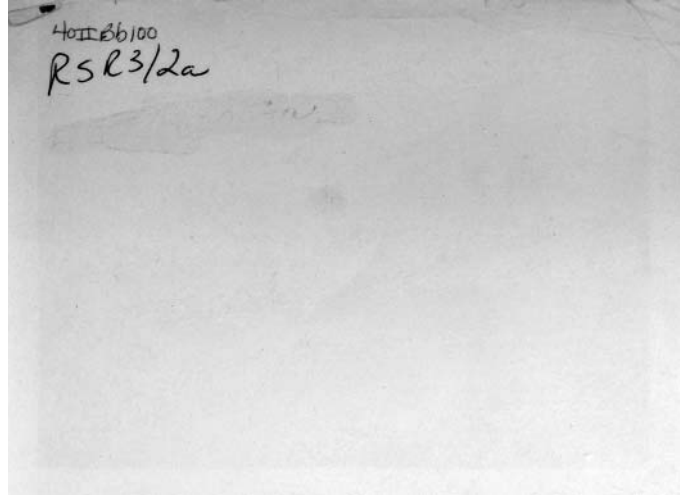
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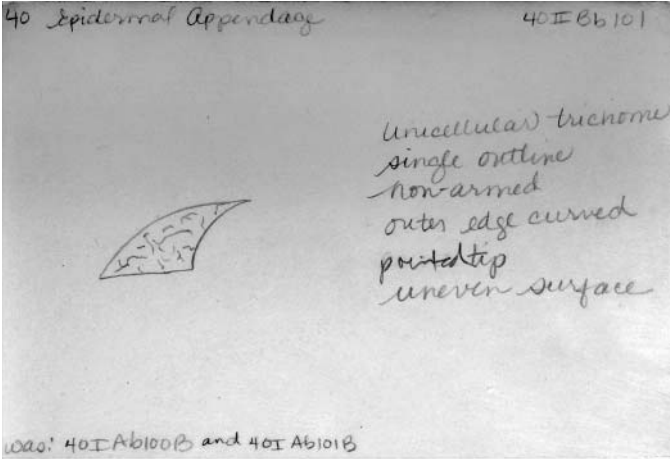
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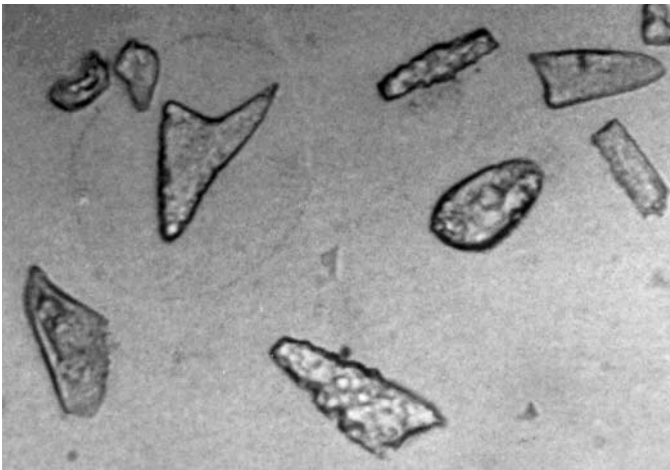
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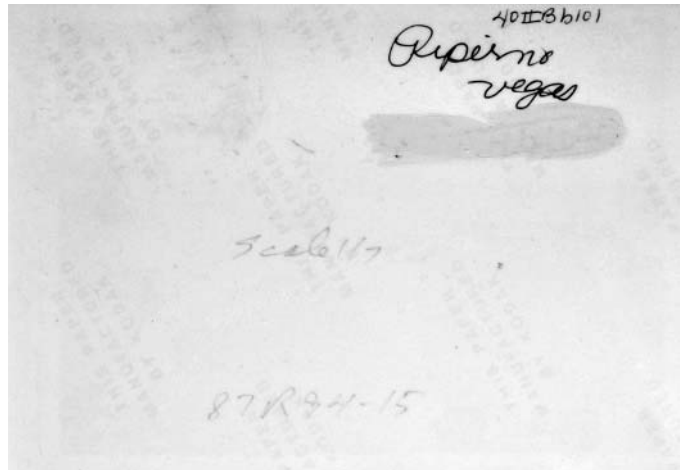
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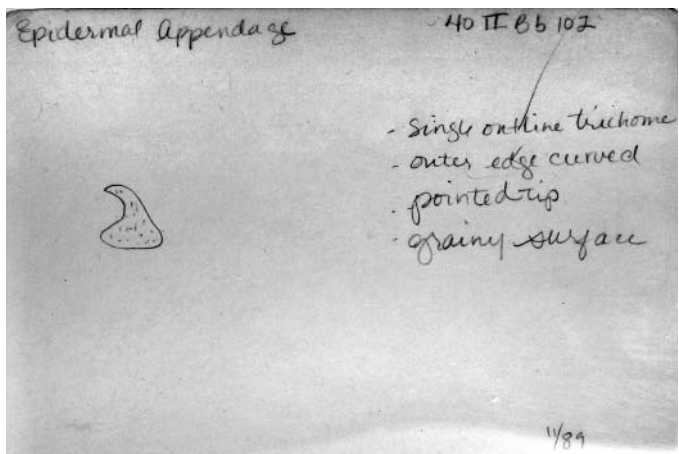
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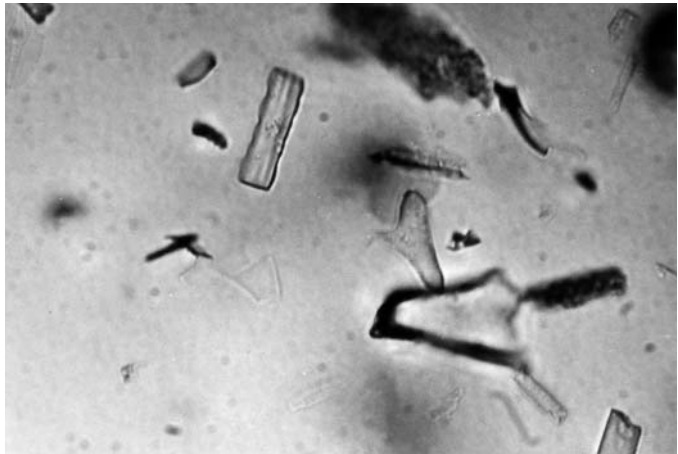
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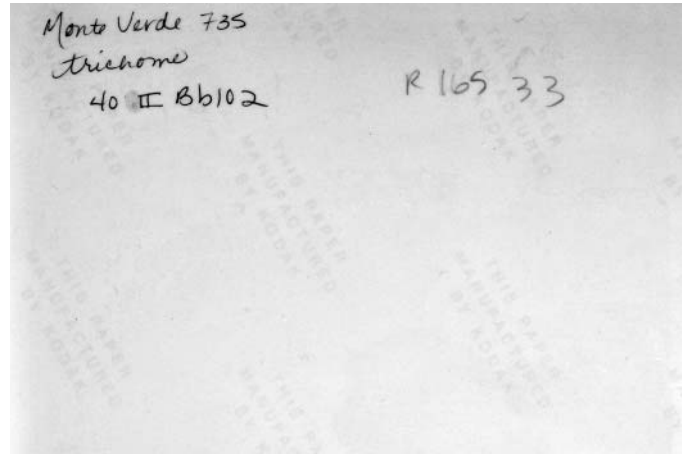
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40IIBb102 card 1.JPG



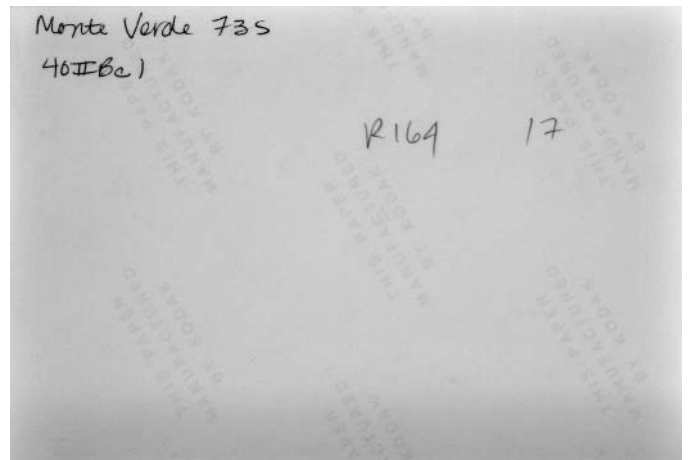
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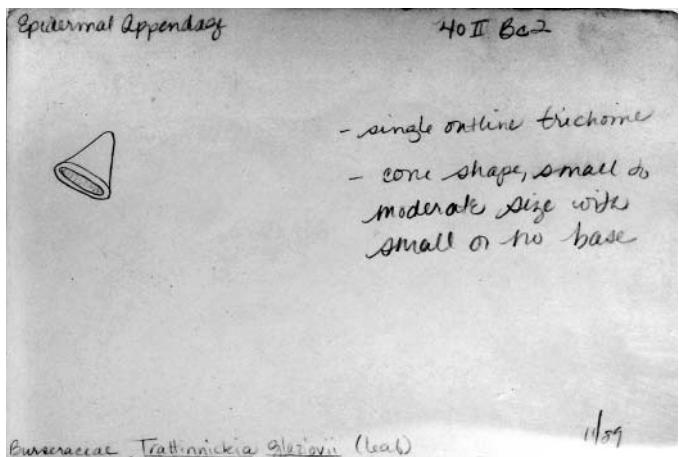
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40IIBc1 photo1f.jpg

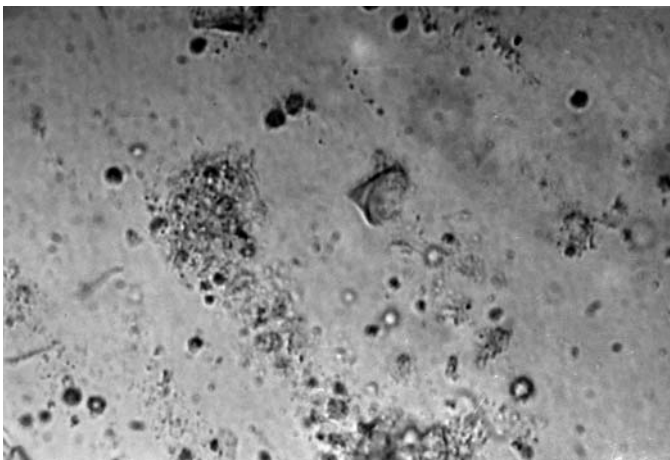


40IIBc1 photo1b.jpg

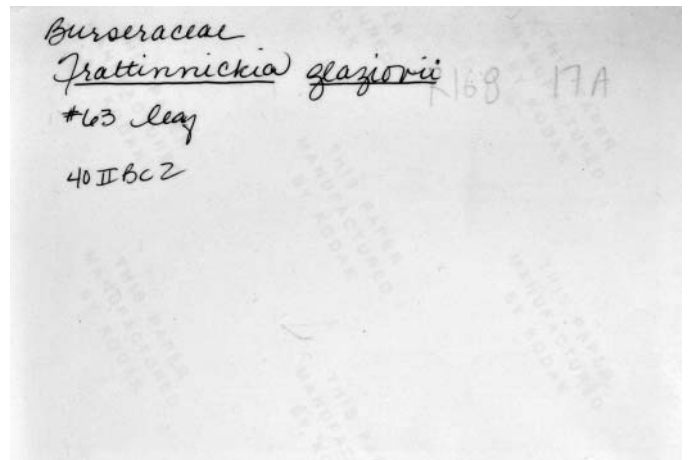


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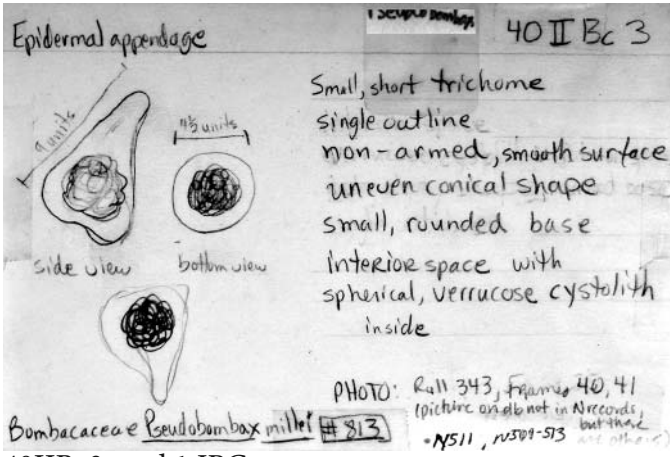




40IIBc2 photo 1f.JPG



40IIBc2 photo 1b.JPG



40IIBc3 card 1.JPG