**Anacardiaceae**  
**Family** Anacardiaceae  
**Genus** Spondias  
**Species** purpurea  
**Type established by** Karol Chandler-Ezell, 2004  
**Diagnostic level:** fruit/seed  

**Comments**
Type established by Karol Chandler-Ezell, 2004  
Diagnostic level: fruit/seed

**Description**
**Undulating transport elements:** Silica casts of transport elements (xylem and phloem) observed in a number of taxa, predominantly in fruits and seeds. Type includes thin-walled, smooth, undulating tubes without end plates.

**Description**
**Facets and overall shape both irregular, often with concave surfaces. NOT a regular, symmetrical sphere.**
Diagnostic level: family

**Description**
- Irregularly faceted hemispheres
- Size large
- Irregular in shape
**Araceae**

**Family** Araceae

**Genus** Colacasia

**Species** esculenta

**Type established by** Karol Chandler-Ezell, 2004. Cultivated tuber. **Diagnostic level:** undetermined

**Comments**

Smooth cystolith, sculptured: Cystoliths are found in leaves of numerous taxa. We observed these smooth, sculpted cystoliths in Dioscorea and Araceae tubers.

**Description**

- Smooth cystolith, sculptured: Cystoliths are found in leaves of numerous taxa. We observed these smooth, sculpted cystoliths in Dioscorea and Araceae tubers.

- Entered by Emily Sternberg
- Updated 2/3/2005

---

**Araceae**

**Family** Araceae

**Genus** Xanthosoma

**Species**

**Authority**

**Type established by** Karol Chandler-Ezell, 2004. Diagnostic level: not determined

**Comments**

Smooth cystolith, sculptured: Cystoliths are found in leaves of numerous taxa. We observed these smooth, sculpted cystoliths in Dioscorea and Araceae tubers.

**Description**

- Smooth cystolith, sculptured: Cystoliths are found in leaves of numerous taxa. We observed these smooth, sculpted cystoliths in Dioscorea and Araceae tubers.

- Entered by Emily Sternberg
- Updated 2/22/2005
Bactris sp.

Side view of body shows profile of two projections on top, smooth bottom surface.

Diagnostic level: family

Description
- Hat-shaped (conical) bodies
- Spheroidal in shape from top view
- 1-5 projections on top, visible as spinulose from side view

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002

There are several small spinulose spheres and other conical bodies in the background of this image.

Diagnostic level: family

Description
- Conical body
- Hat-shaped bodies
- Spheroidal with hat-shape visible in rotation
- 1-5 projection/on visible on convex surface

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002
**Arecaceae**

**Family** Arecaceae

**Genus** Bactris

**Species** sp.

**Authority**

**Comments**

You can spot several spinulose spheres and other conical bodies in the background of this image. Diagnostic level: family

**Description**

- Conical body
- Hat-shaped bodies
- Spheroidal with hat-shape visible in rotation
- 1-5 projections visible on convex surface

**Entered by** Karol Chandler-Ezell

**Updated** 10/15/2002

---

**Arecaceae**

**Family** Arecaceae

**Genus** Cocos

**Species** nucifera

**Authority** L.

**Comments**

Spinulose spheres. Be sure to rotate to determine whether body is a sphere or conical body with spinulose projections. Diagnostic level: family, Arecaceae

**Description**

- Spheres of varying size
- Regular spinulose projections over entire surface

**Entered by** Karol Chandler-Ezell

**Updated** 10/7/2002
### Asteraceae

**Family**
- Asteraceae

**Genus**
- Lipochaeta

**Species**
- sp.

**Authority**
- 

**Comments**
- Be sure sheet is occluded and flat. Three dimensional, irregularly surfaced sheets are another type. Diagnostic level: family

**Description**
- Occluded (black) sheet
- Flat, smooth surface; Often fragmented; Round perforations occur in long lines (usually parallel); Size varies from fragments of a few microns to sheets covering entire fields.

**Entered by**
- Karol Chandler-Ezell

**Updated**
- 10/7/2002

---

### Asteraceae

**Family**
- Asteraceae

**Genus**
- Lipochaeta

**Species**
- sp.

**Authority**
- 

**Comments**
- Asteraceae hairs tend to be armed. Compare to 40IIIBa201 Cucurbitaceae/Asteraceae hair and 40IIIBa202 Croton fraseri (Euphorbiaceae) hair. Diagnostic level: family

**Description**
- Multicellular hair; Straight tip; Large; Armed; Segmented; Base is 40 IV D.

**Entered by**
- Meghann O'Brien

**Updated**
- 02/23/2005
Asteraceae hairs tend to be armed. Compare to 40IIIBa201 Cucurbitaceae/Asteraceae hair and 40IIIBa202 Croton fraseri (Euphorbiaceae) hair. May occur with some hairs segmented and unarmed: type 40IIIBa201 (see lower right) Sometimes occluded as shown, or blackened. Diagnostic level: family

Multicellular hair; Straight tip; Large; Armed; Segmented; Base is 40 IV D.

Be careful of confusion with other Asteraceae multicellular hair types such as armed hairs (40IIIBa1) and 40IIIBa202, Croton fraseri (Euphorbiaceae) hair. Diagnostic level: Asteraceae/Cucurbitaceae

Multicellular hair; Large; Unarmed; Segmented.
Asteraceae hairs tend to be armed. Compare to 40IIIBa201 Cucurbitaceae/Asteraceae hair and 40IIIBa202 Croton fraseri (Euphorbiaceae) hair. Diagnostic level: family

Multicellular hair; Straight tip; Large; Armed; Segmented; Base is 40 IV D.

Entered by: Meghann O'Brien  Updated: 02/23/2005

Asteraceae hairs tend to be armed. Compare to 40IIIBa201 Cucurbitaceae/Asteraceae hair and 40IIIBa202 Croton fraseri (Euphorbiaceae) hair. Diagnostic level: family

Multicellular hair; Curved or bent tip; Large; Armed; Base is 40 IV D.

Entered by: Karol Chandler-Ezell  Updated: 3/1/2005
**Comments**
Unknown origin in tissue. Perhaps a cystolith with occluded fragments in interior.
Diagnostic level: family

**Description**
- Round or oval sphere
- Bumpy surface
- Dark center with projection
- Sphere often faintly silicified
- Small

**Entered by** Karol Chandler-Ezell
**Updated** 10/7/2002

**Comments**
Slide E101.
Diagnostic level: family

**Description**
Hair base; Stellate center; Projections short or mere points.

**Entered by** Meghann O'Brien
**Updated** 2/23/2005
Diagnostic level under investigation. Observed in Bixa orellana (PC1691).

Description:
Irregularly shaped seed epidermal non-quadrilateral. Small projections on surface, shape very irregular. Surface rugulose.

Entered by: Deborah M. Pearsall
Updated: 8/21/2012
Bixaceae
Family
Genus
Species
orellana
Authority
Comments
Projections are not speculate, i.e., not 22VIII.
Not diagnostic

Description
epidermal quadrilateral three-dimensional ("blocky"). Slightly undulating edges, smooth surface, long, thin, irregularly placed projections. Not speculate.

Entered by Deborah M. Pearsall
Updated 8/29/2012

Bixaceae
Family
Genus
Species
orellana
Authority
Comments
Type established by Karol Chandler-Ezell, 2004
Diagnostic level: fruit/seed

Description
Fiber bundles: Groupings of long, small diameter fibers, packed closely in off-set ranks.

Entered by Emily Sternberg
Updated 2/8/2005
**Family**: Bombacaceae

**Genus**: Ceiba

**Species**: PC2866, wood specimen

**Comments**: Diagnostic level: under study

---

**Description**: Tabular crystals with granular surfaces. Probably calcium carbonate. Acute and obtuse angles form edges.

**Entered by**: Deborah M. Pearsall

**Updated**: 8/28/2012

---

**Family**: Bombacaceae

**Genus**: Huberodendron

**Species**: patinoi

**Authority**: Cuatrec.

**Comments**: See top view (Record #155) of this body. Not diagnostic

---

**Description**: - Stomata, with 2 subsidiary cells
  - Surface granular
  - Side view shows two simple, blocky subsidiary cells surrounding stomate are almost as thick as body is wide
  - Overall body is longer than wide

**Entered by**: Karol Chandler-Ezell

**Updated**: 10/7/2002
**Family**: Bombacaceae  
**Genus**: Huberodendron  
**Species**: patinoi  
**Authority**: Cuatrec.

**Comments**
See side view (Record #154) of this body. Not diagnostic.

**Description**
Stomata, with 2 subsidiary cells; Surface granular; Side view shows two simple, blocky subsidiary cells surrounding stomate are almost as thick as body is wide; Overall body is longer than wide.

**Entered by**: Meghann O'Brien  
**Updated**: 2/24/2005

---

**Family**: Bombacaceae  
**Genus**: Huberodendron  
**Species**: patinoi  
**Authority**: L.

**Comments**
Slide 1372a. Diagnostic level: genus

**Description**
Hair base; Rounded cells; Large central cell with smaller surrounding epidermal cells; One row attached cells.

**Entered by**: Meghann O'Brien  
**Updated**: 2/23/2005
Nodular spheres occur in moderate levels in Matisia cf. alata. Size range: 8 - 22 microns. Overlaps with Marantaceae nodular spheres. Marantaceae/Bombacaceae mixed type

nodular sphere: projections are nodular: obtuse tip, not evenly pointed, often rounded.
80IIIB has been considered as a Marantaceae family diagnostic. Occurs rarely in PC2127, Matisia cordata, Bombacaceae. Marantaceae/Bombacaceae mixed type

**Description**
Conical (hat-shaped) body (when viewed in rotation). Bottom is rugulose. Top has 3 nodular projections.

**Entered by** Deborah M. Pearsall
**Updated** 8/21/2012

---

80IIIB has been considered as a Marantaceae family diagnostic. Occurs rarely in PC2127, Matisia cordata, Bombacaceae. This image shows the rugulose bottom. Marantaceae/Cannaceae/Bombacaceae mixed type

**Description**
Conical (hat-shaped) body (when viewed in rotation). Bottom is rugulose. Top has 3 nodular projections.

**Entered by** Deborah M. Pearsall
**Updated** 8/27/2012
**Stomate.**
Diagnostic level: family

**Description**

Stomate has very large, full (turgid) guard cells present.
At four sides, a small band or spine wraps around guard cells.

**MUNo** 120I/IA
**Recno** 106
**Family** Bombacaceae
**Genus** Matisia
**Species** longipes
**Authority** Little

Entered by Karol Chandler-Ezell
Updated 10/7/2002

**Cystolith with stalk.**
Diagnostic level: generalized arboreal indicator

**Description**

Bulbous end of cystolith is rugulose to nodular, as is elongate stalk.

**MUNo** 100I/D
**Recno** 107
**Family** Bombacaceae
**Genus** Matisia
**Species** longipes
**Authority** Little

Entered by Karol Chandler-Ezell
Updated 10/7/2002
**Family** Bombacaceae  
**Genus** Matisia  
**Species** longipes  

**Comments**  
Note flat tip of hair. Occur rarely. Slide 1366. Diagnostic level: species

**Description**  
Hair, unicellular; Short to medium length; Curving; No interior space; Blunt tip; Smooth surface; Simple base.

**Updated** 10/7/2002

---

**Family** Bombacaceae  
**Genus** Matisia  
**Species** longipes  

**Comments**  
Slide 1366 leaf. Diagnostic level: species

**Description**  
Unicellular hairs, sometimes connected to base (as in photo); Simple base is a separate cell; Long, curved; Unarmed, smooth surface; No interior space; Tip smooth and blunt.

**Updated** 02/23/2005
Family: Bombacaceae
Genus: Ochroma
Species: pyramidalis

Category currently overlaps with Marantaceae nodular spheres.
Diagnostic level: Marantaceae/Bombacaceae

Comments:
- Spheroidal body, highly variable shape
- Nodular projections
- Projections irregularly shaped and spaced
- Size range very small to large (8 - 29 microns)

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002
Diagnostic level: family
Note the "corners" of the body, where angular structure cups rounded interior.
When broken, forms 20VD
See also Record #147, 148 and 149.
Note angular structure. From the bottom, it forms one stripe across length of back and two crossing body from side to side. In this top view, they appear as angular bands crossing.

Description
Stomate with four subsidiary cells outside guard cells

Entered by: Meghann O'Brien
Updated: 2/24/2005

Top view. Note attached filament.
Angular structure that forms one stripe across length of back and two crossing body from side to side is not in focus in this view.
Diagnostic level: family

Description
Stomate with four subsidiary cells outside guard cells

Entered by: Meghann O'Brien
Updated: 2/24/2005
Bombacaceae

Family

Pachira

Genus

aquatica

Species

Authority Aubl.

Comments

Side view. See also Record #146, 147 and 149.

Diagnostic level: family
Note angular structure that forms one stripe across length of back and two crossing body from side to side. These appear in “top” of body as angular bands crossing subsidiary cells. In this side view they appear as angular

Description

Stomate with four subsidiary cells outside guard cells

Entered by Meghann O'Brien
Updated 2/24/2005

Note the “corners” of the body, where angular structure cups rounded interior. When broken, forms 20VD.

Bottom view. See also Record #146, 147 and 148.
Note angular structure that forms one stripe across length of back and two crossing body from side to side. These are visible from “top” of body as angular

Description

Stomate with four subsidiary cells outside guard cells

Entered by Meghann O'Brien
Updated 2/24/2005
Family: Bombacaceae  
Genus: Pachira  
Species: aquatica  
Authority: Aubl.

**Comments**

Body is very faint. Notice y-shaped triangular cup around interior rounded part of body.  
Diagnostic level: family

**Description**

- Triangular-cupped epidermal body, non-quadrilateral  
- Round or triangular, depending on view  
- Round edges are faint, cuplike triangular edges more heavily silicified  
- Originates as part of 120IIA Stomata

**Entered by**: Karol Chandler-Ezell  
**Updated**: 10/7/2002

---

**Family**: Bombacaceae  
**Genus**: Pachira  
**Species**: aquatica  
**Authority**: Aubl.

**Comments**

Body is very faint. This view shows the triangular rim.  
Diagnostic level: family

**Description**

- Triangular-cupped epidermal body, non-quadrilateral  
- Round or triangular, depending on view  
- Round edges are faint, cuplike triangular edges more heavily silicified  
- Originates as part of 120IIA Stomata

**Entered by**: Karol Chandler-Ezell  
**Updated**: 10/7/2002
Family: Bombacaceae  
Genus: Pachira  
Species: aquatica  
Authority: Aubl.

See alternate view (Record #153) to see bottom of hair cell base.  
Diagnostic level: genus

Description:
- Hair cell base with radiating appendages
- Discernable center is smoothly rounded on surface, polygonal rim/outline
- Short, regular appendages surround the angular rim

Entered by: Karol Chandler-Ezell  
Updated: 10/7/2002
Note the "corners" of the body, where angular structure cups rounded interior. When broken, forms 20VD. See also Record #147, 148 and 149. Note angular structure. From the bottom, it forms one stripe across length of back and two crossing body.

Description

Stomate with four subsidiary cells outside guard cells

Entered by Meghann O'Brien
Updated 3/2/2005
Family: Bombacaceae  
Genus: Pseudobombax  
Species: millei  
Authority: (Standl.) A.Robyns

**Description**

- Short, small trichome  
- Single outline  
- Non-armed, smooth surface  
- Uneven conical shape with small, rounded base  
- Interior space with spherical, verrucose cystolith inside

**Comments**

- spheres with nodular projections  
- Nodule surfaces are both smooth and ruminate (roughened, chewed--old term was serrate)  
- Nodular-tip is obtuse, sides uneven  
- Nodules regularly arranged, almost spirally ranked

**Description**

- Short, small trichome  
- Single outline  
- Non-armed, smooth surface  
- Uneven conical shape with small, rounded base  
- Interior space with spherical, verrucose cystolith inside

**Comments**

- spheres with nodular projections  
- Nodule surfaces are both smooth and ruminate (roughened, chewed--old term was serrate)  
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**Description**

- Short, small trichome  
- Single outline  
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- Interior space with spherical, verrucose cystolith inside

**Comments**

- spheres with nodular projections  
- Nodule surfaces are both smooth and ruminate (roughened, chewed--old term was serrate)  
- Nodular-tip is obtuse, sides uneven  
- Nodules regularly arranged, almost spirally ranked
**Family**: Bombacaceae  
**Genus**: Pseudobombax  
**Species**: millei  
**Authority**: (Standl.) A.Robyns

**Comments**
Also occurs in the Zingiberaceae  
Diagnostic level: mixed, Zingiberaceae, Bombacaceae. There are subtle differences in the smoothness and abundance of nodules between the two families.

**Description**
- spheres with nodular projections  
- nodule surfaces are both smooth and ruminate (roughened, chewed-old term was serrate)  
- Nodular-tip is obtuse, sides uneven  
- Nodules regularly arranged, almost spirally ranked

**Comments**
Type is not diagnostic to Bombacaceae alone. Cystolith body may be very rugulose, verrucose, or nearly smooth. Diagnostic level: generalized arboreal

**Description**
Cystoliths; Bulbose sphere attached to "stalk" or shaft.; Surface uneven to highly nodular.
### Description

- Spheroidal, highly variable shape
- Surface nodular to rugulose
- Projections irregularly shaped and spaced
- Size very small to large (8 - 29 microns)

### Comments

Small nodular spheres overlap with Marantaceae
Diagnostic level: Marantaceae/Bombacaceae

---

### Description

short, small trichome
single outline
non-armed, smooth surface
uneven conical shape with small, rounded base
interior space with spherical, verrucose cystolith in side.

### Comments

This is a verrucose cystolith encased in a short, broad trichome.
**Family** Bombacaceae  
**Genus** Pseudobombax  
**Species** millei  
**Authority** (Standl.) A.Robyns

**Diagnostic level:** generalized arboreal

**Description**
- Cystolith
- Bulbose sphere attached to “stalk” or shaft
- Surface uneven to highly nodular

**Entered by** Meghann O'Brien  
**Updated** 2/24/2005

**Family** Bombacaceae  
**Genus** Pseudobombax  
**Species** millei  
**Authority** (Standl.) A.Robyns

**Diagnostic level:** generalized arboreal

**Description**
- Cystolith
- Bulbose sphere attached to “stalk” or shaft
- Surface uneven to highly nodular

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002
**Family:** Bombacaceae  
**Genus:** Pseudobombax  
**Species:** millei  
**Authority:** (Standl.) A.Robyns

Also occurs in the Zingiberaceae.
Diagnostic level: mixed, Zingiberaceae, Bombacaceae. There are subtle differences in the smoothness and abundance of nodules between the two families.

**Description**
- Spheres with nodular projections  
- Nodule surfaces are both smooth and ruminant (roughened, chewed--old term was serrate)  
- Nodular-tip is obtuse, sides uneven  
- Nodules regularly arranged, almost spirally ranked

Entered by: Karol Chandler-Ezell  
Updated: 2/7/2008

**Family:** Bombacaceae  
**Genus:** Pseudobombax  
**Species:** millei

Also observed in Matisia longipes leaf.
Diagnostic level: family

**Description**
- Hemisphere with irregular concavities, large  
- Hemisphere often has stippled surface

Entered by: Karol Chandler-Ezell  
Updated: 2/11/2008
### Family
Bombacaceae

### Genus
Quarariba

### Species
cf. grandifolia

#### Comments
See Record #171 to compare. Very broad obtuse tip (rarely pointed) and overall broad, short nature of hair distinguishes type. Diagnostic level: genus

### Description
Multicellular hairs; Segmented; Tip blunt and broad, rarely pointed; Overall hair shortened and broad.

### Image
[Image N279]

### Comments
Unusual because of its very dark, occluded rim and attached tissue. Diagnostic level: genus

### Description
Hair cell base; Radiating appendages (5-6); Appendages are long, regular, acute; Appendages plus rim of base are very dark, set upon a slightly lighter circular base of tissue.

### Image
[Image N278]
<table>
<thead>
<tr>
<th>MIuno</th>
<th>Image</th>
<th>Recno</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Authority</th>
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<tr>
<td></td>
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<td>169</td>
<td>Bombacaceae</td>
<td>Quararibea</td>
<td>grandifolia</td>
<td>(Little) Cuatrec.</td>
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</table>

**Comments**

See size variation in cystoliths.
Diagnostic level: generalized arboreal

**Description**

Crystalline bodies, cystoliths; Spherical in shape; No visible surface--covered in angular projections.

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002

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<th>Image</th>
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</table>

**Comments**

See Record #170 to compare.  
Very broad obtuse tip (rarely pointed) and overall broad, short nature of hair distinguishes type.  
Diagnostic level: genus

**Description**

Multicellular hairs; Segmented; Tip blunt and broad, rarely pointed; Overall hair shortened and broad.

**Entered by** Meghann O'Brien  
**Updated** 2/12/2008
**Bombacaceae**
**Genus** Quararibia
**Species** grandifolia

Schlerids occur widely in woody plants. Note distinctive central ridge in this body that identifies schlerids. Diagnostic level: generalized arboreal.

**Boraginaceae**
**Genus** Cordia
**Species** cf. polyantha

Slide E1030. Diagnostic level: species?

Description:
- Hair base: Rounded cells; Multiple cells, rounded, more uniform size; Darkened (highly silicified); Simple elongated hairs may be unattached.

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002

Entered by: Meghann O'Brien
Updated: 3/2/2005
**Family**: Boraginaceae  
**Genus**: Cordia  
**Species**: hebeclada  
**Authority**: I.M.Johnst.

### Description
- **Comments**:  
  Rotate to see rounded concavity in base where hair inserts. Slide 468 leaf. Type defined by Cesar Veintimilla 06/1991. Diagnostic level: species.

- **Description**:  
  Hair base; Concentric ring pattern; Smooth outline; Projections in a regular pattern.

- **Entered by**: Karol Chandler-Ezell  
- **Updated**: 3/3/2005

---

**Family**: Boraginaceae  
**Genus**: Cordia  
**Species**: hebeclada  
**Authority**: I.M.Johnst.

### Description
- **Comments**:  
  Diagnostic level: Cordia/Heliotropium.

- **Description**:  
  Unicellular trichome; double outline; armed.

- **Entered by**:  
- **Updated**: 10/7/2002
**Family** Boraginaceae  
**Genus** Cordia  
**Species** hebeclada  
**Authority** I.M.Johnst.

**Comments**  
Slide 468 leaf. Type defined by Cesar Veintimilla 06/1991. See also Record #108.

**Description**  
Hair base; Concentric ring pattern; Smooth outline; Projections in a regular pattern.  
Entered by Karol Chandler-Ezell  
Updated 10/15/2002

---

**Family** Boraginaceae  
**Genus** Cordia  
**Species** hebeclada  
**Authority** (Huber) Ducke

**Comments**  
Slide 1772a leaf. Type defined by Shawn Collins 01/1999.  
Diagnostic level: genus

**Description**  
Hair cell base; Rounded or elliptic cells; Small, multiple central cells; Highly silicified central cells; From the side, the hair base is two layers thick.  
Entered by Meghann O'Brien  
Updated 3/8/2005
**Slide 1772a leaf. Type defined by Shawn Collins 01/1999. Diagnostic level: genus**

**Comments**

3/8/2005 Updated

Hair cell base; Rounded or elliptic cells; Small, multiple central cells; Highly silicified central cells; From the side, the hair base is two layers thick.

**Description**

**Enter by** Meghann O'Brien

**Updated** 3/8/2005

---

**Slide 1772b leaf. Type defined by Cesar Veintimilla. Diagnostic level: Cordia/Heliotropium**

**Comments**

2/22/2005 Updated

Epidermal appendage; Unicellular trichome; Double outline; Armed.

**Description**

**Enter by** Meghann O'Brien

**Updated** 2/22/2005
**Family** | Boraginaceae  
---|---  
**Genus** | Cordia  
---|---  
**Species** | hebeclada  
---|---  
**Authority** |  
---|---  
**Comments** | Slide 468 leaf. Type defined by Cesar Veintimilla 06/1991.  
Diagnostic level: species  
---|---  
**Description** | Hair base; Concentric ring pattern; Smooth outline; Projections in a regular pattern.  
---|---  
**Entered by** | Meghann O'Brien  
**Updated** | 2/23/2005  
---|---  
**Family** | Boraginaceae  
---|---  
**Genus** | Cordia  
---|---  
**Species** | hebeclada  
---|---  
**Authority** |  
---|---  
**Comments** | Occurs in leaf. Also occurs in Cordia lutea (fruit) and Heliotropium. Type defined by Cesar Veintimilla.  
Diagnostic level: family  
---|---  
**Description** | Epidermal appendage; Unicellular trichome; Double outline; Armed.  
---|---  
**Entered by** | Meghann O'Brien  
**Updated** | 3/2/2005  
---|---
These simple stomata are not diagnostic to family or even order level at this time. Diagnostic level: not diagnostic.

Description:
- Stomata
- 2 subsidiary cells present outside guard cells
- Dicot epidermal cells attached to subsidiary cells

Diagnostic level: Cordia/Heliotropium

Unicellular trichome; double outline; armed.

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002
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<th>40/Ab</th>
<th>Image</th>
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<td>Diagnostic level: Cordia/Heliotropium</td>
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**Description**

Unicellular trichome; double outline; armed.

**Entered by** Karol Chandler-Ezell

**Updated** 3/3/2005

<table>
<thead>
<tr>
<th>MIUno</th>
<th>40/VBa200</th>
<th>Image</th>
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<td>Type defined by Cesar Veintimilla 05/1991. Diagnostic level: species</td>
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**Description**

Hair cell base; Very large central cell is rounded or elliptic with smaller and elongated cells surrounding; Multiple rows of attached cells.

**Entered by** Meghann O'Brien

**Updated** 2/24/2005
Boraginaceae
Family
Genus
Species
Authority
Comments
Side view.
See Cordia lutea hairs (40IIIAb100), conical bodies may come from projections on hair surface. Diagnostic level: species

Description
- Epidermal non-quadrilateral
- Surface projection, conical shape
- Bottom NOT elongated
- Oval in rotation
- Lightly silicified
- Often occur in series

Entered by Karol Chandler-Ezell
Updated 10/15/2002

Top view shows a Cordia lutea hair (40IIIAb100) with conical projections. Conical bodies (20VCd) may come from projections on hair surface. Diagnostic level (both): species

Description
- Epidermal non-quadrilateral
- Surface projection, conical shape
- Bottom NOT elongated
- Oval in rotation
- Lightly silicified
- Often occur in series

Entered by Karol Chandler-Ezell
Updated 10/15/2002
Family: Boraginaceae
Genus: Cordia
Species: lutea

See Record #112 for another view.
See other Cordia lutea types (20VCd), conical bodies may be derived from hair surface. Type defined by Cesar Veintimilla 05/1991.
Diagnostic level: species

Description:
Hair cell base; Very large central cell is rounded or elliptic with smaller and elongated cells surrounding; Multiple rows of attached cells.

Entered by: Meghann O'Brien
Updated: 2/24/2005

Family: Boraginaceae
Genus: Cordia
Species: lutea

Comments:
Occurs in fruit. Type defined by Cesar Veintimilla.
Diagnostic level: species

Description:
Unicellular hair; Long; Curving; Interior space; Armed.

Entered by: Meghann O'Brien
Updated: 2/22/2005
<table>
<thead>
<tr>
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<th>40IIAb201</th>
<th>238</th>
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<td>Comments</td>
<td>Occurs in leaf. Also occurs in Cordia hebeclada (fruit) and Heliotropium. Type defined by Cesar Veintimilla. Diagnostic level: family</td>
<td>Slide E227. Diagnostic level: genus</td>
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<td>Description</td>
<td>Epidermal appendage; Unicellular trichome; Double outline; Armed.</td>
<td>Unicellular hair; Long; Non-armed; Grainy surface.</td>
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<tr>
<td>Entered by</td>
<td>Meghann O'Brien</td>
<td>Meghann O'Brien</td>
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<td>Updated</td>
<td>3/2/2005</td>
<td>2/23/2005</td>
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</tbody>
</table>
Slide E227. Several hair bases occur in picture next to unicellular hair (40IIIAb201). Concentric ring pattern not easily seen in picture. Diagnostic level: genus

Comments
Hair cell base; Concentric ring pattern; Rugulose, grainy surface; Sinuous outline; Discernable center.

Description

Entered by Meghann O'Brien
Updated 3/2/2005
**Family:** Boraginaceae  
**Genus:** Lithospermum  
**Species:** carolinense

**Comments:**

Slide 1723a. Leaf.  
Hair tip.

**Description:**

Unicellular hair; Interior space; Double-outline; Long, un-armed; 3 times longer than wide; Base is often attached to hair and spherical in shape; Tips often break off.

**Entered by:** Meghann O'Brien  
**Updated:** 9/19/2005

---

**Family:** Boraginaceae  
**Genus:** Lithospermum  
**Species:** carolinense

**Comments:**

Slide 1723a. Leaf.  
Hair tip.

**Description:**

Unicellular hair; Interior space; Double-outline; Long, un-armed; 3 times longer than wide; Base is often attached to hair and spherical in shape; Tips often break off.

**Entered by:** Meghann O'Brien  
**Updated:** 9/19/2005
**Boraginaceae**

*Family* Lithospermum

*Genus* carolinense

*Species* carolinense

**Comments**

Slide 1723a. Leaf.
Hair with base.

**Description**

Unicellular hair; Interior space; Double-outline; Long, un-armed; 3 times longer than wide; Base is often attached to hair and spherical in shape; Tips often break off.

**Entered by** Meghann O'Brien

**Updated** 9/19/2005

---

**Boraginaceae**

*Family* Lithospermum

*Genus* carolinense

*Species* carolinense

**Comments**

Slide 1723b. Leaf.
Hair with partial base attached and tip broken off.

**Description**

Unicellular hair; Interior space; Double-outline; Long, un-armed; 3 times longer than wide; Base is often attached to hair and spherical in shape; Tips often break off.

**Entered by** Meghann O'Brien

**Updated** 9/19/2005
Boraginaceae

Lithospermum

carolinense

Slide 1723a. Leaf.
Hair with base attached.
Diagnostic level: mixed Guazuma, Erythrina, Lithospermum

Comments
Hair base with discernable center and surrounding cells; Center has long, acute, radiating appendages; Surrounding cells are lightly silicified; Center is large and circular.

Description

Entered by  Meghann O'Brien
Updated  9/19/2005
<table>
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<tr>
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<tr>
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<td>Lithospermum</td>
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<tr>
<td>Species</td>
<td>carolinense</td>
</tr>
<tr>
<td>Authority</td>
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</tbody>
</table>

**Comments**

Slide 1723c. Leaf.
Diagnostic level: mixed Guazuma, Erythrina, Lithospermum

**Description**

Hair base with discernable center and surrounding cells; Center has long, acute, radiating appendages; Surrounding cells are lightly silicified; Center is large and circular.

**Entered by** Meghann O'Brien
**Updated** 9/19/2005
**Boraginaceae**

**Family** Boraginaceae

**Genus** Lithospermum

**Species** carolinense

**Comments**

Slide 1723c. Leaf. Partial hair base, shows radiating appendages.

Diagnostic level: mixed Guazuma, Erythrina, Lithospermum

**Description**

Hair base with discernable center and surrounding cells; Center has long, acute, radiating appendages; Surrounding cells are lightly silicified; Center is large and circular.

**Entered by** Meghann O'Brien

**Updated** 9/19/2005

---

**Burseraceae**

**Family** Burseraceae

**Genus** Dacryodes

**Species** occidentalis

**Comments**

Slide 58. Also occurs in Trattinnickia glaziouii, slide 64. Diagnostic level: family

**Description**

Faceted/scalloped bodies, hemispherical or elliptical.

**Entered by** Meghann O'Brien

**Updated** 3/7/2005
**Family**  Burseraceae  
**Genus**  Protium  
**Species**  fimbriatum  
**Authority**  Swart

**Comments**
See other rotations (Records 162 and 164) to get an idea of the three-dimensional shape. This body is very tall with a very ruffled or undulating edge. Diagnostic level: family

**Description**
- Epidermal non-quadrilateral cells  
- Projections on both sides  
- Large rounded central projection on one side  
- Undulating circular shape forms a "brim" around the central projection

**Updated**  10/7/2002

**Entered by**  Karol Chandler-Ezell
Burseraceae
Family Trattinnickia
Genus glaziouii
Species

Slide 64. Also occurs in Dacryodes occidentalis, slide 58. Diagnostic level: family

Faceted/scalloped bodies, hemispherical or elliptical.

Seed epidermis. Projection is not centered and may not be present on all fragments. The projection is often very low. Surface decoration not always evident unless focus is moved up and down. Diagnostic level: family

Seed epidermis; Non-quadrilateral; Often sinous double outline; Prominent rounded, low projection and fine surface decoration.
Burseraceae
Family
Genus
Species
Authority
Comments
Seed epidermis. Projection is not centered and may not be present on all fragments. The projection is often very low. Surface decoration not always evident unless focus is moved up and down.
Diagnostic level: family

Description
- Seed epidermis
- Non-quadrilateral
- Often sinous double outline
- Prominent rounded, low projection and surface decoration

Entered by Karol Chandler-Ezell
Updated 10/7/2002

Burseraceae
Family
Genus
Species
Authority
Comments
Side view; see Record #134 for top view.
Occurs in the leaf.
Diagnostic level: genus

Description
- Epidermal appendage
- Hair cell base
- Radiating appendages
- Discernable center
- Surrounding epidermal cells attached to form disk-- may be lightly silicified

Entered by Shawn K. Collins
Updated 10/7/2002
Family: Burseraceae
Genus: Trattinnickia
Species: peruviana

Occurs in the leaf.
Diagnostic level: genus

**Description**
- Epidermal appendage
- Hair cell base
- Radiating appendages
- Discernable center
- Surrounding epidermal cells attached to form disk-- may be lightly silicified

Entered by: Shawn K. Collins
Updated: 10/7/2002
Top view; see Record #137 for side view.
The small cells that overlay the large central cell appear as a “corona” when viewed from the side.
Occurs in the leaf.
Diagnostic level: genus

- Epidermal appendage
- Hair base
- Radiating appendages
- Discernable center
- Long, regular appendages; acute
- No surrounding epidermal cells (or lightly silicified if present)
### Family Burseraceae

**Genus** Protium  
**Species** fimbriatum  
**Authority** Swart

*Comments*
See other rotations (Records 162 and 163) to get an idea of the three-dimensional shape. This body is very tall with a very ruffled or undulating edge.

*Diagnostic level:* family

*Description*
- Epidermal non-quadrilateral cells
- Projections on both sides
- Large rounded central projection on one side
- Undulating circular shape forms a "brim" around the central projection

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002

---

### Family Cannaceae

**Genus** Canna  
**Species** edulis  
**Authority** Ker Gawl.

*Comments*
Spheres produced by Canna range from smooth to rugulose to irregularly angled or folded. Type 80Ia200 is based on an archaeological specimen of Canna edulis leaf, from the coast of Peru. Diagnostic level: Unknown. Does not occur in chemically extracted specimens; probably not silica.

*Description*
Imperfect spheres; thick, opaque, darkened in center; large; smooth to roughened surface; often occur in chains; type is 21-30 microns and larger.

**Entered by** Neil A. Duncan  
**Updated** 2/24/2005
Large rugulose sphere (10-30 microns). Rugulose spheres occur in many taxa, such as the Marantaceae, Bombacaceae, Cannaceae, Heliconiaceae, and Chrysobalanaceae. Large spheres (10-30 microns) characterize Marantaceae and Cannaceae. Diagnostic level: Marantaceae/Cannaceae.

- Rugulose spheres
- Regular or very irregular in overall shape (may not be strictly spherical)
- Surface bumpy, rough (pock marks) with irregular projections in between

Spheres produced by Canna range from smooth to rugulose to irregularly angled or folded. Type 80IAa201 is based on a modern specimen of Canna edulis leaf. Ephemeral spherical bodies are not included in this type. Diagnostic level: genus Canna.

Sphere with smooth but roughened surface. Highly silicified. Shape can be irregularly spherical. Size range from 8-28 microns.
**PC1390, leaf.** Contrast irregularly angled and folded spheres (80IEa left above scale bar) and rugulose spheres (80IBb right above scale bar).

---

**Small rugulose spheres (<10 microns) that are well silicified (i.e., opaque). According to Iriarte and Piperno, characteristic of woody dicots. Also occur in Canna and Marantaceae. Diagnostic level: woody dicot, with above qualification.**

---

**Small; Spherical; Thick, opaque; rugulose; Often occur in linear chains, often darkened; Usually imperfect, i.e., not perfectly spheroidal.**
<table>
<thead>
<tr>
<th>IMG</th>
<th>MIono</th>
<th>Recno</th>
<th>Family</th>
<th>Genus</th>
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<td>80IIIB</td>
<td>337</td>
<td>Cannaceae</td>
<td>Canna</td>
<td>tuerckheimii (=edulis)</td>
<td>Kraenzl.</td>
<td>80IIIB has been considered is a Marantaceae family diagnostic. Occurs rarely in PC2127, Matisia cordata, Bombacaceae; VR in PC961 Canna tuerckheimii (epidermis)</td>
<td>Conical (hat-shaped) body (when viewed in rotation). Bottom is rugulose. Top has nodular projections. Side view</td>
<td>Deborah M. Pearsall</td>
<td>8/30/2012</td>
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<tr>
<td>Z2177</td>
<td>80IIIB</td>
<td>338</td>
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<td>tuerckheimii (=edulis)</td>
<td>Kraenzl.</td>
<td>80IIIB has been considered is a Marantaceae family diagnostic. Occurs rarely in PC2127, Matisia cordata, Bombacaceae; VR in PC961 Canna tuerckheimii (epidermis)</td>
<td>Conical (hat-shaped) body (when viewed in rotation). Bottom is rugulose. Top has nodular projections.</td>
<td>Deborah M. Pearsall</td>
<td>8/30/2012</td>
</tr>
</tbody>
</table>
Family: Cannaceae
Genus: Canna
Species: tüerckheimii (=edulis)

PC961 (epidermis). Small nodular spheres, moderate in occurrence, variable in size and height of projections. This is a larger example, but smaller than 18 microns. Compare to 80ICc, 80ICa2.

Overlaps with Marantaceae/Bombacaceae type

Comments:

8/30/2012 Updated

nodular sphere: projections are nodular: obtuse tip, not evenly pointed, often rounded.

Description

Entered by: Deborah M. Pearsall
Updated: 8/30/2012
Family: Cannaceae
Genus: Canna
Species: tuerckheimii (=edulis)
Authority: Kraenzl.

Comments:
PC2592, seed. Folded and angled spheres in situ in tissue. Typical size is 10-15 microns.
Diagnostic: Zingiberales

Description:
sphere with irregularly angled/folded surface. Original 80IE.

Entered by: Deborah M. Pearsall
Updated: 8/30/2012

OS511, leaf. Chain of irregularly folded/angled spheres.
Diagnostic: Zingiberales

Description:
sphere with irregularly angled/folded surface. Original 80IE.

Entered by: Deborah M. Pearsall
Updated: 8/30/2012
Canna produces smooth, rugulose, and irregularly folded and angled spheres. Diagnostic level (irregularly folded and angled): order Zingiberales

Description
Irregularly folded and angular spheres; Thick, opaque; Can occur singly or in long chains; This type tends to be in sinous or gently curving chains, not straight chains with linear tissue attached.

Entered by Meghann O'Brien
Updated 2/24/2005

Note how robust and thick bodies are. Diagnostic level: family

Description
- Epidermal non-quadrilaterals
- Seed epidermis (beadlike surface decoration, irregular outline)
- Radial appendages

Entered by Karol Chandler-Ezell
Updated 10/7/2002
Chloranthaceae
Family
Genus Hedyosmum
Species goudotianum
Authority Solms

Comments
Note that bodies are not flat or smooth in rotation. In this view, they are almost "puffed" and irregularly thick.
Diagnostic level: family

Description
- Epidermal non-quadrilaterals
- Seed epidermis (beadlike surface decoration, irregular outline)
- Radial appendages

Entered by Karol Chandler-Ezell
Updated 10/7/2002

Chloranthaceae
Family
Genus Hedyosmum
Species goudotianum
Authority Solms

Comments
Note large size of these polyhedral bodies.
Diagnostic level: family

Description
- Non-transparent
- Large three-dimensional blocky bodies
- Unknown origin
- Polyhedral in outline

Entered by Karol Chandler-Ezell
Updated 10/7/2002
<table>
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<td>Authority</td>
<td>Solms</td>
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<tr>
<td>Comments</td>
<td>Note large size of these polyhedral bodies. See double outline of “plates” or faces on polyhedron. Diagnostic level: family</td>
</tr>
</tbody>
</table>

### Description
- Non-transparent
- Large three-dimensional blocky bodies
- Unknown origin
- Polyhedral in outline

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002

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<table>
<thead>
<tr>
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<td>Species</td>
<td>icaco</td>
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<td>Authority</td>
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</tbody>
</table>
| Comments    | Type established by Karol Chandler-Ezell, 2004  
Diagnostic level: not diagnostic |

### Description
**Verrucate trough body:** decorated, textured verrucate platform with a multi-outlined pit in the center of one side. Seeds, fruit, and root cortex.

**Entered by** Emily Sternberg  
**Updated** 2/22/2005
Chrysobalanaceae

Family Chrysobalanaceae
Genus Chrysobalanus
Species icaco
Authority

Comments
Type established by Karol Chandler-Ezell, 2004
Diagnostic level: fruit/seed

Undulating transport elements: Silica casts of transport elements (xylem and phloem) observed in a number of taxa, predominantly in fruits and seeds. Type includes thin-walled, smooth, undulating tubes without end plates.

Chrysobalanaceae

Family Chrysobalanaceae
Genus Hirtella
Species carbonaria
Authority Little

Comments
Sphere, small. Often very difficult to notice in archaeological samples. Also produced in Canna, Bixa orellana. Diagnostic level: mixed: Chrysobalanaceae/Cannaceae/Bixa

- Nearly smooth
- Transparent
- Small spheres
- Usually <10 microns diameter

Entered by Emily Sternberg
Updated 2/22/2005
A very smooth example of 80IAa1 that appears to be two conjoined disks, as in the original description of the Chrysobalanaceae type by Piperno. Appear somewhat elongated.

Chrysobalanaceae/Cannaceae mixed type

**Description**

small (12 microns or less; typical size 4-6 microns) smooth sphere. Smooth to slightly irregular (not rugulose; irregularity may be localized); may angled, indented (sometimes crater-like), flattened, elongated, or appear as two joined disks (PC152 Hirtella). Well silicified; opaque when viewed overlapping another phytolith.
Chrysobalanaceae

Family
Chrysobalanaceae

Genus
Licania

Species
longistyla

Authority
Fritsch

Comments
Darkened cells in center of image. Diagnostic level: dicot epidermis

Description
- Epidermal non-quadrilateral cells
- Smooth surface
- Polyhedral cells with smooth surface
- Granular decoration to surface

Entered by
Karol Chandler-Ezell

Updated
10/7/2002

---------------------

Chrysobalanaceae/Cannaceae mixed type

80Ia1 showing slight irregularity on edge. Slightly flattened in rotation. The irregularity can look like an inclusion until the sphere is rotated.

Description
small (12 microns or less; typical size 4-6 microns) smooth sphere. Smooth to slightly irregular (not rugulose; irregularity may be localized); may angled, indented (sometimes crater-like), flattened, elongated, or appear as two joined disks (PC152 Hirtella). Well silicified; opaque when viewed overlapping another phytolith.

Entered by
Deborah M. Pearsall

Updated
7/27/2012
**Family**: Chrysobalanaceae  
**Genus**: Licania  
**Species**: longistyla

**Comments**

Same 80IAa1 sphere as image Z2796 rotated to show the slight flattening and irregularity. Chrysobalanaceae/Cannaceae mixed type

**Description**

Small (12 microns or less; typical size 4-6 microns) smooth sphere. Smooth to slightly irregular (not rugulose; irregularity may be localized); may angled, indented (sometimes crater-like), flattened, elongated, or appear as two joined disks (PC152 Hirtella). Well silicified; opaque when viewed overlapping another phytolith.

---

**Family**: Chrysobalanaceae  
**Genus**: Licania  
**Species**: platypus

**Comments**

Sphere, small. Often very difficult to notice in archaeological samples. Also produced in Canna, Bixa. Diagnostic level: mixed, Chrysobalanaceae/Canna/Bixa

**Description**

Nearly smooth; Transparent; Small spheres; Usually <10 microns diameter.
Commelinaceae
Family Commelina
Genus coelestis
Species PC3154 leaf
Description
Hooked hair, double outline
small rounded interior shape

6/25/2015
Updated

Comments
Described by Neil Duncan. Common to abundant in this species and common in C. erecta. Larger and more hooked than similar Phaseolus hairs, but would be confusers where Commelina also grows.
Diagnostic level: genus (in absence of Phaseolus)
Commelinaceae
Genus Commelina
Species dianthafolia

Description
Quadrilateral schlerid with scalloped surface

Comments
PC3155, leaf
Described by Neil Duncan. The scallops on these schlerids are somewhat similar to those of Cucurbita spheres. The quadrilateral form distinguishes them. Common. Also common in C. robusta.

Diagnostic level: not diagnostic

Authority

---

Commelinaceae
Genus Commelina
Species erecta

Description
Flat domed rhizome cylinder: Cylindrical body with ciliate or beaded decoration along cylinder and a distinctive, smooth head. Overall shape a cylinder which is polygonal in cross section.

Comments
Type established by Karol Chandler-Ezell, 2004
C. erecta photos by Neil Duncan, 2011
Side view of flat domed rhizome cylinder, potential Calathea "confuser." Note small size.

Authority
**Commelinaceae**

**Family** Commelinae

**Genus** Commelina

**Species** erecta

**Type established by** Karol Chandler-Ezell, 2004

**C. erecta photos by** Neil Duncan, 2011

**Side view of flat domed rhizome cylinder, potential Calathea “confuser.” Note smaller size.**

**Comments**

10/18/2012 Updated

**Description**

**Flat domed rhizome cylinder:** Cylindrical body with ciliate or beaded decoration along cylinder and a distinctive, smooth head. Overall shape a cylinder which is polygonal in cross section.

**Authority**

Deborah M. Pearsall

**Entered by** Deborah M. Pearsall

**Updated** 10/18/2012

---

**Commelinaceae**

**Family** Commelinae

**Genus** Commelina

**Species** erecta

**Type established by** Karol Chandler-Ezell, 2004

**C. erecta photos by** Neil Duncan, 2011

**Bottom view (base of ciliate or beaded cylinder) of flat domed rhizome cylinder**

**Description**

**Flat domed rhizome cylinder:** Cylindrical body with ciliate or beaded decoration along cylinder and a distinctive, smooth head. Overall shape a cylinder which is polygonal in cross section.

**Authority**

Deborah M. Pearsall

**Entered by** Deborah M. Pearsall

**Updated** 10/18/2012
**Family** Commelinaceae  
**Genus** Commelina  
**Species** erecta  

**Type established by** Karol Chandler-Ezell, 2004  
**C. erecta photos by** Neil Duncan, 2011

**A group of cylinders in partial rotation; note decoration of base**

**Description**

**Flat domed rhizome cylinder:** Cylindrical body with ciliate or beaded decoration along cylinder and a distinctive, smooth head. Overall shape a cylinder which is polygonal in cross section.

**Entered by** Deborah M. Pearsall  
**Updated** 10/18/2012
Commelinaceae

Family Commelinae

Genus Commelina

Species erecta

PC3157, leaf
Described by Neil Duncan.
The scallops on these schlerids are somewhat similar to those of Cucurbita spheres. The quadrilateral form distinguishes them. Smaller, less robust, and rarer in this species.
Diagnostic level: not diagnostic

Description
quadrilateral schlerid with scalloped surface

Entered by Deborah M. Pearsall
Updated 11/1/2016

Commelinaceae

Family Commelinae

Genus Commelina

Species erecta

PC3157, leaf
Described by Neil Duncan.
Unicellular hairs. Rare to moderate abundance.
Diagnostic level: not diagnostic

Description
Unicellular hair, straight edges, rounded tip

Entered by Deborah M. Pearsall
Updated 11/1/2016
**Commelina scabra**

Described by Neil Duncan.

Unicellular hairs, more “hat-shaped” than the hairs in *C. erecta*.

Diagnostic level: not diagnostic

**Cucurbita pepo var. ozarkana**

Diagnostic level: genus, domesticated

Larger hemisphere of spheres is visible in this view. See Piperno’s 2000 Journal Archaeological Science article: “Phytoliths in Cucurbita and other neotropical Cucurbitaceae ....” for extensive discussion of the spheres produced by this family.

**Cucurbita sp.** (domesticated, large) type; Large spherical phytoliths with deeply scalloped surfaces of contiguous concavities; Clean demarcation between 2 hemispheres of different size; Larger hemisphere has larger, round scallops and takes 1/2 to 2/3 of total sphere volume; Scallops are rounded, very distinct, larger, and regularly distributed; Smaller hemisphere is often less than 1/3 of sphere and has smaller, less

**Entered by** Deborah M. Pearsall

**Updated** 11/1/2016

**Entered by** Karol Chandler-Ezell

**Updated** 10/7/2002
Cucurbitaceae
Genus Cucurbita
Species pepo var. ozarkana

Diagnostic level: genus, domesticated
In this view, you can see the difference between "large" and "small" hemispheres.
See Piperno’s 2000 Journal Archaeological Science article: "Phytoliths in Cucurbita and other neotropical Cucurbitaceae ...." for extensive discussion of the spheres produced by this family.

Description
Cucurbita sp. (domesticated, large) type; Large spherical phytoliths with deeply scalloped surfaces of contiguous concavities; Clean demarcation between 2 hemispheres of different size; Larger hemisphere has larger, round scallops and takes 1/2 to 2/3 of total sphere volume; Scallop surfaces are rounded, very distinct, larger, and regularly distributed; Smaller hemisphere is often less than 1/3 of sphere and has smaller, less.

Comments
10/7/2002 Updated
Cucurbita sp. (domesticated, large) type; Large spherical phytoliths with deeply scalloped surfaces of contiguous concavities; Clean demarcation between 2 hemispheres of different size; Larger hemisphere has larger, round scallops and takes 1/2 to 2/3 of total sphere volume; Scallop surfaces are rounded, very distinct, larger, and regularly distributed; Smaller hemisphere is often less than 1/3 of sphere and has smaller, less.

Description
Spherical hair base; large central cell is surrounded by smaller rounded epidermal cells; Transparent.

Comments
3/1/2005 Updated
Spherical hair base; large central cell is surrounded by smaller rounded epidermal cells; Transparent.
In some cases, base of hair is still inserted, making central cell very dark and obvious.

**Diagnostic level:** Asteraceae/Cucurbitaceae

Spherical hair cell base; Large central cell; surrounded by small, rounded cells; Transparent.

**Number of joints varies.**

**Diagnostic level:** Cucurbitaceae/Asteraceae

Multicellular hair; Segmented, hooked or bent tip; Often darkened, joints of segments often rounded or bulging.
Hairbase and attached cells form a large sphere. This particular base is darkened/occluded. Also visible in image: A rotated, partial hairbase.

Diagnostic level: Cucurbitaceae/Asteraceae

Description
Central cell spherical; Rounded, regular surrounding cells; Central cell darkened; Adjacent cells attached.

Entered by Karol Chandler-Ezell
Updated 3/1/2005

Multicellular non-armed hair; Segmented; Straight tip; Large; No interior space.

Entered by Shawn K. Collins
Updated 3/1/2005
### Multicellular non-armed hair; Segmented; Straight tip; Large; No interior space.

- **Description**
  - Multicellular non-armed hair; Segmented; Straight tip; Large; No interior space.

- **Entered by** Shawn K. Collins
- **Updated** 3/1/2005

### Multicellular hair; Segmented; unarmed; joints of segments often rounded or bulging.

- **Description**
  - Multicellular hair; Segmented; unarmed; joints of segments often rounded or bulging.

- **Entered by** Karol Chandler-Ezell
- **Updated** 3/1/2005
The presence of elongated facets/scallops, that are irregularly distributed, are the diagnostic features of gourd. See Piperno et al. 2000.

Diagnostic level: species

Description
Large faceted/scalloped sphere; can be hemispherical (1/2 to almost full globes with one flattened side); large, elongated scallops are distributed in an irregular manner; the undecorated or flattened side is often smooth.
Spore with coarse verrucae; Surface composed of small nodules; Sphere is hollow and often torn.
**Family**  Cyatheaceae  
**Genus**  Cyathea  
**Species**  pallescens  

**Slide 2229a. Leaf.**

**Description**  
Spore with coarse verrucae; Surface composed of small nodules; Sphere is hollow and often torn.

**Entered by**  Meghann O'Brien  
**Updated**  9/19/2005
Family: Cyatheaceae
Genus: Cyathea
Species: pallescens

Slide 2229a. Leaf.

Description:
Hemisphere; Not faceted; Smooth surface.

Entered by: Meghann O'Brien
Updated: 9/19/2005
Cyatheaceae
Family
Genus
Species
pallescens
Authority

Slide 2229a. Leaf.

Description
Hemisphere; Not faceted; Smooth surface.

Entered by Meghann O'Brien
Updated 9/19/2005


**Family**
Cyperaceae

**Genus**
Cyperus

**Species**
esculentus

**Description**
- Epidermal cells, small
- Conical or “hat-shaped” bodies
- Hat-shaped
- May occur in files
- Tend to be quadrilateral in top view

**Comments**
PC628, leaf
Often occur in lines or ranks. Often conical in top view, but non-quadrilateral in side view. In side view, conical projections with “shoulders”. Diagnostic level: family

**Entered by**
Deborah M. Pearsall

**Updated**
11/8/2012
PC629 inflorescence
Some examples have edge projections
Diagnostic level: under study

**Description**
Epidermal non-quadrilateral, seed or fruit epidermis irregularly shaped angled to irregularly quadrilateral, surface grainy no projections on edges, flat to undulating grainy surface
<table>
<thead>
<tr>
<th>Family</th>
<th>Cyperaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Cyperus</td>
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<tr>
<td>Species</td>
<td>esculentus</td>
</tr>
</tbody>
</table>

**PC629 inflorescence**

Some examples have edge projections.

*This photo shows edge projections.*

**Diagnostic level:** under study

**Description**

Epidermal non-quadrilateral, seed or fruit epidermis irregularly shaped angled to irregularly quadrilateral, surface grainy no projections on edges, flat to undulating grainy surface

**Enter by:** Deborah M. Pearsall

**Updated:** 11/8/2012

<table>
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</tr>
<tr>
<td>Species</td>
<td>esculentus</td>
</tr>
</tbody>
</table>

**PC629 inflorescence**

Diagnostic level: under study

**Description**

Epidermal non-quadrilateral, seed or fruit epidermis polyhedral in top view with conical projections undecorated; projection short, surface curved or undulating, polyhedral to quadrilateral

**Enter by:** Deborah M. Pearsall

**Updated:** 11/8/2012
**PC629 inflorescence**
This example (viewed from the bottom) has edge decoration/projections.
Diagnostic level: genus.

**Description**
Epidermal non-quadrilateral, seed or fruit epidermis polyhedral cell in top view, with conical projections entire upper surface decorated.

**Comments**

**PC626, leaf**
Often occur in lines or ranks. Often conical in top view, but non-quadrilateral in side view. In side view, conical projections with “shoulders”. Diagnostic level: family.

**Description**
- Epidermal cells, small
- Conical or “hat-shaped” bodies
- Hat-shaped
- May occur in files
- Tend to be quadrilateral in top view.
**Cyperaceae**
**Family** Cyperaceae
**Genus** Cyperus
**Species** esculentus var. lejotostachyus

*PC626, leaf*
Often occur in lines or ranks. Often conical in top view, but non-quadrilateral in side view. In side view, conical projections with "shoulders". Diagnostic level: family

**Comments**
- Epidermal cells, small
- Conical or "hat-shaped" bodies
- Hat-shaped
- May occur in files
- Tend to be quadrilateral in top view

**Description**
- Epidermal cells, small
- Conical or "hat-shaped" bodies
- Hat-shaped
- May occur in files
- Tend to be quadrilateral in top view

**Entered by** Deborah M. Pearsall
**Updated** 11/8/2012

---

**Cyperaceae**
**Family** Cyperaceae
**Genus** Cyperus
**Species** esculentus var. lejotostachyus

*PC627 inflorescence*
Diagnostic level: genus

**Description**
Epidermal non-quadrilateral, seed or fruit epidermis polyhedral cell in top view, with conical projections entire upper surface decorated

**Entered by** Deborah M. Pearsall
**Updated** 11/8/2012
Cyperaceae
Family
Genus Cyperus
Species esculentus var.
Authority

PC627 inflorescence
Diagnostic level: genus

**Description**
Epidermal non-quadrilateral, seed or fruit epidermis polyhedral cell in top view, with conical projections entire upper surface decorated

Entered by Deborah M. Pearsall
Updated 11/8/2012
Family: Cyperaceae  
Genus: Cyperus  
Species: hermaphroditus  

**Description**  
- Epidermal cells, small  
- Conical or "hat-shaped" bodies  
- Hat-shaped  
- May occur in files  
- Tend to be quadrilateral in top view  

**Entered by**: Deborah M. Pearsall  
**Updated**: 11/8/2012
Cyperaceae
Genus Cyperus
Species hermaphroditus

This variant has flat-topped rather than conical projections. Both flat and conical are present in the specimen; flat tend to occur in epidermal sheets.

Diagnostic level: genus

Description
polyhedral epidermal cells, decorated on the entire surface.

Entered by Deborah M. Pearsall
Updated 2/4/2013
Family: Cyperaceae
Genus: Cyperus
Species: hermaphroditus

Comments:
PC2997
This variant has flat-topped rather than conical projections. Both flat and conical are present in the specimen; flat tend to occur in epidermal sheets
Diagnostic level: genus

Description:
polyhedral epidermal cells, decorated on the entire surface.

Entering date: 2/4/2013
Updated: 2/4/2013

Family: Cyperaceae
Genus: Cyperus
Species: hermaphroditus

Comments:
PC2996, leaf
double-outline trichome
Not diagnostic

Description:
Double-outline trichome
non-armed
curved tip (outer edge)
length of base greater than or equal to 1/2 length of tip (outer edge)

Entering date: 2/7/2013
Updated: 2/7/2013
Family: Cyperaceae
Genus: Cyperus
Species: hermaphroditus

Description:
- Double-outline trichome
- Non-armed
- Outer edge straight
- Acute tip
- Moderate size

Comments:
- PC2997, inflorescence
- Double-outline trichome
- Not diagnostic

Entered by: Deborah M. Pearsall
Updated: 2/7/2013

Family: Cyperaceae
Genus: Scirpus
Species: sp.

Description:
- Polyhedral to rounded in outline
- Surface and edge may undulate
- Sometimes edges are decorated with undulations, beadlike nodules, or grainy surface
- Central projection of Scirpus spp. is very tall and thin

Comments:
- Epidermal seed phytolith
- The genus Scirpus is distinct for its very tall conical projection and tall, pointed "sombrero" appearance
- Diagnostic level: genus

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002
The genus Scirpus is distinct for its very tall conical projection and tall, pointed "sombreo" appearance. Diagnostic level: genus

Description
Polyhedral to rounded in outline. Surface and edge may undulate. Sometimes edges are decorated with undulations, beadlike nodules, or grainy surface. Central projection of Scirpus spp. is very tall and thin.

- Epidermal cells, small
- Conical or "hat-shaped" bodies
- Hat-shaped
- May occur in files
- Tend to be quadrilateral in top view

Entered by Karol Chandler-Ezell
Updated 10/7/2002
Often occur in lines or ranks.
Often conical in top view, but non-quadrilateral in side view.
In side view, conical projections with "shoulders".
Diagnostic level: family

Description
- Epidermal cells, small
- Conical or "hat-shaped" bodies
- Hat-shaped
- May occur in files
- Tend to be quadrilateral in top view

Entered by Karol Chandler-Ezell
Updated 10/7/2002
**Family:** Dichapetalaceae  
**Genus:** Stephanopodium  
**Species:** longipedicellatum

**Comments:**
Very variable in appearance, recognizable by the twisted appearance with smooth concave curves next to angular plate junctions. Diagnostic level: family.

**Description:**
- Epidermal non-quadrilaterals  
- Three dimensional  
- Angled, plate-like blocky  
- Surface grainy  
- Broad faceted branches in one plane

**Entered by:** Karol Chandler-Ezell  
**Updated:** 10/7/2002
**Family**: Dichapetalaceae

**Genus**: Stephanopodium

**Species**: longipedicellatum

**Comments**

Dichapetalaceae family diagnostic type. Surfaces angled, plate-like, yet curving. Dichapetalaceae type has 3 broad branches, surface grainy while other types have thin or pointed branches. Diagnostic level: family

**Description**

- Epidermal non-quadrilaterals
- Three dimensional, blocky
- Angled shape

**Entered by**: Karol Chandler-Ezell

**Updated**: 10/7/2002

---

**Family**: Dichapetalaceae

**Genus**: Stephanopodium

**Species**: peruvianum

**Authority**: Poepp. & Endl.

**Comments**

Very variable in appearance, recognizable by the twisted appearance with smooth concave curves next to angular plate junctions. Diagnostic level: family

**Description**

- Epidermal non-quadrilaterals
- Three dimensional
- Angled, plate-like blocky
- Surface grainy
- Broad faceted branches in one plane

**Entered by**: Karol Chandler-Ezell

**Updated**: 10/7/2002
Family: Dichapetalaceae
Genus: Tapura
Species: peruviana

Very variable in appearance, recognizable by the twisted appearance with smooth concave curves next to angular plate junctions. Diagnostic level: family

Description
- Epidermal non-quadrilaterals
- Three dimensional
- Angled, plate-like blocky
- Surface grainy
- Broad faceted branches in one plane

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002

Family: Dichapetalaceae
Genus: Tapura
Species: peruviana

This shows a typical elongate schlerid. Diagnostic level: generalized arboreal

Description
Elongate body with a central spine or ridge. Usually three-sided, with all three sides flat to slightly concave. Schlerids typically have an elongate triangular appearance all-round; three sided, one end wider than the narrow tip. Surface may be smooth, granular, or even striated.

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002
**Family** Dichapetalaceae  
**Genus** Tapura  
**Species** peruviana  
**Authority** K.Krause ex Milbr.

**Comments**
This shows a very short, broad, curved example.  
Diagnostic level: generalized arboreal

**Description**
Elongate body with a central spine or ridge. Usually three-sided, with all three sides flat to slightly concave. Schlerids typically have an elongate triangular appearance all-round: three sided, one end wider than the narrow tip. Surface may be smooth, granular, or even striated.

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002

---

**Family** Dioscoreaceae  
**Genus** Dioscorea  
**Species** Type established by Karol Chandler-Ezell, 2004. Cultivated tuber.  
**Authority**

**Comments**
Diagnostic level: root/tuber

**Description**
Blocky parenchyma: large, rounded blocks of silica which are casts of parenchyma cells formed from silica sequestered there. Bodies are very transparent, with flattened or undulating surfaces, and occur in root and tuber cortex tissue.

**Entered by** Emily Sternberg  
**Updated** 2/8/2005
**Family** Dioscoreaceae

**Genus** Dioscorea

**Species**


**Diagnostic level:** root/tuber

**Comments**

2/8/2005 Updated

Multiple-lobed parenchyma: Silica casts of parenchyma with multiple rounded lobes, such as those formed in rapidly growing tissues, observed in roots and tubers.

---

**Family** Dioscoreaceae

**Genus** Dioscorea

**Species**


**Diagnostic level:** not diagnostic

**Comments**

2/8/2005 Updated

Striated, wide transport elements: Open-ended transport elements with striations running perpendicular to the long dimension. Found in roots, fruits, and seeds.
<table>
<thead>
<tr>
<th>Family</th>
<th>Dioscoreaceae</th>
<th>Family</th>
<th>Ebenaceae</th>
<th>Genus</th>
<th>Dioscorea</th>
<th>Genus</th>
<th>Diospyros</th>
<th>Species</th>
<th>virginiana</th>
<th>Authority</th>
<th>L.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments</td>
<td>Type established by Karol Chandler-Ezell, 2004. Domesticated tuber. Diagnostic level: root/tuber.</td>
<td>Comments</td>
<td>Faceted hemisphere, side view (see Record #177 for top view). Diagnostic level: family</td>
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<td></td>
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</tr>
<tr>
<td>Description</td>
<td>Straight transport elements: Straight, silicified transport elements arranged in bundles. Found in roots and tubers.</td>
<td>Description</td>
<td>Spheroidal body; Faceted/scalloped; Large and hemispherical/elliptical; Has a central ventral plane, edges are scalloped.</td>
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<tr>
<td>Entered by</td>
<td>Emily Sternberg</td>
<td>Entered by</td>
<td>Meghann O'Brien</td>
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<tr>
<td>Updated</td>
<td>2/22/2005</td>
<td>Updated</td>
<td>2/24/2005</td>
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</tr>
</tbody>
</table>
Ebenaceae
Family
Diospyros
Genus
virginiana
Species

Faceted hemisphere, top view (see Record #176 for side view). Diagnostic level: family

Faceted body; Faceted/scalloped; Large and hemispherical/elliptical; Has a central ventral plane, edges are scalloped.

Note interesting "ridge" of bumps gives it a scalloped appearance on the dorsal ridge. Diagnostic level: generalized arboreal

- Schlerid

Entered by Meghann O'Brien
Updated 2/24/2005

Entered by Karol Chandler-Ezell
Updated 10/7/2002
**Family** Ericaceae

**Genus** Macleania

**Species** sp.

**Comments**

Very large schlerid. Diagnostic level: generalized arboreal

**Description**

- Schlerid

**Entered by** Karol Chandler-Ezell

**Updated** 10/7/2002
Family: Euphorbiaceae
Genus: Acalypha
Species: diversifolia

Comments:
Diagnostic level: not diagnostic

Description:
- Hair base
- Epidermal cells
- Stellate center

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002
Euphorbiaceae
Family
Genus Amanoa
Species anomala
Authority Little

Comments
Be sure to rotate blocky quadrilaterals to see the distinct nature of the projections in this type. See other Euphorbiaceae taxa to see range of variation of this type across the family.
Diagnostic level: family

Description
- Multifaceted, blocky quadrilateral, on at least one side
- Rounded or spheroidal in rotation
- May have grainy surface
- Projections on some edges
- May be irregular in appearance

Entered by Karol Chandler-Ezell
Updated 10/7/2002
**Euphorbiaceae**

**Family**

**Genus**

**Species**

**Authority**

**Comments**

View of rounded side... projections not visible, facets not distinct in this view. Be sure to rotate to see both views. Diagnostic level: family

**Description**

- Multifaceted, blocky quadrilateral, on at least one side
- Rounded or spheroidal in rotation
- May have grainy surface
- Projections on some edges
- May be irregular in appearance

**Entered by**

Karol Chandler-Ezell

**Updated**

10/7/2002

---

**Euphorbiaceae**

**Family**

**Genus**

**Species**

**Authority**

**Comments**

This type is not diagnostic of Euphorbiaceae. It is produced in a number of dicots. May occur singly or in sheets of different sizes. This is a particularly large sheet. May be occluded. Diagnostic level: not diagnostic

**Description**

Epidermal non-quadrilateral (leaf origin)
- Smooth to grainy surface (no projections/no perforations)
- Sinuous shape (anticlinal cells)
- Often double outline
- not elongated

**Entered by**

Karol Chandler-Ezell

**Updated**

10/7/2002
**Description**

- Rounded
- Multifaceted blocky
- May have grainy surface
- May have some projections on its edges
- May be irregular in appearance

**Comments**

Blocky quadrilateral epidermal tissue. In profile, projections and facets on multifaceted face give crown-like appearance. Rotate to spot multifaceted space and distinguish from non-diagnostic 3D epidermal blocks. Diagnostic level: family

**Description**

- Rounded
- Multifaceted blocky
- May have grainy surface
- May have some projections on its edges
- May be irregular in appearance

**Comments**

Blocky quadrilateral. This example is more flattened than usual, showing range of the type. Diagnostic level: family

**Description**

- Rounded
- Multifaceted blocky
- May have grainy surface
- May have some projections on its edges
- May be irregular in appearance

**Comments**

Blocky quadrilateral epidermal tissue. In profile, projections and facets on multifaceted face give crown-like appearance. Rotate to spot multifaceted space and distinguish from non-diagnostic 3D epidermal blocks. Diagnostic level: family
### Croton fraseri

- Multicellular hair
- Segmented
- Straight tip
- Interior space visible (each segment has double outline)

**Description**

Can have roughened edges, but many examples are smooth. Diagnostic level: species

**Comments**

10/7/2002 Updated

---

### Manihot esculenta

**Manihot secretory body:** Manihot esculenta (yuca, manioc) root rind, leaf, stem, and fruit silicify distinctive cells resembling pores or nectaries. These bodies also occur rarely in one wild species tested (M. hunzikerii). Bodies are small (5-12 microns in diameter), heart-shaped, with a raised exterior and indented/open interior. A thin, flat marginal flange is sometimes present.

**Description**

- Multicellular hair
- Segmented
- Straight tip
- Interior space visible (each segment has double outline)

**Comments**

Type established by Karol Chandler-Ezell, 2004
Diagnostic level: genus

2/8/2005 Updated

---
Description

Manihot secretory body: Manihot esculenta (yuca, manioc) root rind, leaf, stem, and fruit silicify distinctive cells resembling pores or nectaries. These bodies also occur rarely in one wild species tested (M. hunzikerii). Bodies are small (5-12 microns in diameter), heart-shaped, with a raised exterior and indented/open interior. A thin, flat marginal flange is sometimes present.
**Manihot secretory body:** *Manihot esculenta* (yuca, manioc) root rind, leaf, stem, and fruit silicify distinctive cells resembling pores or nectaries. These bodies also occur rarely in one wild species tested (*M. hunzikerii*). Bodies are small (5-12 microns in diameter), heart-shaped, with a raised exterior and indented/open interior. A thin, flat marginal flange is sometimes present.

**Description**

- **Entered by**: Emily Sternberg
- **Updated**: 2/22/2005
**Fabaceae**  
**Family**  
**Genus**  
**Species** macrocantha  
**Authority**

**Type established by Karol Chandler-Ezell, 2004**  
**Diagnostic level: family, seeds/pods**  

**Comments**

Fibrous mesh: We observed silicified fibers in irregular masses, mesh-like in appearance, in Fabaceae seeds and pod, including peanut and acacia.

**Description**

**Entered by** Emily Sternberg  
**Updated** 2/8/2005

---

**Fabaceae**  
**Family**  
**Genus**  
**Species** hypogaea  
**Authority**

**Type established by Karol Chandler-Ezell, 2004**  
**Diagnostic level: family**

**Description**

Fibrous mesh: We observed silicified fibers in irregular masses, mesh-like in appearance, in Fabaceae seeds and pod, including peanut and acacia.

**Entered by** Emily Sternberg  
**Updated** 2/22/2005
probably calcium carbonate (CaCO₃) crystals. Appear in many of the genera of the Fabaceae, but also present in Musaceae, Flacourtiaceae and Bombacaceae. Diagnostic level: not diagnostic

**Description**

Blocky crystals; Irregularly spaced striations; Vary greatly in size; Sometimes show “bubbles” or other effects of weathering; Occur singly or in clusters; Frequently fragmentary.

**Comments**

Blocky crystals; Irregularly spaced striations; Vary greatly in size; Sometimes show “bubbles” or other effects of weathering; Occur singly or in clusters; Frequently fragmentary.

**From the top, this hair base may be confused with a diagnostic produced by Dalium guianense (also of the Fabaceae family). Rotate to see the thickness of the hair base. Slide 1772a leaf. Type defined by Shawn Collins 01/1999. Diagnostic level: genus**

**Description**

Hair cell base; Rounded or elliptic cells; Central cell large; surrounded by smaller cells; From the side, the base is two layers thick.
**Family**: Fabaceae
**Genus**: Brownea
**Species**: ucayalina

**Slide 1772a leaf. Type defined by Shawn Collins 01/1999. Diagnostic level: genus**

**Comments**

2/24/2005 Updated

**Description**

Hair cell base; Rounded or elliptic cells; Small, multiple central cells; Highly silicified central cells; From the side, the hair base is two layers thick.

**Image**

![Image of leaf](image_url)

**Entered by**: Meghann O'Brien
**Updated**: 2/24/2005

---

**Family**: Fabaceae
**Genus**: Brownea
**Species**: ucayalina

**Slide 1772a leaf. Type defined by Shawn Collins 01/1999. Diagnostic level: genus**

**Comments**

2/22/2005 Updated

**Description**

Epidermal quadrilateral; Two to four sinuous edges; Moderately sinuous; Rough, grainy surface

**Image**

![Image of leaf](image_url)

**Entered by**: Meghann O'Brien
**Updated**: 2/22/2005
Family: Fabaceae  
Genus: Dialium  
Species: guianense  
Authority: (Aubl.) Sandwith

Slide 1766e leaf. Type defined by Shawn Collins 01/1999. Diagnostic level: genus

Description
Armed unicellular hair; Short to medium length; Straight; Acute tip; No interior space.

Entered by: Meghann O'Brien  
Updated: 3/8/2005

Family: Fabaceae  
Genus: Dialium  
Species: guianense  
Authority: (Aubl.) Sandwith

Slide 1766e leaf. Type defined by Shawn Collins 01/1999. Diagnostic level: genus

Description
Unicellular hair; Short to medium in length; Re-curving, doubles back on itself; Interior space rounded; Acute tip; Smooth surface; Interior space has blunt tip, ends before the curve of the hair.

Entered by: Meghann O'Brien  
Updated: 02/23/2005
Family: Fabaceae
Genus: Dialium
Species: guianense
Authority: (Aubl.) Sandwith

Comments:
Slide 1766e leaf. Type defined by Shawn Collins 01/1999. Diagnostic level: genus

Description:
Unicellular hair; Medium length; Curved; No interior space; Blunt tip; "Scaled" surface (scales may not continue to tip); Frequently fragmentary; Without base.

Entered by: Meghann O'Brien
Updated: 02/23/2005

---

Family: Fabaceae
Genus: Dialium
Species: guianense
Authority: (Aubl.) Sandwith

Comments:
Ornamental Indigo. From the top, this may be confused with Brownea ucayalina. Rotate to see the thickness of the hair base. Slide 1766e leaf. Typed defined by Shawn Collins 01/1999. Diagnostic level: genus

Description:
Hair cell base; Rounded cells; Large central cell surrounded by small, elongated cells. From the side, the base is ONE layer of cells thick.

Entered by: Meghann O'Brien
Updated: 2/24/2005
**Fabaceae**

**Family**  
Fabaceae

**Genus**  
Erythrina

**Species**  
amazonica

**Authority**  
Krukoff

**Comments**  
Slide 1811. Leaf.  
Diagnostic level: mixed Guazuma, Erythrina, Lithospermum

**Description**  
Hair base: Distinctive, large, circular central cell with radiating, acute appendages; Surrounding cells are lightly silicified.

**Entered by** Meghann O’Brien  
**Updated** 9/19/2005

---

**Family**  
Fabaceae

**Genus**  
Inga

**Species**  
densiflora

**Authority**  
Benth.

**Comments**  
Diagnostic level: genus

**Description**  
- Epidermal quadrilateral  
- 3-dimensional  
Shape square to rectangular epidermal cell (length less than 2x width) with round/spherical bulb or projection in center of one flattened side. All surfaces smooth, but surface of rectangle and edges are upturned and undulating.

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002
**Family**: Fabaceae  
**Genus**: Inga  
**Species**: densiflora  
**Authority**: Benth.

**Diagnostic level**: genus

**Description**
- Epidermal quadrilateral
- 3-dimensional Shape square to rectangular epidermal cell (length less than 2x width) with round/spherical bulb or projection in center of one flattened side. All surfaces smooth, but surface of rectangle and edges are upturned and undulating.

**Entered by**: Karol Chandler-Ezell  
**Updated**: 10/7/2002

---

**Family**: Fabaceae  
**Genus**: Inga  
**Species**: densiflora  
**Authority**: Benth.

**Diagnostic level**: not diagnostic

**Description**
- Stomata

**Entered by**: Karol Chandler-Ezell  
**Updated**: 10/7/2002
Family: Fabaceae
Genus: Inga
Species: densiflora

**Description**
- Hair cell base
- Radiating appendages from a discernable center
- Surrounding epidermal cells are attached to form a disk; cells quadrilateral; tall in side view
- Side view shows two layers of surrounding cells

**Entered by:** Karol Chandler-Ezell
**Updated:** 10/7/2002
Description

**Verrucate trough body:** decorated, textured verrucate platform with a multi-outlined pit in the center of one side. Seeds, fruit, and root cortex.

**Description**

**Two-lobed parenchyma:** Silica casts of parenchyma limited to two rounded lobes observed in *Inga* seeds. Further comparative research needed to determine the distribution of this type in other Fabaceae taxa.
**Fabaceae**

**Family** Fabaceae

**Genus** Pachyrhizus

**Species** erosus

**Authority**

Comments:

Type established by Karol Chandler-Ezell, 2004
Diagnostic level: root/tuber

**Description**

Straight transport elements: Straight, silicified transport elements arranged in bundles. Found in roots and tubers.

**Entered by** Emily Sternberg

**Updated** 2/8/2005

---

**Family** Fabaceae

**Genus** Phaseolus

**Species** lunatus

**Authority** L.

Comments:

Phaseolus hair, small when compared to 40IIIAa301. Diagnostic level: genus

**Description**

- Unicellular hair
- Short to medium in length
- Hooked end
- Interior space is rounded
- Small (as compared to 40IIIAa301)

**Entered by** Shawn K. Collins

**Updated** 3/1/2005
**Family** Fabaceae  
**Genus** Phaseolus  
**Species** lunatus  

*Phaseolus* hair, small when compared to 40IIIAa301.

**Diagnostic level:** genus

**Comments**
- Unicellular hair
- Short to medium in length
- Hooked end
- Interior space is rounded
- Small (as compared to 40IIIAa301)

**Description**

- Unicellular hair
- Short to medium in length
- Hooked end
- Interior space is rounded
- Small (as compared to 40IIIAa301)

**Entered by** Shawn K. Collins  
**Updated** 10/7/2002

---

**Family** Fabaceae  
**Genus** Phaseolus  
**Species** vulgaris  

*Phaseolus* hair, small when compared to 40IIIAa301.

**Diagnostic level:** genus

**Comments**
- Unicellular hair
- Short to medium in length
- Hooked end
- Interior space is rounded
- Small (as compared to 40IIIAa301)

**Description**

- Unicellular hair
- Short to medium in length
- Hooked end
- Interior space is rounded
- Small (as compared to 40IIIAa301)

**Entered by** Karol Chandler-Ezell  
**Updated** 10/15/2002
**Phaseolus vulgaris**

**Family** Fabaceae

**Genus** Phaseolus

**Species** vulgaris

**Comments**

Phaseolus hair, small when compared to 40IIIAla301.

**Description**

- Unicellular hair
- Short to medium in length
- Hooked end
- Interior space is rounded
- Small (as compared to 40IIIAla301)

**Entered by** Karol Chandler-Ezell

**Updated** 10/15/2002

---

**Casearia sylvestris**

**Family** Flacourtiaceae

**Genus** Casearia

**Species** sylvestris

**Authority** Sw.

**Comments**

See Record #140 for a variation of the same body. Occurs in the leaf. Small, tall hair cell base. Note the decorated schlerids in background-- these are common in the sample.

**Description**

Hair cell base, in side view. The small cells that overlay the large central cell appear as a "corona" when viewed from the side. Similar to 40IVa200Bb, but contracted in the center when viewed from side, and smaller, less than 25 microns. Updated by O’Brien, Duncan, Pearsall.

**Entered by** Shawn K. Collins

**Updated** 5/31/2006
<table>
<thead>
<tr>
<th>MuNo</th>
<th>Image</th>
<th>Z098</th>
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<tr>
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<tr>
<td>Genus</td>
<td>Casearia</td>
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<tr>
<td>Authority</td>
<td>Sw.</td>
<td></td>
</tr>
</tbody>
</table>

**Comments**

Side view (see also Record #139): tall hair base, small. Occurs in the leaf. Note the decorated schlerids in background—these are common in the sample. Diagnostic level: family

**Description**

Hair cell base, in side view. The small cells that overlay the large central cell appear as a “corona” when viewed from the side. Similar to 40IVAa200Bb, but constricted in the center when viewed from side, and smaller. Updated by O’Brien, Duncan, and Pearsall.

<table>
<thead>
<tr>
<th>MuNo</th>
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</tr>
</thead>
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<tr>
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<tr>
<td>Authority</td>
<td>Sw.</td>
<td></td>
</tr>
</tbody>
</table>

**Comments**

Stomate with two subsidiary cells. Diagnostic level: not diagnostic

**Description**

Stomate with two subsidiary cells. Updated by O’Brien, Duncan, and Pearsall.
Flacourtiaceae

Family: Flacourtiaceae
Genus: Casearia
Species: sylvestris

Top view. See Records #140,139 for a variation of the same body. Occurs in the leaf. Small, tall hair cell base. Note the decorated sclerids in background--these are common in the sample.

Diagnostic level: family

Comments

- Epidermal appendage
- Hair base
- Radiating appendages
- Discernable center
- Long, regular appendages; acute
- Less than 25 microns in diameter

Entered by: Neil A. Duncan
Updated: 5/31/2006

Flacourtiaceae

Family: Flacourtiaceae
Genus: Pleuranthodendron
Species: lindenii

Occurs in the leaf.

Diagnostic level: family

Comments

- Epidermal appendage
- Hair base
- Rounded central cell, distinct; central cell is lightly silicified
- Surrounding cells form a disk; cells are angled

Entered by: Shawn K. Collins
Updated: 3/3/2005
Flacourtiaceae

Family: Flacourtiaceae
Genus: Pleuranthodendron
Species: lindenii

Comments:
- Occurs in the leaf. In this example, the surrounding disk is not completely developed.
- Diagnostic level: family

Description:
- Epidermal appendage
- Hair base
- Rounded central cell, distinct; central cell is lightly silicified surrounding cells form a disk; cells are angled

Entered by: Shawn K. Collins
Updated: 3/3/2005

---

Flacourtiaceae

Family: Flacourtiaceae
Genus: Pleuranthodendron
Species: lindenii

Comments:
- Slide 1377 leaf.
- Diagnostic level: family

Description:
- Long unicellular hair; Double interior space; Acute tip.

Entered by: Meghann O'Brien
Updated: 2/22/2005
Flacourtiaaceae

Family Flacourtiaaceae
Genus Pueraria
Species phaseoloides var. javanica

Moderate to common in abundance.
Diagnostic level: family

Epidermal appendage
long unicellular hair, non-armed, with smooth surface and double interior space
Acute tip, no base

Description

Entered by Shawn K. Collins
Updated 3/3/2005

Flacourtiaaceae

Family Flacourtiaaceae
Genus Tetrathyllum
Species macrophyllum

Authority Poepp. & Endl.

Occurs in the leaf.
Diagnostic level: family

Description
- Epidermal appendage
- Hair base
- Large rounded or elliptic central cell with short regular appendages that surround the angular rim. Rim is external to a ring around the center.

Entered by Shawn K. Collins
Updated 3/3/2005
**Family** Humiriaceae  
**Genus** Humiriastrum  
**Species** procerum  

**Comments**  
Occurs in leaf. Type defined by Cesar Vientimilla 05/1991. Diagnostic level: family

**Description**  
Epidermal non-quadrilateral; Polyhedral cells; Smooth surface; Surface with perforations and slender divisions; May occur alone or in groups.

**Authority**

**Family** Lauraceae  
**Genus** Aniba  
**Species** hostmanniana  

**Comments**  
2 large examples of schlerids, note variation in facets, shape. This taxa produces very sculpted, multi-surfaced bodies. Diagnostic level: generalized arboreal

**Description**  
- Schlerids

**Entered by** Meghann O'Brien  
**Updated** 2/22/2005

**Family** Lauraceae  
**Genus** Aniba  
**Species** hostmanniana  

**Comments**  
2 large examples of schlerids, note variation in facets, shape. This taxa produces very sculpted, multi-surfaced bodies. Diagnostic level: generalized arboreal

**Description**  
- Schlerids

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002
Description

- Schlerid

Comments

2 large examples of schlerids, note variation in facets, shape. This taxa produces very sculpted, multi-surfaced bodies. Diagnostic level: generalized arboreal

Description

- Stomate

Comments

Stomate, note guard cells and turgid state of cells. Diagnostic level: not diagnostic
Lauraceae

Aniba

hostmanniana

Mez

Hair base.
Diagnostic level: family

Description

- Hair cell base
- Rectangular to oblong, 8 radiating appendages formed by 7 radiating attached cells; center is polyhedral

Entered by Karol Chandler-Ezell
Updated 3/5/2005

Family Lauraceae
Genus Beilschmiedia
Species alloiophylla
Authority (Rusby) Kosterm.

Comments
Diagnostic level: family

Description

- Large striated sphere
- Sphere, smooth, thick (not flattened)
- Very large diameter (>40 microns)

Entered by Karol Chandler-Ezell
Updated 10/7/2002
**Lauraceae**  
**Family** Lauraceae  
**Genus** Caryodaphnopsis  
**Species** fosteri  
**Authority** H.van der Werff

**Side view** (see Record #193 for top view).  
Diagnostic level: family

**Description**
- Epidermal non-quadrilaterals  
- Discrete cells (not fragments)  
- Surface projections  
- Single rounded projection or "hat" on one side  
- Rounded in top view

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002

---

**Top view** (see Record #192 for side view).  
Diagnostic level: family

**Description**
- Epidermal non-quadrilaterals  
- Discrete cells (not fragments)  
- Surface projections  
- Single rounded projection or "hat" on one side  
- Rounded in top view

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002
**Family** Lauraceae

**Genus** Chlorocardium

**Species** venenosum

**Authority** (Kosterm. & Pinkley) J.G. Rohwer, H.G.Richter & H.van

**Description**
- Seed epidermis, angled to irregularly quadrilateral; surface grainy; small projections on edges
- Surface grainy

**Entered by** Karol Chandler-Ezell

**Updated** 3/5/2005

**Description**
- Seed epidermis, angled to irregularly quadrilateral; surface grainy; small projections on edges
- Surface grainy

**Entered by** Karol Chandler-Ezell

**Updated** 10/7/2002
**Diagnostic level:** not diagnostic

**Comments**

- Hair cell base
- Formed of rounded cells, similar in size
- Central cell is clearly discernable

**Description**

Entered by: Karol Chandler-Ezell

Updated: 10/7/2002

---

**Family** Malvaceae

**Genus** Gossypium

**Species** globosa

**Authority** Mez

**Comments**

Compare to 160I, small heart-shaped secretory body. 160II has a variably shaped center. Observed in Gossypium (PC 2665); diagnostic level under study.

**Description**

Secretory body with variably shaped center

Entered by: Deborah M. Pearsall

Updated: 8/21/2012
Malvaceae

Family: Malvaceae
Genus: Gossypium
Species: ?

Comments:

Compare to 160I, small heart-shaped secretory body. 160II has a variably shaped center. Observed in Gossypium (PC 2665), diagnostic level under study.

Description:

Secretory body with variably shaped center

Entered by: Deborah M. Pearsall
Updated: 8/21/2012

Malvaceae

Family: Malvaceae
Genus: Gossypium
Species: ?

Comments:

In PC E1022, Gossypium. Also observed in PC E1004, Malachra alceifolia, Malvaceae

Diagnostic level: Malvaceae

Description:

Multicellular hair radiating from center. Hair segments narrow and long

Entered by: Deborah M. Pearsall
Updated: 8/27/2012
### Malvaceae

**Family**
- Malvaceae

**Genus**
- Gossypium

**Species**

**Authority**

**Comments**

8/27/2012 Updated

**Description**

Multicellular hair radiating from center. Hair segments narrow and long

**Entered by**
- Deborah M. Pearsall

**Updated**
- 8/27/2012

---

### Malvaceae

**Family**
- Malvaceae

**Genus**
- Gossypium

**Species**

**Authority**

**Comments**

See size variation in cystoliths.

**Description**

Crystalline bodies, cystoliths; Spherical in shape; made up of angular projections.

**Entered by**
- Deborah M. Pearsall

**Updated**
- 8/28/2012
Family: Marantaceae
Genus: Calathea
Species: allouia

Comments:
Body on left is 22VIIBc2 (no spikes).
Body on right is 22VIIBc3 (spikes).
Diagnostic level: species (both types)

Description:
- Cylindrical seed bodies, large
- Shaft of cylinder with porous to densely ciliate surface
- Ciliate surface has appearance of abundant 3-dimensional spots or bumps
- Shaft is twisted away from axis, with irregular or broken end
- May be very shortened

Comments:
- Disks formed with the "tip" or dome breaks away from Marantaceae cylindrical seed bodies
- Large diameter, distinct rim. Underside view (see other record) shows dark, grainy to ciliate or porous remains of cylinder
- "Stalk" present on some taxa and has a grainy surface and variable tip which may be broad/obtuse to acuminate

Comments:
- "Top" or dome-side view of "tip only" from Calathea allouia. You can only identify to species if you can match dome and spines. Otherwise identify only to Genus.
- Inset shows close up of underside of C. allouia "tip only" where shaft of cylinder has broken away.

Entered by: Karol Chandler-Ezell
Updated: 10/7/2002
Marantaceae

Family: Calathea
Genus: allouia
Species: (Aubl.) Lindl.

Diagnostic level: species
Note that the "tip only" and pieces of cylinder only are also visible in this image (bottom view of "tip only" in bottom right side of field, piece of cylinder only in center left side of field). Inset shows closeup of C.allouia type. Notice the distinctive traits of the thin spines surrounding a flattened dome tip.

Comments

10/7/2002 Updated
- Cylindrical seed bodies, large
- Shaft of cylinder with porous to densely ciliate surface
- Ciliate surface has appearance of abundant 3-dimensional spots or bumps
- Shaft is twisted away from axis, with broken end OR short, broad and blunt cylinder

Description

22VIIBc3
MUno

2/3/2005 Updated
Irregular rhizome cylinder: Small cylindrical bodies with undulating, beaded, nodular, or spiked surface decoration. Abruptly narrowed tip or head. Observed in Calathea, but not other genera.

Description

26IAa
MUno

Type established by Karol Chandler-Ezell, 2004
Diagnostic level: Calathea rhizomes

Description

242
MUno

The phytolith to the left of the scale shows the tip clearly.

Entered by Emily Sternberg
Updated 2/3/2005

Description

Irregular rhizome cylinder: Small cylindrical bodies with undulating, beaded, nodular, or spiked surface decoration. Abruptly narrowed tip or head. Observed in Calathea, but not other genera.
Marantaceae
Family: Marantaceae
Genus: Calathea
Species: allouia

Type established by Karol Chandler-Ezell, 2004
Diagnostic level: Calathea rhizomes

Comments
2/3/2005 Updated

Description
**Flat domed rhizome cylinder:** Cylindrical body with ciliate or beaded decoration along cylinder and a distinctive, smooth head. Overall shape a cylinder which is polygonal in cross section. Body size is smaller than related Marantaceae inflorescence types. Observed in Calathea; does not occur in other genera.

Entered by: Emily Sternberg
Updated: 2/3/2005

Authority

---

Marantaceae
Family: Marantaceae
Genus: Calathea
Species: allouia

Phytoliths above the scale are this type. Phytolith at lower right is 26IAa (see record 258)

Type established by Karol Chandler-Ezell, 2004
Diagnostic level: Calathea genus, rhizome

Description
**Flat rhizome type:** flattened, somewhat elongated body with a decorated, beaded edge, and an elongate, irregularly stellate center. Center appears somewhat elevated above the ends (platform appearance).

Entered by: Emily Sternberg
Updated: 2/3/2005
Marantaceae
Family Calathea
Genus allouia
Species

Comments
Type established by Karol Chandler-Ezell, 2004
Diagnostic level: genus

Description
Verrucate sphere: spherical to spheroidal bodies, up to 50 microns in diameter, with dense verrucate decoration (irregularly shaped projections).

Entered by Emily Sternberg
Updated 2/3/2005

Marantaceae
Family Calathea
Genus allouia
Species

Comments
See phytolith at lower right. The other forms are 26IIB
Type established by Karol Chandler-Ezell, 2004
Diagnostic level: Calathea, rhizome

Description
Irregular rhizome cylinder: Small cylindrical bodies with undulating, beaded, nodular, or spiked surface decoration. Abruptly narrowed tip or head. Does not occur in other genera.

Entered by Emily Sternberg
Updated 2/2/2005
**Family**: Marantaceae  
**Genus**: Calathea  
**Species**: allouia  
**Type established by**: Karol Chandler-Ezell, 2004  
**Diagnostic level**: Calathea, rhizome

**Description**

**Flat domed rhizome cylinder**: Cylindrical body with ciliate or beaded decoration along cylinder and a distinctive, smooth head. Overall shape a cylinder which is polygonal in cross section. Body size is smaller than related Marantaceae inflorescence types. Does not occur in other genera.

[Image of the flat domed rhizome cylinder]

**Entered by**: Emily Sternberg  
**Updated**: 2/22/2005
Family: Marantaceae
Genus: Calathea
Species: allouia

Comments:
Type established by Karol Chandler-Ezell, 2004
Diagnostic level: Calathea genus, rhizome

Description:
**Flat domed rhizome cylinder:** Cylindrical body with ciliate or beaded decoration along cylinder and a distinctive, smooth head. Overall shape a cylinder which is polygonal in cross section. Body size is smaller than related Marantaceae inflorescence types. Does not occur in other genera.

Entered by: Emily Sternberg
Updated: 2/22/2005

Description:
**Flat rhizome type:** flattened, somewhat elongated body with a decorated, beaded edge, and an elongate, irregularly stellate center. Center appears somewhat elevated above the ends (platform appearance).

Entered by: Emily Sternberg
Updated: 2/22/2005
**Family**: Marantaceae  
**Genus**: Calathea  
**Species**: allouia  
**Authority**:  

**Comments**
Type established by Karol Chandler-Ezell, 2004  
Diagnostic level: Calathea genus, rhizome

**Description**
**Flat rhizome type**: flattened, somewhat elongated body with a decorated, beaded edge, and an elongate, irregularly stellate center. Center appears somewhat elevated above the ends (platform appearance).

**Description**
**Sphere with acute, curved, pointed projections.** Size range in Calathea allouia 7.5 - 25 microns, but 15-20 micron range most common. Compare to 80Kb occurring in Costus sp.
Marantaceae  
Family: Calathea  
Genus: allouia  
Species: PC2458

**Diagnostic level:** Potential species-level diagnostic. Type overlaps with 80IKa, but is distinguished by size.

Occurs in leaf and less often in inflorescence.

**Comments**

4/23/2010 Updated

Sphere with acute, curved, pointed projections. Size range in *Calathea allouia* 7.5 - 25 microns, but 15-20 micron range most common. Compare to 80IKb occurring in *Costus* sp.

**Description**

Sphere with acute, curved, pointed projections. Size range in *Calathea allouia* 7.5 - 25 microns, but 15-20 micron range most common. Compare to 80IKb occurring in *Costus* sp.

80IKb  
MUno  
Neil A. Duncan

**Comments**

9/11/2012 Updated

angled/folded with nodules separate from the folds. Size tends to be 20 microns or larger.

**Description**

angled/folded with nodules separate from the folds. Size tends to be 20 microns or larger.

80IEb  
MUno  
Deborah M. Pearsall

**Comments**

PC2596 *Calathea allouia* leaf

These folded/angled spheres have distinctive nodules separate from the folds. Grade into rugulose (bumpy, rough surface) spheres.

Type first defined by Karol Chandler-Ezell

Diagnostic level under study

**Description**

angled/folded with nodules separate from the folds. Size tends to be 20 microns or larger.
<table>
<thead>
<tr>
<th>Family</th>
<th>Marantaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Calathea</td>
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<td>Species</td>
<td>allouia</td>
</tr>
</tbody>
</table>

**PC2596 Calathea allouia leaf**

These folded/angled spheres have distinctive nodules separate from the folds. Grade into rugulose (bumpy, rough surface) spheres.

Diagnostic level under study

**Description**

angled/folded with nodules separate from the folds. Size tends to be 20 microns or larger.

**Entered by** Deborah M. Pearsall

**Updated** 9/11/2012

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<tr>
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<td>Species</td>
<td>allouia</td>
</tr>
</tbody>
</table>

**PC2597 Calathea allouia stem**

Some examples are curved, but not hemispherical.

Diagnostic level: under study

**Description**

epidermal non-quadrilateral
three dimensional/blocky
angled edges with small facets and stipled surface

**Entered by** Deborah M. Pearsall

**Updated** 9/11/2012
Marantaceae
Family
Calathea
Genus
allouia
Species
PC2597 Calathea allouia stem
some examples are curved, but not hemispherical
Diagnostic level: under study

Comments
9/13/2012 Updated

Description
epidermal non-quadrilateral
three dimensional/blocky
angled edges with small facets and stippled surface

Entered by Deborah M. Pearsall
Updated 9/13/2012

Marantaceae
Family
Calathea
Genus
allouia
Species
PC2598, inflorescence
Note that this type can be quite long; considerable variation is present
Diagnostic level: species

Comments
9/13/2012 Updated

Description
porous to densely ciliate cylinder shaft; abundant three dimensional spots and bumps;
shaft twisted/broken irregularly, may be very shortened broad, blunt tip, granular surface

Entered by Deborah M. Pearsall
Updated 9/13/2012
Marantaceae
Family Calathea
Genus allouia
Species PC2598, inflorescence
Note that these inflorescence types can be quite large; size is variable
Diagnostic level: species

Comments
9/13/2012 Updated
porous to densely ciliate cylinder shaft, abundant three dimensional spots and bumps;
shaft twisted/broken irregularly; may be very shortened;
flattened, grainy "tip" with thin spines around edge of disk

Description
22VIIBc3
MUno Deborah M. Pearsall
Entered by
Updated 9/13/2012

Authority

porous to densely ciliate cylinder shaft, abundant three dimensional spots and bumps;
shaft twisted/broken irregularly; may be very shortened;
flattened, grainy "tip" with thin spines around edge of disk

Description
2204
Recno 354
Entered by Deborah M. Pearsall
Updated 9/13/2012

Authority
PC2598, inflorescence, type occurs rarely. Spheres produced by Canna range from smooth to rugulose to irregularly angled or folded. Type 80IAa201 is based on a modern specimen of Canna edulis leaf. Ephemeral spherical bodies are not included in this type. Diagnostic level: Canna genus (rare in Calathea).

Description
Sphere with smooth but roughened surface. Highly silicified. Shape can be irregularly spherical. Size range from 8-28 microns.

Comments
9/13/2012 Updated

nodular sphere: projections are nodular: obtuse tip, not evenly pointed, often rounded.

Description
nodular sphere: projections are nodular: obtuse tip, not evenly pointed, often rounded.

Comments
9/13/2012 Updated
Marantaceae
Family Calathea
Genus allouia
Species
Authority

Comments
type established by Karol Chandler-Ezell
PC2348, C. allouia inflorescence
Diagnostic level: Calathea/Maranta

Description
rough spheres to irregular flattened bodies with nodules, occasional spinules, and distinctive linear ridges

Entered by Deborah M. Pearsall
Updated 9/11/2012
Marantaceae
Family
Calathea
Genus
altissima
Species
Calathea spp.
Authority
(Poepp. & Endl.) Koern.

Comments
Calathea spp. seed body. Still has distinct, curved stalk tip of Calathea spp., but cylinder is very short relative to width. Diagnostic level: genus

Description
Cylindrical seed bodies, large in diameter. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft is twisted away from axis with irregular or broken end OR very shortened. Tip/stalk is broad with acuminate or acute stalk (often with a sight curve at tip).

Entered by Karol Chandler-Ezell
Updated 10/7/2002
**Calathea altissima**

*Note flattened, polygonal edges, finely rugulose/granular underside*

**Diagnostic level:** genus

---

**Calathea spp. tips**

The disk of the "tip" of the cylindrical seed body ony. Large diameter, distinct rim. Underside shows dark, grainy to ciliate or porous remains of cylinder. "Stalk" has (not seen here) has grainy surface and variable tip -- broad/obtuse to acuminate. May be bulbous with curving acuminate stalk.

---

**Calathea crotalifera**

*Note the 80IIIB rugulose conical bodies in background... Especially note bulbous rims of seed body tips.*

**Diagnostic level:** family, wild taxa

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**Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious segments. Cylinder is straight along its axis. Tips variable: very blunt to acuminate with a side rim present and decorated or absent.*

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**Entered by:** Karol Chandler-Ezell

**Updated:** 10/7/2002
### Description

Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious segments. Cylinder is straight along its axis. Tips variable: very blunt to acuminate with a side rim present and decorated or absent.

#### Comments

Marantaceae nodular spheres and rugulose conical bodies
Diagnostic level: Marantaceae/Bombacaceae

### Description

80 III B: Conical body. Distinct, dome on top is rugulose to nodular (Convex side). Rugulose on bottom (concave side) Size range 3-14 microns.

80 I Ca: Nodular sphere:
Shape of spheres varies: round to oval to irregular in shape. Average Size varies from 7 - 16 microns.

#### Comments

Marantaceae nodular spheres and rugulose conical bodies
Diagnostic level: Marantaceae/Bombacaceae
**Family:** Marantaceae

**Genus:** Calathea

**Species:** lutea

**Authority:** (Aubl.) Schult.

**Comments**

Marantaceae conical body
Top view. Type is centered above the 25.
Diagnostic level: family

**Description**

- Conical body.
- Distinct dome on top is rugulose to nodular (Convex side).
- Rugulose on bottom (concave side).
- Size range 3-14 microns.

**Entered by:** Karol Chandler-Ezell
**Updated:** 10/7/2002

**Family:** Marantaceae

**Genus:** Calathea

**Species:** lutea

**Authority:** (Aubl.) Schult.

**Comments**

Length is 27.5 microns leaf sample.
Body occurs to the right of the 80IIIB example.
Diagnostic level: family

**Description**

- Rectangular body, wider than tall.
- Surface scored by diagonal ridges or scores.

**Entered by:** Karol Chandler-Ezell
**Updated:** 10/7/2002
These are large examples of the type, VA

Diagnostic level: Calathea/Maranta

Description

rough spheres to irregular flattened bodies with nodules, occasional spinules, and distinctive linear ridges

Entered by: Deborah M. Pearsall
Updated: 9/13/2012
Marantaceae
Family Marantaceae
Genus Calathea
Species lutea

PC2595, leaf
This photo shows a string of the bodies
Diagnostic level: family

Description
- Rectangular body, wider than tall.
- Surface scored by diagonal ridges or scores.

Entered by Deborah M. Pearsall
Updated 9/13/2012

Marantaceae
Family Marantaceae
Genus Calathea
Species lutea

Epidermis fragment showing anticlinal cells (20IA), stomata (120), and schlerids (110).
Diagnostic level: not diagnostic

Description
epidermal non-quadrilateral smooth surface
sinuous edge (anticlinal cells)
not elongated

Entered by Deborah M. Pearsall
Updated 9/13/2012
**Marantaceae**

**Family** Marantaceae  
**Genus** Calathea  
**Species** macrosipalia  
**Authority** (Wild. ex Koern.) K.Koch

**Comments**  
Length is 27.5 microns  
leaf specimen  
Diagnostic level: family

**Description**  
- Rectangular body, wider than tall.  
- Surface scored by diagonal ridges or scores.

**Entered by** Karol Chandler-Ezell  
**Updated** 10/7/2002

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**Marantaceae**  
**Family** Marantaceae  
**Genus** Calathea  
**Species** majestica  
**Authority**

**Comments**  
PC1385a, fruit, very abundant  
seed body, still has distinct, curved stalk tip of Calathea spp., but cylinder is very short relative to width.  
Note “corkscrew” axis of main body shaft. This appears to be a point where the bodies “break” resulting in Tip pieces and base pieces.  
Diagnostic level: genus

**Description**  
Cylindrical seed bodies, large in diameter.  
Shaft of cylinder with porous to densely ciliate surface.  
Ciliate surface has appearance of abundant 3-dimensional spots or bumps.  
Shaft is twisted away from axis with irregular or broken end OR very shortened.  
Tip/stalk is broad with acuminate or acute stalk (often with a sight curve at tip).

**Entered by** Deborah M. Pearsall  
**Updated** 9/13/2012
Marantaceae
Family
Genus
Species
Authority
Comments
PC1385a, fruit, very abundant
seed body, still has distinct, curved stalk tip of Calathea spp., but cylinder is very short relative to width. Note “corkskrew” axis of main body shaft. This appears to be a point where the bodies “break” resulting in tip pieces and base pieces. Diagnostic level: genus

Description
Cylindrical seed bodies, large in diameter. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft is twisted away from axis with irregular or broken end OR very shortened. Tip/stalk is broad with acuminate or acute stalk (often with a slight curve at tip).

Entered by
Deborah M. Pearsall
Updated
9/13/2012
Marantaceae
Family Calathea
Genus majestica
Species

PC1385a fruit
Diagnostic level: under study

Description
Irregularly shaped non-quadrilateral epidermis of seed or fruit; small projections on surface, shape very irregular, projections are rounded

Entered by Deborah M. Pearsall
Updated 9/17/2012

Donax, Maranta specimens

Description
epidermal non-quadrilateral, smooth surface perforated epidermis with scalloped and curved edges well silicified

Entered by Deborah M. Pearsall
Updated 9/20/2012
**Family**: Marantaceae  
**Genus**: Calathea  
**Species**: marantina  
**Authority**: (Willd. ex Koern.) K.Koch

**Comments**
Wild Marantaceae seed body.  
Diagnostic level: family, wild taxa

**Description**
Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious segments. Cylinder is straight along its axis. Tips variable: very blunt to acuminate with a side rim present and decorated or absent.

**Entered by**: Karol Chandler-Ezell  
**Updated**: 10/7/2002
Marantaceae

Genus Calathea
Species marantina

Description

seed body. Note variation in width of cylinder. Stalk on tip of body on left is very small, reduced. Stalk is missing on body on the left. Diagnostic level: family, not Maranta

Marantaceae NOT Maranta spp.
Pieces of Cylindrical seed bodies, large diameter (Broken pieces of the cylinders or cylinders with missing tips) Segments of pieces of cylinders have porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps.

Description

epidermal non-quadrilateral smooth surface
sinuous edge (anticlinal cells) not elongated

Epidermis fragment showing anticlinal cells
Diagnostic level: not diagnostic
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<tr>
<th>Image</th>
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<tbody>
<tr>
<td><strong>Marantaceae</strong> Family</td>
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<tr>
<td><strong>Donax</strong> Genus</td>
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<tr>
<td><strong>Species</strong></td>
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<tr>
<td><strong>PC1388 fruit, very abundant</strong> Comments</td>
<td></td>
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<tr>
<td><strong>9/20/2012</strong> Updated</td>
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</table>

Cylindrical seed body. Cylinder shaft has porous appearance, lacks three dimensional spots and bumps; cilia not present. Head is spheroidal, base encased in cylinder. Cylinder flares out at top.

**Entered by**: Deborah M. Pearsall

**Updated**: 9/20/2012
**Family** | Marantaceae  
---|---  
**Genus** | Donax  
**Species** |  
**Comments** | PC1388 fruit, very abundant  
Diagnostic level: Donax  
This image shows the base of the head, within the cylinder (from beneath)  

**Description**  
Cylindrical seed body. Cylinder shaft has porous appearance, lacks three dimensional spots and bumps; cilia not present. Head is spheroidal, base encased in cylinder. Cylinder flares out at top.

**Entered by** | Deborah M. Pearsall  
**Updated** | 9/20/2012

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**Family** | Marantaceae  
---|---  
**Genus** | Donax  
**Species** |  
**Comments** | PC1388 fruit, very abundant  
Diagnostic level: Donax  
This image shows the top of the head, extending out from the cylinder  

**Description**  
Cylindrical seed body. Cylinder shaft has porous appearance, lacks three dimensional spots and bumps; cilia not present. Head is spheroidal, base encased in cylinder. Cylinder flares out at top.

**Entered by** | Deborah M. Pearsall  
**Updated** | 9/20/2012
spheroidal phytoliths with nodules and cilia or spinules on surface
Family: Marantaceae
Genus: Donax
Species: arundastrum

**Comments**
PC280, inflorescence
Can look like a very large conical body
Diagnostic to genus

**Description**
Cylindrical seed body. Cylinder shaft has porous appearance, lacks three dimensional spots and bumps; often covered with long cilia. Like 22VIIDa (cylinder long, unsegmented, head is short, smooth to bumpy, extends down side of cylinder) but cylinder is broken off very short.

**Comments**
PC280 inflorescence
Type first defined in Costus.
Side view of conical form. Sometimes the projections break off, leaving flat rugulose/nodular bodies
Diagnostic level: under study

**Description**
large conical body with large dome (projection) and a narrow rim with a lightly decorated edge. Granular to rugulose surface
**Marantaceae**

**Family** Marantaceae

**Genus** Donax

**Species** arundastrum

**Author**

**Comments**

PC280 inflorescence, common
Diagnostic level: under study

**Description**

epidermal non-quadrilateral from seed or fruit
small projections on surface, shape very irregular
many long, thin projections

Entered by: Deborah M. Pearsall
Updated: 9/17/2012

---

**Marantaceae**

**Family** Marantaceae

**Genus** Donax

**Species** arundastrum

**Authority**

**Comments**

PC280 inflorescence
Diagnostic level under study

**Description**

spheroidal phytoliths with nodules and cilia or spinules on surface

Entered by: Deborah M. Pearsall
Updated: 9/17/2012
Description

spheroidal phytoliths with nodules and cilia or spinules on surface

Entered by: Deborah M. Pearsall
Updated: 9/17/2012
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<td>Donax</td>
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<tr>
<td>Species</td>
<td>arundastrum</td>
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<td>Authority</td>
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</table>

**Comments**

PC280, inflorescence
Note variation in size, shown in following records.
Diagnostic level: genus

**Description**

Cylindrical seed body. Cylinder shaft has porous appearance, lacks three dimensional spots and bumps; often covered with long cilia. Cylinder long, unsegmented, head is short, smooth to bumpy, extends down side of cylinder.
Marantaceae
Family
Genus
Species
arundastrum
Species
PC280, inflorescence
Note variation in size, shown in following records.
Diagnostic level: genus

Cylindrical seed body. Cylinder shaft has porous appearance, lacks three dimensional spots and bumps; often covered with long cilia. Cylinder long, unsegmented, head is short, smooth to bumpy, extends down side of cylinder

Entered by Deborah M. Pearsall
Updated 9/18/2012
Marantaceae
Family Marantaceae
Genus Donax
Species arundastrum

Comments
PC280, inflorescence
May look like a large conical body
Diagnostic level: genus

Description
Cylindrical seed body. Cylinder shaft has porous appearance, lacks three dimensional spots and bumps; often covered with long cilia. Like 22VIIda (cylinder long, unsegmented, head is short, smooth to bumpy, extends down side of cylinder) but cylinder is broken off very short.

Entered by Deborah M. Pearsall
Updated 9/18/2012

Family Marantaceae
Genus Donax
Species arundastrum

Comments
PC280, inflorescence
Diagnostic level: Marantaceae

Description
Fragment of base (cylinder) of 22VIIda (cylinder long, unsegmented, head is short, smooth to bumpy, extends down side of cylinder)

Entered by Deborah M. Pearsall
Updated 9/18/2012
Marantaceae
Family
Genus
Species
arundastrum

PC280, inflorescence
When very broad are difficult to roll and appear in bottom view, as seen here
Diagnostic level: genus

Cylindrical seed body. Cylinder shaft has porous appearance, often covered with long cilia. Like 22VIIDa (cylinder long, unsegmented, head is short, smooth to bumpy, extends down side of cylinder) but cylinder is broken off very short.

Entered by Deborah M. Pearsall
Updated 9/18/2012
**Description**

Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious "segments". Axis of shaft twists like a corkscrew or "zig-zag" to varying degrees.

**Comments**

seed bodies. Show range of variation in wild types. Diagnostic level: Marantaceae, wild taxa

**Entered by** Karol Chandler-Ezell
**Updated** 3/3/2005

Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious "segments". Axis of shaft twists like a corkscrew or "zig-zag" to varying degrees.

**Comments**

seed bodies, Note how body continues to narrow below tip. Diagnostic level: family, wild taxa

**Entered by** Karol Chandler-Ezell
**Updated** 10/7/2002
### Marantaceae

**Family**: Marantaceae  
**Genus**: Ischnosiphon  
**Species**: inflatus  
**Authority**: L. Andersson

**Comments**

Spiralling of "corkscrew" along shaft very apparent in body right of center. Diagnostic level: family, wild taxa

**Description**

Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious "segments". Axis of shaft twists like a corkscrew or "zig-zag" to varying degrees.

---

### Marantaceae

**Family**: Marantaceae  
**Genus**: Maranta  
**Species**: arundinacea  
**Authority**: L.

**Comments**

Note both conical (hat-shaped) bodies and nodular spheres in this field. Both appear in Marantaceae. 80IIIB looks like rugulose or nodular sphere in flat view, but side view shows conical shape. Diagnostic level, 80IIIB: family  
Diagnostic level, 80IICa1: Marantaceae/Bombacaceae

**Description**

Spheres with nodular projections  
Conical bodies:  
Top: convex surface smooth to irregular; Bottom: concave surace with nodular projections; Shape irregular to spheroidal.
**Family** Marantaceae  
**Genus** Maranta  
**Species** arundinacea  
**Authority** L.

### Comments
Note the “bottom” view of the bodies, since this is the typical side up. Often it looks like an irregular star-shape or a granular textured disk with irregular margins. Note in bottom left and far right “tip” only bodies. See below.  
Diagnostic level: species

### Description
- Short cylindrical seed body with smooth-to-solid granular surface.  
- Bottom and side views show broad bulbous base  
- Base varies from very irregular and flattened to polyhedral  
- Base and stalk may fuse to form a “skirt” in very shortened bodies.  
- Stalk shape varies from broad to angular/pointed  
- Stalk length varies from truncated to very long (<1/2 diameter to >1/2

Entered by: Karol Chandler-Ezell  
Updated: 10/7/2002
Marantaceae
Family
Genus
Species
arundinacea
Authority
L.

Comments
Note shortness of cylinder compared to "tip" and Maranta sp. type.
Diagnostic level; species

Description
- Short cylindrical seed body with smooth-to-solid granular surface.
- Bottom and side views show broad bulbous base
- Base varies from very irregular and flattened to polyhedral
- Base and stalk may fuse to form a "skirt" in very shortened bodies.
- Stalk shape varies from broad to angular/pointed
- Stalk length varies from truncated to very long (<1/2 diameter to >1/2

Entered by
Karol Chandler-Ezell
Updated
10/7/2002

Type established by Karol Chandler-Ezell, 2004
Diagnostic level: Maranta/Calathea rhizomes

Description
Rhizome spindle: cylindrical body that tapers gradually to a pointed tip
(lacks distinctive head area or distinctly separate cylinder and head
areas). Nodular surface decoration. Body is round in cross section.
Observed in Maranta and Calathea; does not occur in other genera.

Entered by
Emily Sternberg
Updated
2/3/2005
Marantaceae
Family Marantaceae
Genus Maranta
Species arundinacea

A seed body type, Diagnostic level: family, wild taxa; occurs in one specimen of arrowroot rhizome

Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious segments. Cylinder is straight along its axis. Tips variable: very blunt to acuminate with a side rim present and decorated or absent.
Marantaceae
Family
Genus
Species
arundinacea
arundinacea
Species
arundinacea

PC2670, fleshy rhizome, moderate

A seed body type,
Diagnostic level: family, wild taxa; occurs in one specimen of arrowroot rhizome

9/27/2012
Updated

Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious segments. Cylinder is straight along its axis.
Tips variable: very blunt to acuminate with a side rim present and decorated or absent.

Description

Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious segments. Cylinder is straight along its axis.
Tips variable: very blunt to acuminate with a side rim present and decorated or absent.

Description

- Short cylindrical seed body with smooth-to-solid granular surface.
- Bottom and side views show broad bulbous base
- Base varies from very irregular and flattened to polyhedral
- Base and stalk may fuse to form a "skirt" in very shortened bodies.
- Stalk shape varies from broad to angular/pointed
- Stalk length varies from truncated to very long (<1/2 diameter to >1/2

Description

PC2038, inflorescence
Diagnostic level: species

This image is a view from the bottom (often in this rotation)

Description

- Short cylindrical seed body with smooth-to-solid granular surface.
- Bottom and side views show broad bulbous base
- Base varies from very irregular and flattened to polyhedral
- Base and stalk may fuse to form a "skirt" in very shortened bodies.
- Stalk shape varies from broad to angular/pointed
- Stalk length varies from truncated to very long (<1/2 diameter to >1/2

Description
Marantaceae
Family
Genus
Species
arundinacea
Species
arundinacea

Description
- Short cylindrical seed body with smooth-to-solid granular surface.
- Bottom and side views show broad bulbous base
- Base varies from very irregular and flattened to polyhedral
- Base and stalk may fuse to form a "skirt" in very shortened bodies.
- Stalk shape varies from broad to angular/pointed
- Stalk length varies from truncated to very long (<1/2 diameter to >1/2

Entered by
Deborah M. Pearsall
Updated
10/2/2012
Description

- Short cylindrical seed body with smooth-to-solid granular surface.
- Bottom and side views show broad bulbous base
- Base varies from very irregular and flattened to polyhedral
- Base and stalk may fuse to form a "skirt" in very shortened bodies.
- Stalk shape varies from broad to angular/pointed
- Stalk length varies from truncated to very long (<1/2 diameter to >1/2

Entered by Deborah M. Pearsall

Updated 10/2/2012
Marantaceae

Family: Marantaceae
Genus: Maranta
Species: arundinacea

Description:
- Short cylindrical seed body with smooth-to-solid granular surface.
- Bottom and side views show broad bulbous base
- Base varies from very irregular and flattened to polyhedral
- Base and stalk may fuse to form a “skirt” in very shortened bodies.
- Stalk shape varies from broad to angular/pointed
- Stalk length varies from truncated to very long (<1/2 diameter to >1/2

Authority: Marantaceae, Maranta, arundinacea

Comments:
PC2038, inflorescence
Diagnostic level: species
View is of partially rotated body

Entered by: Deborah Pearsall
Updated: 10/2/2012

Marantaceae

Family: Marantaceae
Genus: Maranta
Species: gibba

Description:
- Rugulose spheres
- Regular or very irregular in overall shape (may not be strictly spherical)
- Surface bumpy, rough (pock marks) with irregular projections in between

Authority: Marantaceae, Maranta, gibba

Comments:
Large (10-30 microns) rugulose spheres. Rugulose spheres occur in many taxa, very common in Marantaceae, Bombacaceae, Cannaceae, Heliconiaceae, and Chrysobalanaceae. Small rugulose spheres (< 10 microns) that are well silicified (i.e., opaque) are, according to Iriarte and Piperno, characteristic of woody dicots. Large spheres (10-30

Entered by: Karol Chandler-Ezell
Updated: 2/7/2008
<table>
<thead>
<tr>
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<tr>
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</tr>
<tr>
<td>Species</td>
<td>gibba</td>
</tr>
<tr>
<td>Authority</td>
<td>Sm. in Rees</td>
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### Description
- Seed phytolith, cylindrical in form.
- Barrel of cylinder has irregular projections on a solid surface.
- Surface NOT granular, but smooth with irregular scallops.
- End of cylinder has a "stalk" with a large smooth tip.
- Size large: average length 30-50 microns.

**Entered by:** Karol Chandler-Ezell  
**Updated:** 10/7/2002
Marantaceae
Family Maranta
Genus gibba
Species Size range in length: 25 - 55 microns
Note: may occur in all Maranta spp., including Maranta arundinacea
Diagnostic level: genus

Comments
- Seed phytolith, cylindrical in form.
- Barrel of cylinder has irregular projections on a solid surface.
- Surface NOT granular, but smooth with irregular scallops.
- End of cylinder has a "stalk" with a large smooth tip.
- Size large: average length 30-50 microns.

Description
- Seed phytolith, cylindrical in form.
- Barrel of cylinder has irregular projections on a solid surface.
- Surface NOT granular, but smooth with irregular scallops.
- End of cylinder has a "stalk" with a large smooth tip.
- Size large: average length 30-50 microns.

Entered by Karol Chandler-Ezell
Updated 10/7/2002
Marantaceae
Family
Genus
Species
Authority

Note range of variation in size, nature of decoration on cylinders, and proportional length of bodies between bodies on the right and left.
Note: may occur in all Maranta spp., including Maranta arundinacea.
Note: you may encounter the "tip" of the body only: see below.

Diagnostic level: genus

Comments

10/7/2002 Updated

- Seed phytolith, cylindrical in form.
- Barrel of cylinder has irregular projections on a solid surface.
- Surface NOT granular, but smooth with irregular scallops.
- End of cylinder has a "stalk" with a large smooth tip.
- Size large: average length 30-50 microns.

Description

Entered by Karol Chandler-Ezell
Updated 10/7/2002

- Nodular spheres: Shape of spheres varies: round to oval to irregular in shape. Average Size varies from 7 - 16 microns. Projections are nodular: obtuse tip, not evenly pointed, often rounded.

Conical body:
Marantaceae
Family
Maranta
Genus
gibba
Species

rugulose conical bodies, Leaf sample
Diagnostic level: family

10/7/2002
Updated

Conical body. Distinct, dome on top is rugulose to nodular (Convex side). Rugulose on bottom (concave side) Size range 3-14 microns.

80IIB
MUno
96
Recno

10/7/2002
Updated

80 ICa1
MUno
97
Recno

80 I Ca: Nodular sphere:
Shape of spheres varies: round to oval to irregular in shape. Average Size varies from 7 - 16 microns. Projections are nodular: obtuse tip, not evenly pointed, often rounded.

Very elongate end of range for this type. Nodular spheres Diagnostic level: Marantaceae/Bombacaceae

80 I Ca: Nodular sphere:
Shape of spheres varies: round to oval to irregular in shape. Average Size varies from 7 - 16 microns. Projections are nodular: obtuse tip, not evenly pointed, often rounded.

Karol Chandler-Ezell
Entered by

10/7/2002
Updated
Marantaceae
Family
Maranta
Genus
gibba
Species
PC2036, inflorescence
Diagnostic level: genus

Comments
10/2/2012 Updated
- Seed phytolith, cylindrical in form.
- Barrel of cylinder has irregular projections on a solid surface.
- Surface NOT granular, but smooth with irregular scallops.
- End of cylinder has a “stalk” with a large smooth tip.
- Size large: average length 30-50 microns.

Description

- Seed phytolith, cylindrical in form.
- Barrel of cylinder has irregular projections on a solid surface.
- Surface NOT granular, but smooth with irregular scallops.
- End of cylinder has a “stalk” with a large smooth tip.
- Size large: average length 30-50 microns.

Entered by Deborah M. Pearsall
Updated 10/2/2012
Marantaceae

Family Marantaceae
Genus Maranta
Species gibba

Comments
PC2036, inflorescence
Diagnostic level: genus

Description
- Seed phytolith, cylindrical in form.
- Barrel of cylinder has irregular projections on a solid surface.
- Surface NOT granular, but smooth with irregular scallops.
- End of cylinder has a "stalk" with a large smooth tip.
- Size large: average length 30-50 microns.

Entered by Deborah M. Pearsall
Updated 10/2/2012
<table>
<thead>
<tr>
<th>Family</th>
<th>Marantaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Maranta</td>
</tr>
<tr>
<td>Species</td>
<td>gibba</td>
</tr>
</tbody>
</table>

**Description**

rough spheres to irregular flattened bodies with nodules, occasional spinules, and distinctive linear ridges

**Entered by** Deborah M. Pearsall

**Updated** 9/11/2012
Cylindrical seed bodies, large. Shaft of cylinder with porous to densely ciliate surface. Ciliate surface has appearance of abundant 3-dimensional spots or bumps. Shaft often has obvious segments. Cylinder is straight along its axis. Tips variable: very blunt to acuminate with a side rim present and decorated or absent.
Marantaceae
Family
Pleistochya
Genus
morlaei
Species
PC1826, inflorescence
Diagnostic level: under study
Comments
Irregularly shaped non-quadrilateral epidermis of seed or fruit; small projections on surface, shape very irregular projections are rounded

Description
Irregularly shaped non-quadrilateral epidermis of seed or fruit; small projections on surface, shape very irregular projections are rounded

Entered by Deborah M. Pearsall
Updated 10/1/2012

Marantaceae
Family
Pleistochya
Genus
morlaei
Species
PC1825, leaf
Diagnostic level: family
Comments
In this specimen the bodies are smoother, and sometimes have small projections.

Description
- Rectangular body, wider than tall.
- Surface scored by diagonal ridges or scores.

Entered by Deborah M. Pearsall
Updated 10/1/2012
<table>
<thead>
<tr>
<th>Family</th>
<th>Marantaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Stromanthe</td>
</tr>
<tr>
<td>Species</td>
<td>jarquinii</td>
</tr>
<tr>
<td>Authority</td>
<td>jarquinii</td>
</tr>
</tbody>
</table>

**Description**

- Cylindrical seed body, smooth/solid cylinder shaft
- Shortened, broad cylinder, smooth surface
- Robust single and bifurcated angular projections
- Tip smooth

**Entered by** Deborah M. Pearsall

**Updated** 10/2/2012
**Marantaceae**
**Stromanthe**
**jarquinii**

**PC1822, inflorescence**
**Diagnostic level: genus**

**Description**
cylindrical seed body, smooth/solid cylinder shaft
shortened, broad cylinder, smooth surface
robust single and bifurcated angular projections
tip smooth

**Entered by** Deborah M. Pearsall
**Updated** 10/2/2012
**Marantaceae**

**Family** Marantaceae  
**Genus** Stromanthe  
**Species** jarquinii  
**Authority**  
**Comments**
PC1822, inflorescence  
Diagnostic level: genus  

**Description**
cylindrical seed body  
irregularly shaped with smooth, complex, robust projections  
robust tip that is a continuation of the cylinder  

**Entered by** Deborah M. Pearsall  
**Updated** 10/3/2012
**Family** Marantaceae  
**Genus** Stromanthe  
**Species** jarquinii  
**Authority**  

**PC1822, inflorescence**  
Type established by Karol Chandler-Ezell, 2004  
Diagnostic level: not diagnostic

**Description**  
**Verrucate trough body**: decorated, textured verrucate platform with a multi-outlined pit in the center of one side. Seeds, fruit, and root cortex.

**Surface with small round concavities ("dimpled") and rounded projections.**  
Flattened to spheroidal.
<table>
<thead>
<tr>
<th>MUno</th>
<th>Image</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 801G  | Z2308  | Marantaceae | Stromanthe | jarquinii | PC1822, inflorescence  
Diagnostic level: under study  
This view shows the rounded projections |

**Description**  
Surface with small round concavities ("dimpled") and rounded projections.  
Flattened to spheroidal.

<table>
<thead>
<tr>
<th>MUno</th>
<th>Image</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 412   | 2379   | Marantaceae | Stromanthe | jarquinii | PC2622, inflorescence  
Diagnostic level: Stromanthe, Thalia  
This specimen had only short cylinders.  
Bottom view  
Compare to 22VIIDd, Donax |

**Description**  
Porous to densely ciliate cylinder shaft, abundant three dimensional spots and bumps  
shaft short or elongated, tip a sphere enclosed in top of shaft.
Family: Marantaceae
Genus: Stromanthe
Species: jarquinii

PC2622, inflorescence
Diagnostic level: Stromanthe, Thalia
This specimen had only short cylinders.
Bottom view
Compare to 22VIIDd, Donax

Description
Porous to densely ciliate cylinder shaft, abundant three dimensional spots and bumps
shaft short or elongated, tip a sphere enclosed in top of shaft

Entered by: Deborah M. Pearsall
Updated: 10/3/2012
Marantaceae
Family
Genus
Species
Stromanthe
stromanthoides

PC1824, inflorescence
Type established by Karol Chandler-Ezell, 2004
Diagnostic level: not diagnostic
Image shows variation in size and shape; note very elongated example

Verrucate trough body: decorated, textured verrucate platform with a multi-outlined pit in the center of one side. Seeds, fruit, and root cortex.

Description

Entered by Deborah M. Pearsall
Updated 10/3/2012

Marantaceae
Family
Genus
Species
Thalia
geniculata

PC1156, fruit
Diagnostic level: under study
This specimen had some examples with longer projections; see body below the scale and compare to one above the scale
Rarely observed in Thalia multiflora leaf

Irregularly shaped non-quadrilateral epidermis of seed or fruit; small projections on surface, shape very irregular projections are rounded

Description

Entered by Deborah M. Pearsall
Updated 10/3/2012
Marantaceae
Family
Genus
Species
geniculata

This specimen has long cylinders
Compare to 22VIId, Donax

Description
Porous to densely ciliate cylinder shaft, abundant three dimensional spots and bumps
shaft short or elongated, tip a sphere enclosed in top of shaft

Entered by
Deborah M. Pearsall

Updated
10/3/2012
<table>
<thead>
<tr>
<th>MiNo</th>
<th>Image</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>22VIIb</td>
<td>2333</td>
<td>Porous to densely ciliate cylinder shaft, abundant three dimensional spots and bumps. Shaft short or elongated, tip a sphere enclosed in top of shaft.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MiNo</th>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>80IIb</td>
<td>N2872</td>
<td>Conical body, flat, rugulose to smooth base. Top is narrow, with ciliate projections.</td>
</tr>
</tbody>
</table>
Marantaceae
Family
Genus
Species
Authority
Comments

cPC1740, root, common.
Type defined by Karol Chandler-Ezell, 11/2004
Diagnostic level: under study

Conical body
flat, rugulose to smooth base
top is narrow, with ciliate projections

Description

Entered by Deborah M. Pearsall
Updated 10/10/2012

Marantaceae
Family
Genus
Species
Authority
Comments

cPC1740, root, common.
Type defined by Karol Chandler-Ezell, 11/2004
Diagnostic level: under study

Conical body
flat, rugulose to smooth base
top is narrow, with ciliate projections

Description

Entered by Deborah M. Pearsall
Updated 10/10/2012
Marantaceae
Family
Thalia
Genus
geniculata
Species
PC1740, root, common.
Type defined by Karol Chandler-Ezell, 11/2004
Diagnostic level: under study

Comments
10/10/2012
Updated
Conical body
flat, rugulose to smooth base
top is narrow, with ciliate projections

Moraceae
Family
Artocarpus
Genus
altilis
Species
Authority
(Parkinson) Fosberg
Comments
Armed hair; hair is bent in a right angle
from base, rather than curving as in
Boraginaceae Cordia lutea 40IIIAb100.
Often has a piece of attached epidermal
issue at base with a "torn" appearance.
Distinct multiple outline appearance
helps to separate it from similar types.
Diagnostic level: family

Description
Unicellular hair; Long; Bent; Interor space; Armed.
Entered by
Meghann O'Brien
Updated
02/23/2005
<table>
<thead>
<tr>
<th>Image</th>
<th>MIUno</th>
<th>Recno</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Authority</th>
<th>Comments</th>
<th>Description</th>
<th>Entered by</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>N501</td>
<td>40IIIAb101</td>
<td>36</td>
<td>Moraceae</td>
<td>Artocarpus</td>
<td>altilis</td>
<td>(Parkinson) Fosberg</td>
<td>Armed hair: hair is bent in a right angle from base, rather than curving as in Boraginaceae Cordia lutea 40IIIAb100. Often has a piece of attached epidermal tissue at base with a &quot;torn&quot; appearance. Distinct multiple outline appearance helps to separate it from similar types. Diagnostic level: family</td>
<td>Unicellular hair; Long; Bent; Interior space; Armed.</td>
<td>Meghann O'Brien</td>
<td>02/23/2005</td>
</tr>
</tbody>
</table>
| N502  | 40IVFd | 37 | Moraceae | Artocarpus | altilis | (Parkinson) Fosberg | Diagnostic level: family | - Hair base
- very small stellate center embedded in a well silicified body; outer ring more effemeral | Shawn K. Collins | 3/1/2005 |
Musaceae
Family Heliconia
Genus curtispatha
Species

Comments
Be careful to rotate these phytoliths to see their shape (ellipse or blocky) and the depth of the trough. Check for surface decoration.
Diagnostic level: genus

Description
- Troughed body
- Deep trough, compact
- From top, trough cuts body into two parts
- Trough ends acute; smooth edges OR Trough ends acute; projections on edges OR Trough ends blunt; projections on edge

Entered by Shawn K. Collins
Updated 10/7/2002
Musaceae

Family
Heliconia

Genus
curtispatha

Species

Authority
Petersen

Comments
Be careful to rotate these phytoliths to see their shape (ellipse or blocky) and the depth of the trough. Check for surface decoration.

Diagnostic level: genus

Description
- Troughed body
- Deep trough, compact
- From top, trough cuts body into two parts

80IIAb) Trough ends acute; projections on edges

Entered by
Karol Chandler-Ezell
Updated 10/15/2002

Musaceae

Family
Heliconia

Genus
curtispatha

Species

Authority
Petersen

Comments
Be careful to rotate these phytoliths to see their shape (ellipse or blocky) and the depth of the trough. Check for surface decoration.

Diagnostic level: genus

Description
- Troughed body
- Deep trough, compact
- From top, trough cuts body into two parts

80IIAc) Trough ends blunt; projections on edge

Entered by
Karol Chandler-Ezell
Updated 10/15/2002
Musa, cultivated banana leaf. Often occur in chains. Should be thick and blocky. Diagnostic level: genus.

Description
Troughed bodies; Shallow trough; Not elongated; From top, trough appears as circular depression; Bottom view may show up a spheroid with irregular bumps.
**Musa, cultivated banana leaf.** Should be thick and blocky. Diagnostic level: genus

**Description**
Troughed bodies; Shallow trough; Not elongated; From top, trough appears as circular depression; Bottom view may show up a spheroid with irregular bumps.

**Comments**
probably calcium carbonate (CaCO₃) crystals. Also observed in Fabaceae, Flaucortiaceae, and Bombacaceae families. Diagnostic level: not diagnostic

**Description**
- Crystalline cubes
- Irregularly spaced striations
- Vary greatly in size
- Sometimes may have "air bubbles" or appear weathered
- Occur singly or in clusters
- Frequently fragmentary

**Comments**
Entered by: Meghann O'Brien
Updated: 2/24/2005

**Entered by**
Shawn K. Collins
**Updated**
10/7/2002
Description

Multi-cellular hair; smooth edges; elongated tip; in immature hairs intercellular spaces are as wide as they are long, but become elongated and restricted and more numerous as hair lengthens.

Entered by: Meghann O'Brien
Updated: 9/19/2005
Slide 1397a; Leaf
Picture shows a broken hair without the tip.

Description
Multi-cellular hair; smooth edges; elongated tip; In immature hairs intercellular spaces are as wide as they are long, but become elongated and restricted and more numerous as hair lengthens

Description
Hair base; Highly silicified and distinctive central cells, usually 1-4 cells; Surrounding cells are blocky, can be rounded, and uniform in size
Family: Piperaceae  
Genus: Piper  
Species: aduncum var. aduncum (Venezuala)  

Description:
Hair shaft still attached to base.

Comments:  
9/19/2005 Updated  
Hair base; Highly silicified and distinctive central cells, usually 1-4 cells; Surrounding cells are blocky, can be rounded, and uniform in size

Entered by: Meghann O'Brien  
Updated: 9/19/2005
**Family**: Piperaceae  
**Genus**: Piper  
**Species**: aduncum L. var.  
**Authority**:  

**Comments**: Slide 1397a; Leaf  

**Description**  
Hair base: Highly silicified and distinctive central cells, usually 1-4 cells; Surrounding cells are blocky, can be rounded, and uniform in size.

**Entered by**: Meghann O'Brien  
**Updated**: 9/19/2005
Immature multi-cellular hair, only one intercellular space developed; Acute, elongated tip

Multi-cellular, armed hair; Large; Interior spaces; Elongated, acute tip
Piperaceae
Genus Piper
Species aduncum L. var. aduncum (Venezuala)

Comments
Slide 1397a; Leaf

Description
Multi-cellular, armed hair; Large; Interior spaces; Elongated, acute tip

Entered by Meghann O'Brien
Updated 9/19/2005
Multi-cellular, armed hair; Interior spaces; Acute tip; Can also occur as an armed sheath surrounding multi-cellular hair.
**Family**  Piperaceae  
**Genus**  Piper  
**Species**  aduncum L. var. aduncum (Venezuala)  
**Authority**  

**Comments**  
Slide 1398a. Inflorescence  
Segments often occur individually or in pairs throughout slide  

**Description**  
Multi-cellular hair; Smooth edges, grainy surface texture; Interior spaces; Blunt, rounded tip, sometimes more elongated and pointed; Individual segments can be broad, squarish in shape  

**Entered by**  Meghann O'Brien  
**Updated**  9/19/2005
**Family**  
Piperaceae

**Genus**  
Piper

**Species**  
aduncum L. var. aduncum (Venezuala)

**Description**  
Hair base: No distinguishable center. Comprised of uniform sized round cells; Cells are three-dimensional and form a mass of cells, sometimes forming a concave body. Cells are often highly silicified.

**Comments**  
9/19/2005 Updated

**Description**  
Hair base: No distinguishable center. Comprised of uniform sized round cells; Cells are three-dimensional and form a mass of cells, sometimes forming a concave body. Cells are often highly silicified.

**Comments**  
9/19/2005 Updated
**Piperaceae**

**Family**  
Piperaceae

**Genus**  
Piper

**Species**  
aduncum L. var. aduncum (Venezuala)

**Comments**  
Slide 1398a. Inflorescence.

**Description**  
Hair base: No distinguishable center. Comprised of uniform all sized rounded cells; Cells are three-dimensional and form a mass of cells, sometimes forming a concave body; Cells are often highly silicified.

**Pooaceae**

**Family**  
Pooaceae

**Genus**  
Paspalum

**Species**  
lividum

**Comments**  
Tubular body  
These bodies are very similar to the narrow rectangular IRP, but are tubules, not flattened pieces. These occur mostly in non-Zea grases and rarely in Zea spp.  
Diagnostic level: wild Poaceae

**Description**  
Tubular bodies have distinct, rounded or pointed tips at each end, since they are actually narrow cylinders, or rounded tubes, rather than flat, two-dimensional bodies. Bodies are not twig-like or sharply curving (i.e. not bent in a zig-zag pattern). In some cases, projections are ranked at 90 degree intervals around the central spine of the body.
Poaceae
Family
Genus
Species
Authority
Lividum
Trin. ex Schltdl.

**Burr-like spheres and elongate bodies with needle projections.** Occur mainly in Digitaria spp. and in Arundinella hispida, but not in Zea spp. Diagnostic level: wild Poaceae

**Description**

Key characteristic of this type is the shape of the projections. In spheroid bodies, sharp, often curved projections rise barb-like from the central body. Overall appearance is of a rounded or flattened cocklebur. Bodies range from spherical to elongate to cylindrical bodies. Projections are not cylindrical or speculate, but rather flattened and blade-like. Central spine of these bodies can be straight but often

**Comments**

10/7/2002 Updated

Base a rondel that is usually circular in outline, but can be square. The upper part of the body (sides and top) is rounded to squared, or even “puffed.” The upper part of the body is decorated with beadlike (spherical-tipped) or speculate (spherical tip with a visible parallel-sided stalk) projections. There should be more than four projections, and these are not spikes

**Description**

Half-decorated rondel. Found in high numbers in teosinte fruit cases, and in very low numbers in some types of maize. A good Zea indicator, and is especially characteristic of teosinte and primitive maize. The body illustrated shows very long speculate projections. See other illustration for range of variation.

**Comments**

10/7/2002 Updated
Poaceae
Family
Genus
Species
luxuriens
Zea
Authority
(Durieu & Asch.) R.M.Bird

Comments
Sheet of robust globular bodies. Robust globular bodies occur in maize and teosinte only, and are good Zea spp. indicators. Diagnostic level: genus

Description
This type is a full, three-dimensional globule with a visible globular surface (see bottom right body in sheet). Projections must be speculative to fit the type. There may be very few projections on some bodies. Key diagnostic feature of this type is that the bodies are heavily silicified - appearing purple under transmitted light - and the projections are long and wide (robust, not delicate).
<table>
<thead>
<tr>
<th>Family</th>
<th>Poaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Zea</td>
</tr>
<tr>
<td>Species</td>
<td>luxuriens</td>
</tr>
<tr>
<td>Authority</td>
<td>(Durieu &amp; Asch.) R.M.Bird</td>
</tr>
<tr>
<td>Comments</td>
<td>Half-decorated oblong body. Differs from the 1/2 decorated rondel only in that their bases are blocky, square or rectangular, not a rondel. Often occur in dense sheets in teosinte. Diagnostic level: genus</td>
</tr>
</tbody>
</table>

### Description

The upper part of the body (sides and top) is rounded to squared, or even "puffed." The upper part of the body is decorated with beadlike (sperical-tipped) or speculate (spherical tip with a visible parallel-sided stalk) projections.

<table>
<thead>
<tr>
<th>Family</th>
<th>Poaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Zea</td>
</tr>
<tr>
<td>Species</td>
<td>mays</td>
</tr>
<tr>
<td>Authority</td>
<td>L.</td>
</tr>
<tr>
<td>Comments</td>
<td>Wavy top rondel. Rectangular bases, bilobate bases, and saddle bases are excluded from this type. Occur only in maize. Good maize indicator even within the range of teosinte. Diagnostic level: species, domesticated</td>
</tr>
</tbody>
</table>

### Description

Base a rondel (circular to oval in shape), flat, not concave. Base must be longer than the body is high/tall. Top is a single, complete wave that is equal to or less than the length of the rondel base. Edges of the top and bottom are not ruffled. Convergence of the sides forms the top, which is a single, undulating
Poaceae

Family: Zea
Genus: mays
Species: mays
Authority: L.

Description:
Base is a rondel that is oval to circular in outline. Rondel must be longer than it is tall. Edges of top are ruffled or undulating, filmy in maize, more heavily silicified in teosinte. The top does not have any acute or sharply angled edges. Tops distinctly not with spikes. Top is flat and ephemeral. View from top is outline of ruffled top crossing more heavily silicified circular outline of the...
Poaceae  
Family  
Genus  
Species  
mays  
Authority  

Diagnostic level: Zea spp. and some other panicoid grasses. Irregular IRP, IRP type was first described by Piperno and Pearsall (1993). IRP bodies are the product of epidermal silicification in the fruitcase, cupule, glume, and other infl. tissues. Found in Zea spp., Panicum bulbosum, and Lasiacis spp. (panicoid grasses), and Neurolepis pittieri (bamboo).

Description

Shape is not rectangular. Bodies are often L-shaped, triangular, or other irregular shapes. Body may be two-dimensional and flattened, or more three-dimensional (i.e. thickness may vary considerably). Projections may be distributed regularly or irregularly, as long as they are along all surfaces (not just margins) and are stipitate.

Entered by  Karol Chandler-Ezell  
Updated  10/7/2002

Family  
Genus  
Species  
mays mays  
Authority  

wavy top rondel: Described by Bozarth (1993). Rectangular bases, bilobate bases, and saddle bases are excluded from this type. Occur only in maize. Good maize indicator even within the range of teosinte. Diagnostic level: species, domesticated

Description

Base a rondel (circular to oval in shape), flat, not concave. Base must be longer than the body is high/tall.; Top is a single, complete wave that is equal to or less than the length of the rondel base. Edges of the top and bottom are not ruffled. Convergence of the sides forms the top, which is a single, undulating

Entered by  Karol Chandler-Ezell  
Updated  10/7/2002
Poaceae
Family
Zea
Genus
Species
mays mays

wavy top rondel: Described by Bozarth (1993). Rectangular bases, bilobate bases, and saddle bases are excluded from this type. Occur only in maize. Good maize indicator even within the range of teosinte.
Diagnostic level: species, domesticated

Comments
10/7/2002 Updated

Gracile spherical body
This is a relatively rare type that occurs in maize, and not in teosinte or other wild panicoid grasses.
Compare to their robust cousins (Robust globular bodies) in size, nature of projections, and degree of silicification.

Description
Gracile spherical bodies are spherical, diameter generally in the 10-15 micron range. Bodies are lightly silicified, with short, narrow, speculate projections (which appear to break off sometimes). Projections are typically few.
**Description**

Rectangular IRP. Wide (>7.5 microns width). IRP type was first described by Piperno and Pearsall (1993). IRP bodies are the product of epidermal silicification in the fructicase, cupule, glume, and other infl. tissues. Diagnostic level: Zea spp. and some other panicoid grasses.

**Comments**

- Body may be two-dimensional and flattened, or more three-dimensional (i.e. thickness may vary considerably). Sides may be undulating, but may not be crenate. Projections may be distributed regularly or irregularly, as long as they are along all surfaces (not just margins) and are speculate. Speculate projections have a distinct stalk and head, which is rounded to.

**Description**

Rectangular in outline with irregular margins and 1-3 semi-circular cuts. Frequently cuts are taken from a "corner" of the body. Surface is undulating to roughened, and may show raised ribs that thicken the body.
### Poaceae Family Zea Genus luxuriens Species luxuriens

**Diagnostic level:** genus  
Half-decorated rondel  
Found in high numbers in teosinte fruit cases, and in very low numbers in some types of maize.  
This is a good Zea indicator, and is especially characteristic of teosinte and primitive maize.  
The body illustrated here shows the beadlike projections. See other.

#### Description
Base a rondel that is usually circular in outline, but can be square.  
The upper part of the body (sides and top) is rounded to squared, or even "puffed." The upper part of the body is decorated with beadlike (sperical-tipped) or speculate (spherical tip with a visible parallel-sided stalk) projections.  
There should be more than four projections, and these are not spikes.

---

### Sterculiaceae Family Guazuma Genus ulmifolia Species ulmifolia

**Authority** (Durieu & Asch.) R.M.Bird

**Comments**  
- Diagnostic level: mixed Guazuma, Erythrina, Lithospermum

#### Description
- Hair base  
- Long radiating appendages; lightly silicified surrounding cells; large open circular center
<table>
<thead>
<tr>
<th>Family</th>
<th>Sterculiaceae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Guazuma</td>
</tr>
<tr>
<td>Species</td>
<td>ulmifolia</td>
</tr>
<tr>
<td>Authority</td>
<td></td>
</tr>
<tr>
<td>Comments</td>
<td>PC 2870, wood specimen</td>
</tr>
<tr>
<td></td>
<td>Diagnostic level: under study</td>
</tr>
</tbody>
</table>

**Description**

Blocky crystals, not tabular, with granular surfaces

**Entered by** Deborah M. Pearsall

**Updated** 8/28/2012
**Guazuma ulmifolia**

**PC 2870, wood specimen**

**Diagnostic level: under study**

**Comments**

8/28/2012 Updated

**Description**

Tabular crystals with granular surfaces. Probably calcium carbonate. Tabular crystals with curved and/or right angle edges

**Watteria americana**

**PC Clark 33**

**Diagnostic: Watteria, Sterculiaceae**

**Comments**

8/28/2012 Updated

**Description**

Unicellular hair, long, non-armed, smooth surface, base occurs as part of same cell, attachment of base to hair is rounded
Ulmaceae

Family

Celtis

Genus

schippii

Species

Authority

Comments

20 V a, b, and c separated only by arrangement of conical bodies. 20 V Ca describes when these conical bodies occur singly. Diagnostic level: species

- Masses of hat-shaped bodies
- Rounded and conical, bottom flattened and elongated

Description

Entered by Karol Chandler-Ezell
Updated 10/7/2002

20 VCa

MUno

Recno 61

Family Ulmaceae
Genus Celtis
Species schippii
Authority Standl.

Comments

- Small epidermal cells
- Hat-shaped, conical, or triangular in appearance
- Bottom flattened and elongated
- Rounded (but not necessarily circular) in top view, with a smaller and darker circle in the center (may not be in exact center of body)

Description

Entered by Karol Chandler-Ezell
Updated 10/7/2002

20 VCb

MUno

Recno 62

Family Ulmaceae
Genus Celtis
Species schippii
Authority Standl.

Comments

Occurs singly in Celtis schippii leaf and fruit. 20 V a, b, and c separated only by arrangement of conical bodies. 20 V Ca describes a singly occurring conical body. 20 V Cb describes when 2 of these bodies are fused along their flat surfaces. 20 V Cc describes when these conical

Description

Entered by Karol Chandler-Ezell
Updated 10/7/2002
Family: Ulmaceae
Genus: Celtis
Species: schippii

Comments:
20 V a,b, and c separated only by arrangement of conical bodies. 20 V Cc describes when these conical bodies occur in fused masses. Diagnostic level: species

Description:
- Masses of hat-shaped bodies
- Rounded and conical, bottom flattened and elongated

Seed or fruit epidermal cells. Diagnostic level: species

Description:
- Seed epidermis
- Anticlinal cells
- Surface with projections or perforations (appear to be dark spots or dots)
- No double outline
- Sinuous shape in outline
**Family** Ulmaceae  
**Genus** Celtis  
**Species** schippii  
**Authority** Standl.

### Comments
See Record #61 for another view.  
20 V a, b, and c separated only by arrangement of conical bodies.  
20 V Ca describes when these conical bodies occur singly.  
Diagnostic level: species

### Description
- Masses of hat-shaped bodies  
- Rounded and conical, bottom flattened and elongated

**Entered by** Karol Chandler-Ezell  
**Updated** 10/15/2002
### Ulmaceae

**Family**: Ulmaceae  
**Genus**: Celtis  
**Species**: schippii  
**Authority**

**Comments**: Occurs in fruit. Type defined by Cesar Veintimilla 05/1991. Diagnostic level: species

**Description**  
Epidermal non-quadrilateral; Anticlinal cells; Surface with projections or perforations; Not double outline; Sinuous shape.

**Entered by**: Meghann O'Brien  
**Updated**: 2/22/2005

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### Ulmaceae

**Family**: Ulmaceae  
**Genus**: Trema  
**Species**: integerrima  
**Authority**

**Comments**: Type defined by Cesar Veintimilla 06/1991. Diagnostic level: genus

**Description**  
Hair cell base: Rounded cells; Large central cell rounded with clear divisions that appear inside of base; Central.

**Entered by**: Meghann O'Brien  
**Updated**: 2/23/2005
Ulmaceae
Genus Trema
Species integerrima

Type defined by Cesar Veintimilla
Diagnostic level: genus

Comments

3/7/2005
Updated

Hair cell base; Rounded cells; Large central cell rounded with clear divisions that appear inside of base; Central.

Description

- Smooth tip
- Double outline
- un-armed body
- Wide, splayed base
- Often has cystolith inserted in base

Entered by Meghann O'Brien
Updated 3/7/2005

Ulmaceae
Family Ulmaceae
Genus Trema
Species micrantha

Comments

10/7/2002
Updated

Hair often has cystoliths inserted in base. Some examples have slight surface texturing, but most are smooth. Diagnostic level: genus

Description

- Smooth tip
- Double outline
- un-armed body
- Wide, splayed base
- Often has cystolith inserted in base

Entered by Karol Chandler-Ezell
Updated 10/7/2002
<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N416</td>
<td>Hair. Note cystoliths inserted in the base. Diagnostic level: genus</td>
</tr>
<tr>
<td></td>
<td>- Smooth tip</td>
</tr>
<tr>
<td></td>
<td>- Double outline</td>
</tr>
<tr>
<td></td>
<td>- Unarmed body</td>
</tr>
<tr>
<td></td>
<td>- Wide, splayed base</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N415</td>
<td>Hair base. Only some of the smaller cells are still with the hair base in this example. Diagnostic level: genus</td>
</tr>
<tr>
<td></td>
<td>- Epidermal appendage</td>
</tr>
<tr>
<td></td>
<td>- Hair cell base</td>
</tr>
<tr>
<td></td>
<td>Central cell isosodiometric, undivide, surrounded by smaller cells</td>
</tr>
</tbody>
</table>
**Family**: Ulmaceae  
**Genus**: Trema  
**Species**: micrantha  
**Type defined by**: Cesar Veintimilla 05/1991.  
**Diagnostic level**: genus  

**Description**  
Unicellular hair: Long, non-armed; Some hairs may have low relief bumps; Smooth surface; Base occurs as part of same cell, but may break off; May have “V” shape or rounded base.  

**Description**  
Cystolith: Highly rugulose; Irregular shape; Different sizes; Bulbous with distinct stalk and bulb.
Family: Zingiberaceae  
Genus: Costus  
Species: guanaienis  

Diagnostic level: Potential species-level diagnostic, under study. Type overlaps with 80IKa, but is distinguished by larger size.

Occurs in rhizome.

Description:
Sphere with acute, curved, pointed projections. Size range in Costus guanaienis 15 - 40 microns, but 25 - 30 micron range most common. Compare to 80IKa occurring in Calathea allouia.

Entered by: Neil A. Duncan  
Updated: 4/23/2010
Family: Zingiberaceae
Genus: Costus
Species: guaniensis

**Description**

- Spheroidal, slightly variable shape
- Surface nodular with large basal diameter
- Projections irregularly shaped and spaced
- Size large (> 18 microns)

**Comments**

- Large nodular sphere, 18 microns and larger in size, with short projections with large basal diameter. Sphere can be slightly irregularly shaped. Diagnostic level: Family

**Description**

- Spheroidal, slightly variable shape
- Surface nodular with spinulose projections or cilia
- Projections tightly spaced

**Comments**

- These spheres have nodular and spinulose projections or cilia. Nodular projections outnumber spinulose or cilia. Projections are tightly spaced. Diagnostic level: Under investigation.
Family: Zingiberaceae
Genus: Costus
Species: scaber

Also occurs in the Bombacaceae. Diagnostic level: mixed, Zingiberaceae, Bombacaceae. There are subtle differences in the smoothness and abundance of nodules between the two families.

Description:
- Spheres with nodular projections
- Nodule surfaces are both smooth and ruminate (roughened, chewed--old term was serrate)
- Nodular-tip is obtuse, sides uneven
- Nodules regularly arranged, almost spirally ranked

Entered by: Neil A. Duncan
Updated: 2/7/2008

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Family: Zingiberaceae
Genus: Costus
Species: scaber

Description:
- Large conical body with large dome (projection) and a narrow rim with a lightly decorated edge. Granular to rugulose surface

Entered by: Deborah M. Pearsall
Updated: 10/17/2012
Zingiberaceae

Renealmia

oligosperma

Diagnositc level: under study. Also observed in Donax, Thalia (Marantaceae)

spheroidal phytoliths with nodules and cilia or spinules on surface

Entered by: Neil A. Duncan
Updated: 5/31/2006