

Asteraceae or Compositae – Aster F.

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- 1160 genera; 19,085 spp. (Zomlefer, 1994) – Dated
 - GA – USDA - 113 genera and 451 spp – out of date but Maps useful.
 - 1528 genera; 22,750 spp. (acc. to Mabberley 2000, *The Plant Book*)
 - Flora North America – 23,000 spp. in 1500 genera (2413 in NA flora)
 - <http://beta.floranorthamerica.org/Asteraceae> **MOST UP TO DATE**
 - Weakley 2017 – 507 in GA or 12%; with 20,000-25,000 world wide
 - Distribution – Cosmopolitan (excl. Antarctica) – mostly Temperate latitudes

My primary reference: *Vascular Flora of the Southeastern United States* Vol 1. Asteraceae by Arthur Cronquist 1980. A UNC publication. But the above FNA link is more current.

At Least ½ of the species in this little golden guide book for the US are considered members of the Asteraceae.



Asteraceae (Compositae)

Family Diagnosis (more of a "nutshell" than the description - next slide)

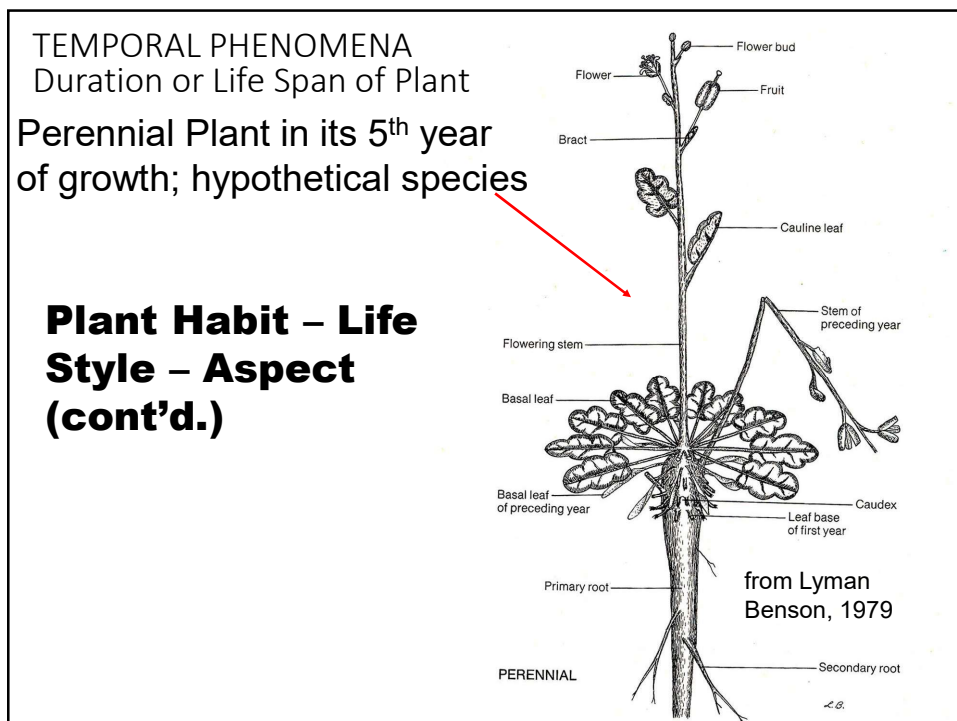
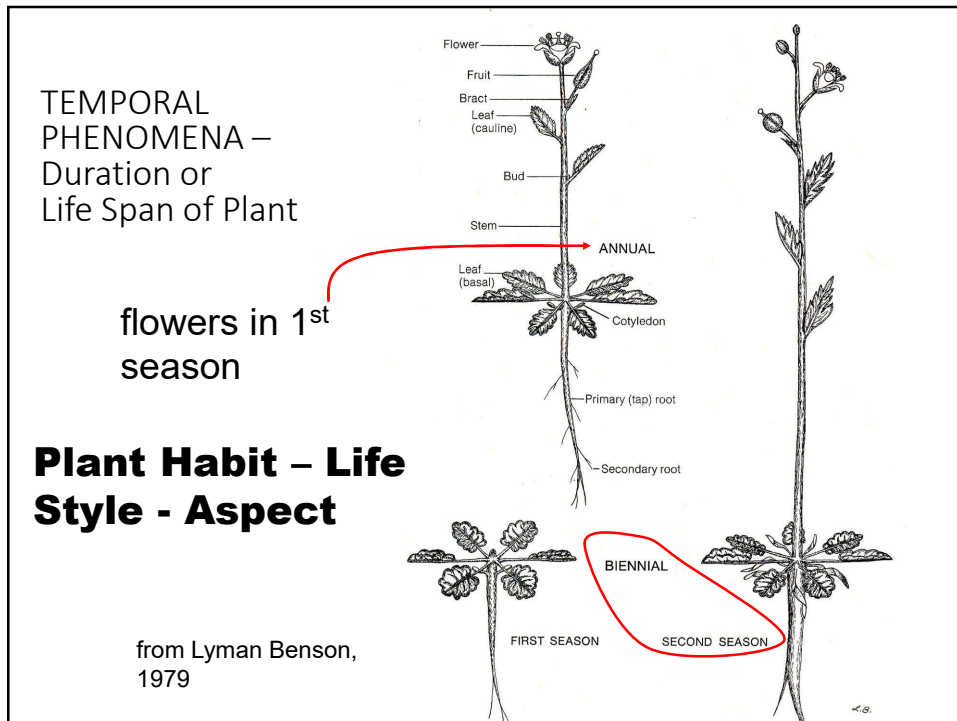
Herbs (shrubs); inflorescence a head; flowers with a reduced calyx called a pappus; anthers connate in a cylinder around the style; carpels 2; ovary inferior; fruit a cypsela ("achene")

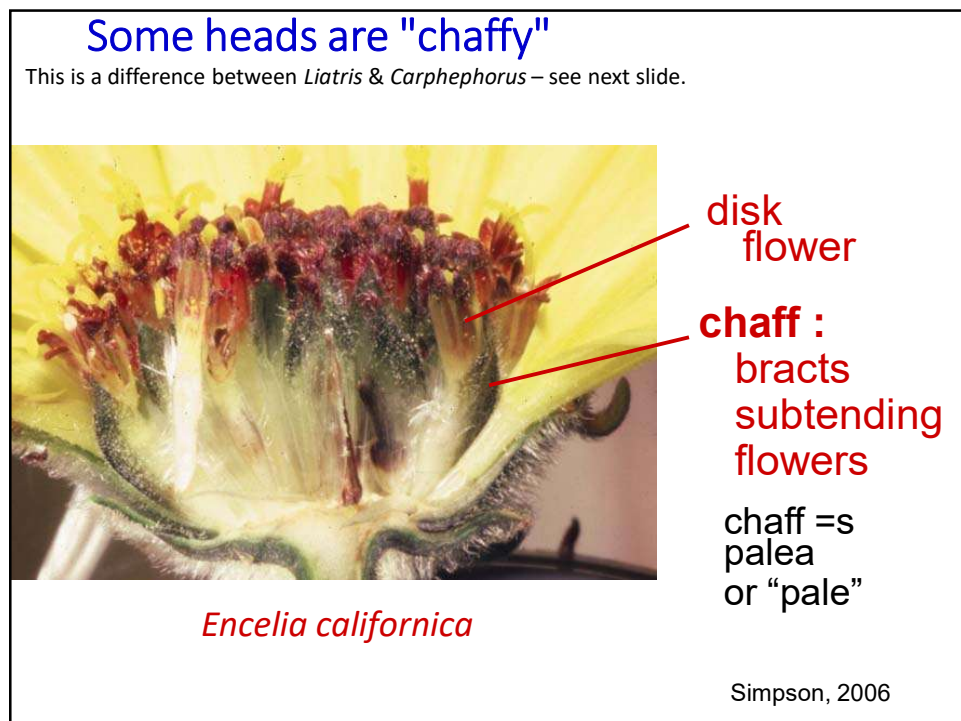
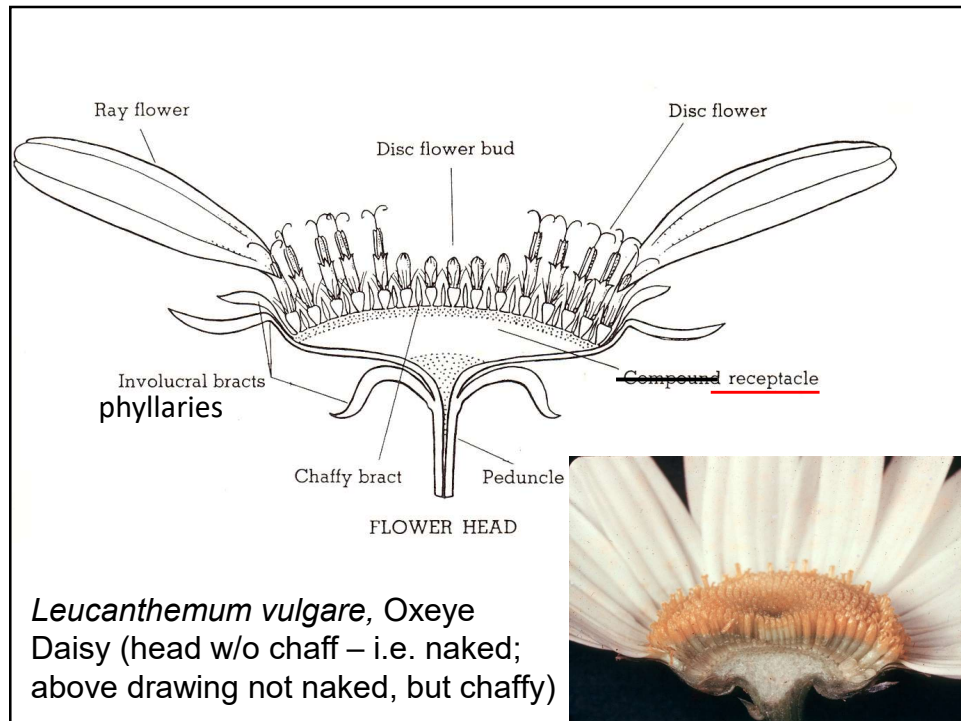
Asteraceae (Compositae)

Family Description

Vegetatively variable (e.g. lvs. alt., opp. whorled or basal)

The Asteraceae are distinctive in being herbs, shrubs, vines or trees, the inflorescence a head (capitulum) subtended by an involucre of bracts known as phyllaries, flowers either disk or ray/ligulate (rarely bi-labiate, i.e. 2 lipped) with heads of many taxa a mix of central disk and peripheral ray flws. Calyx modified into a pappus of scales, awns, or capillary bristles (or absent); androecium syngenesious [anthers united (connate) & filaments distinct]; ovary inferior with a single basal ovule; fruit a multiple of achenes (cypselas).



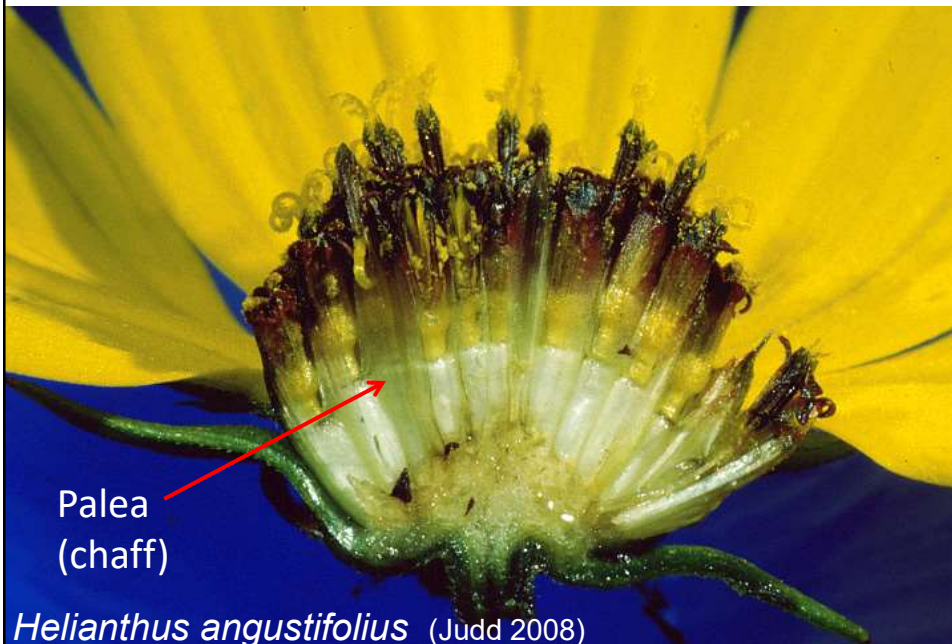


Liatris spp. – have no chaff or paleae or “pales”
(a special kind of bract); within the head.

Carphephorus pseudoliatris
has chaff (bracts) within head



photo – Melton Wiggins (with perm.)
Rare in SW GA; more common in Panhandle FL



Palea
(chaff)

Helianthus angustifolius (Judd 2008)

Look alike Heads – Apiaceae (Umbelliferae) –
Parsley F.



Eryngium yuccifolium rattlesnake-master

Judd, 2008

Look alike Heads – Fabaceae (Leguminosae) –
Pea or Legume F.



Dalea purpurea – purple prairie “clover”

Judd, 2008



Dalea pinnata – Summer

farewell

Hattaway – Discover
Life

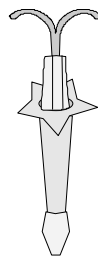


Asteraceae: floral variation

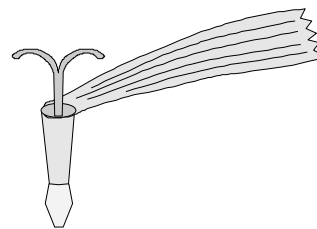
3 structural types of flowers/florets: (more if consider sex):

- 1) **Disk (tube)**: corolla radial symmetry, 5 (4) teeth-like lobes
- 2) **Ray (ligulate)**: bilateral symmetry with basal tube with an open/flat extension with 3-5 apical teeth.
- 3) Bilabiate: corolla bilateral symmetry (2 lips) in central florets – not illus. here (rare in our flora, e.g. *Chaptalia* – sunbonnets)

Disk (tube) & Ray Flowers



disk



ligulate / ray

Mod. From Simpson, 2006

Ray Flower



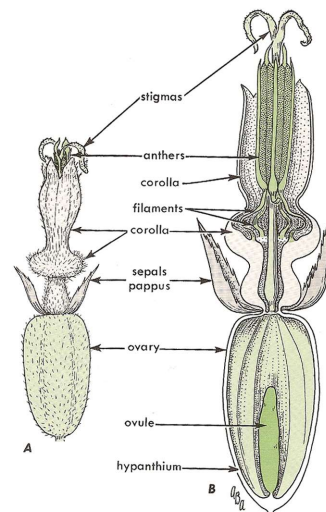
Taraxacum officinale (Dandelion) - from Judd 2008

Disk Flowers

note the pappus (modified calyx)
consists of 2 awns



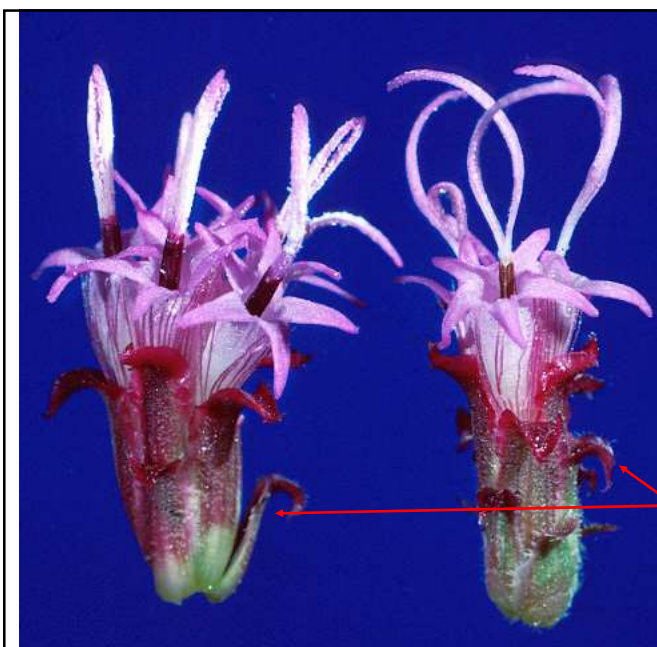
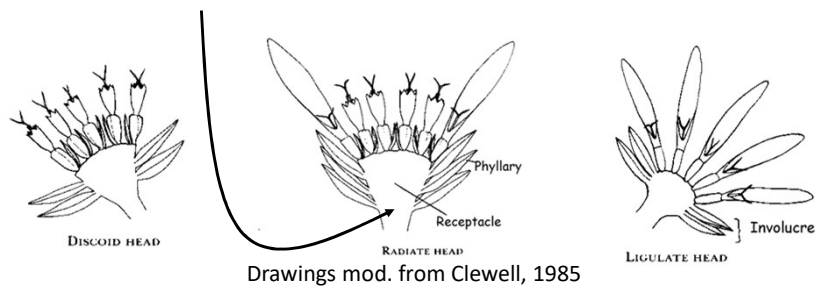
Helianthus angustifolius (Judd 2008)



Three (main*) types of heads (in our flora):

- 1) **discoid**, with only disk flowers;
- 2) **radiate**, with central (bisexual or male) disk flowers and peripheral (female or sterile) ray flowers;
- 3) **ligulate**, with all ray flowers (typically with 5-toothed corolla apices);

Note the Receptacle.




Discoid Heads
with Disc/Disk
flws only

Note the
symmetry of
the flowers in
the small
heads.

What are
these bracts
called?

Liatris pycnostachya – from Judd 2008

Baccharis halmifolia — 
Groundsel; Saltbush — Disk
only flws; note the white is
due to the **pappus**. Plants
are dioecious.



Articum minus —
Burdock — less obvious
here but all discoid
heads [note the
involucral bracts
(phyllaries)]

Conoclinium
coelestinum Mistflower,
Ageratum
(relative of *Eupatorium*)

Note heads at bottom
are older and in the
fruiting stage with the
pappus showing on a lot
of the heads.



Heads radiate: inner disk & outer ray fls.

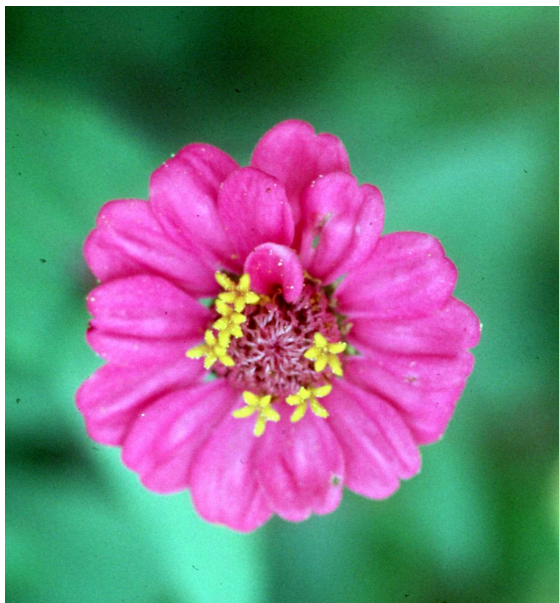
disk flowers ray flowers



Encelia farinosa

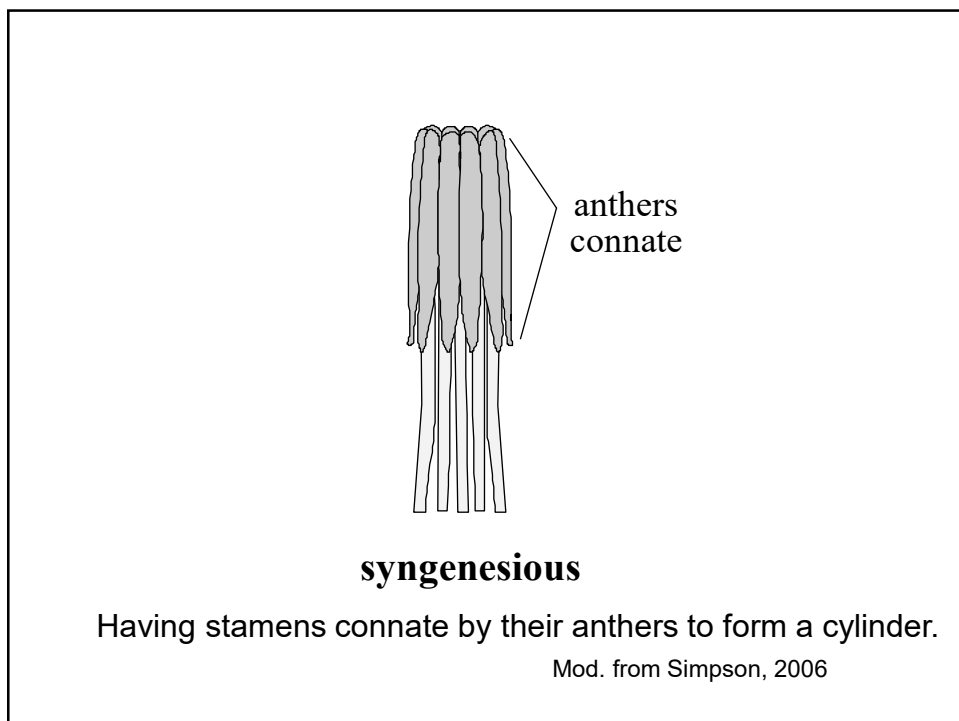
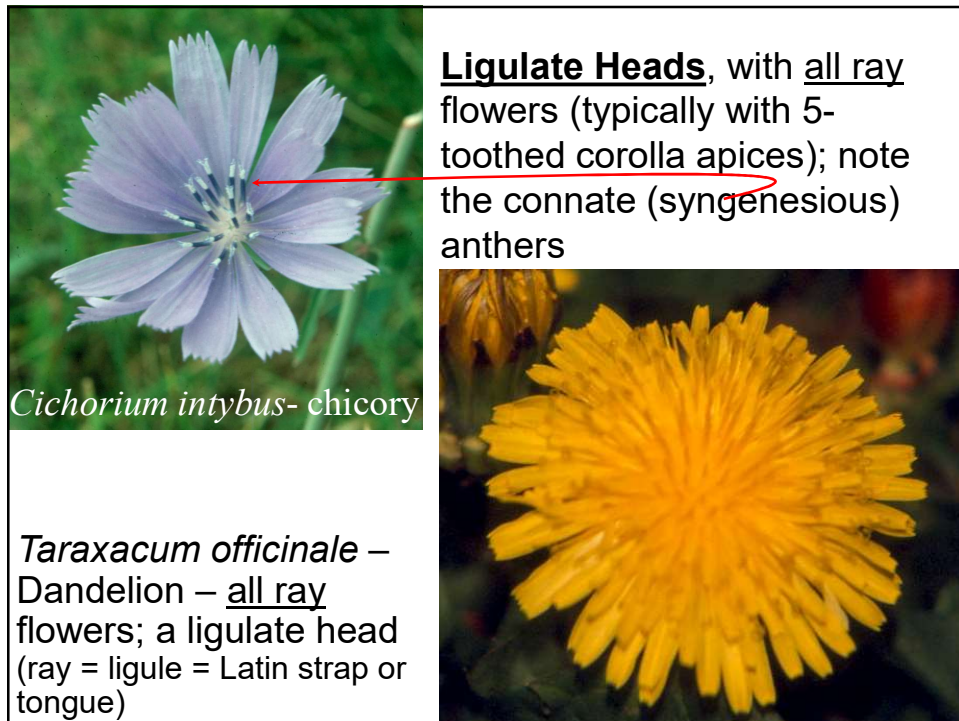
Xylorhiza orcuttii

Simpson, 2006



Zinnia sp.

Radiate Heads i.e. with central (bisexual) disk flowers and peripheral (pistillate & fertile) ray flowers. Sunflower is another example, (but the disk flowers are not so obvious as here).



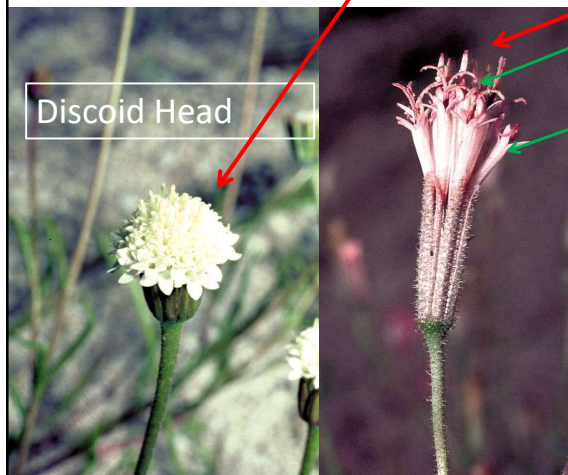
Chaptalia tomentosa – sunbonnets (the uncommon 3 floret head (trimorphic type))

Note bilabiate (2-lipped) corolla of central disk florets)



SE Flora

Disk flws. ctr., Filiform/Pistillate marginal: Head Disciform
Disk flws. (all): Heads Discoid



Discoid Head

Disk Flowers
(center/internal)

Filiform/Pistillate
Flowers (marginal)

Disciform Head
(resembles a
disc, but is not);
it is uncommon)

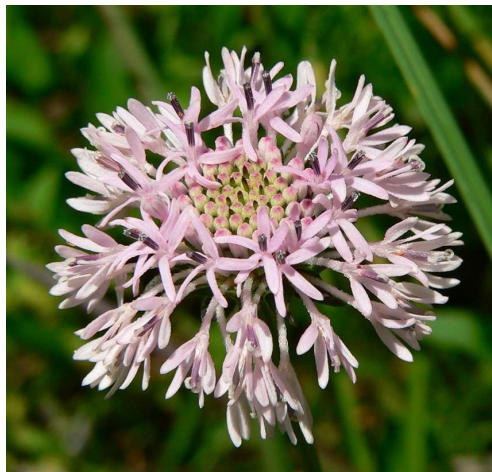
Chaenactis gabriuscula

Palafoxia arida

mod. from
Simpson, 2006



Centaurea cyanus
– Bachelor's
buttons April
1975



Marshallia morphri – Coosa Barbara's-
buttons

courtesy of R. Ware

RADIANT = a discoid head with a peripheral ring of flowers having much enlarged, often bilateral corollas (UC Berkeley)

A Summary: Types of Heads & Types of Flowers they Contain

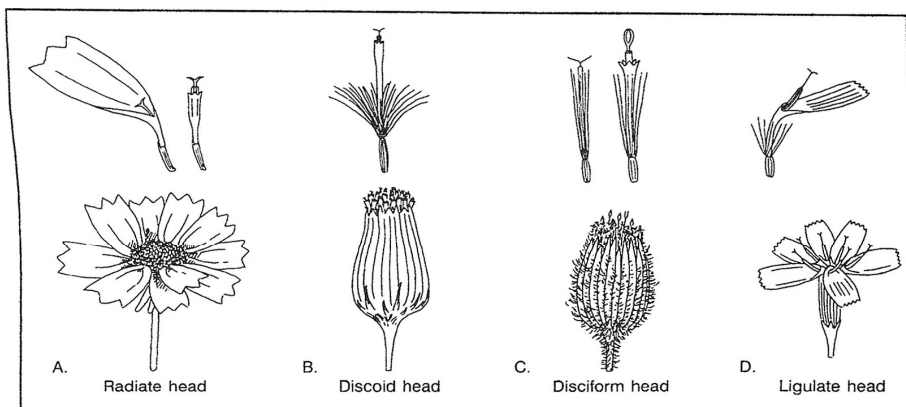


FIGURE 14-56 Types of heads and the flowers that they contain. A. Radiate head with ray and disk flowers. B. Discoid head with only disk flowers. C. Disciform heads with filiform flowers and disk flowers. D. Ligulate head with only ligulate flowers

Zack Murrell 6th ed.

The least common and most difficult to grasp is the Disciform (disc-like) head with both disk and filiform flowers. The latter are not only slender (filiform) but imperfect/pistillate also.

10/29/2020

Involucre morphology

one whorl



Senecio vulgaris

two whorls



Coreopsis maritima

many whorls



Encelia californica

Simpson, 2006

Involucre morphology

Phyllaries spiny



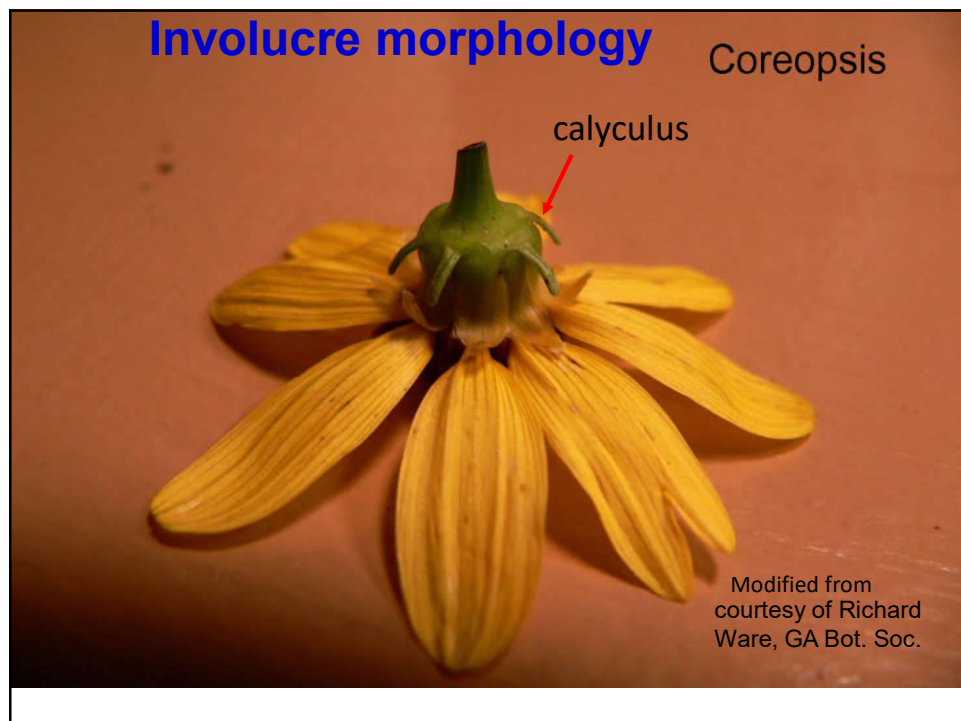
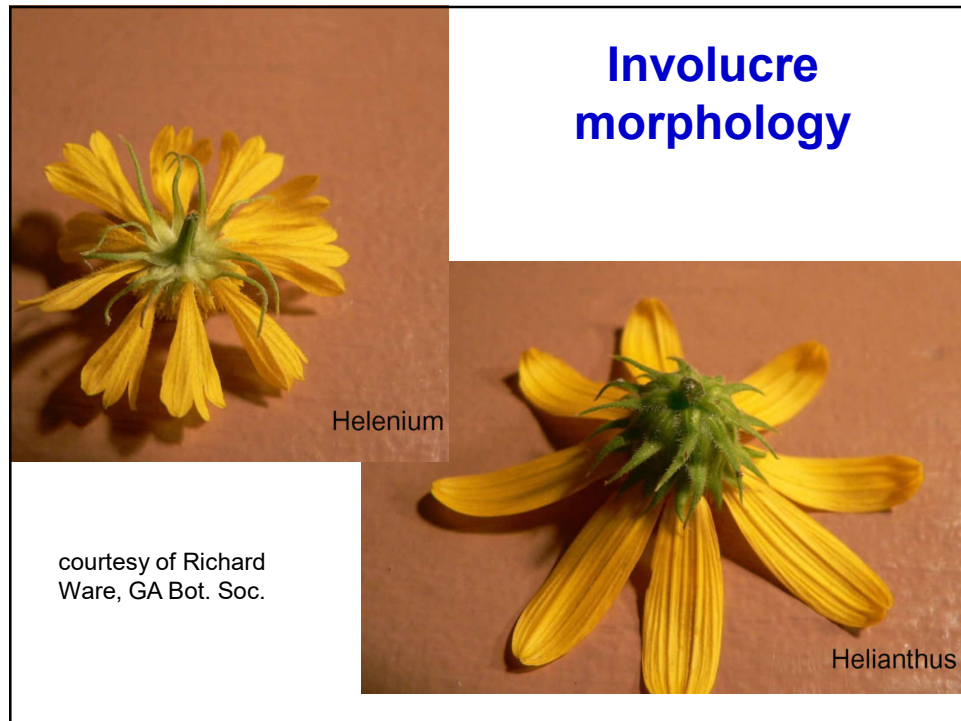
Cirsium vulgare

Phyllaries spiny & squarrose



Silybum marianum

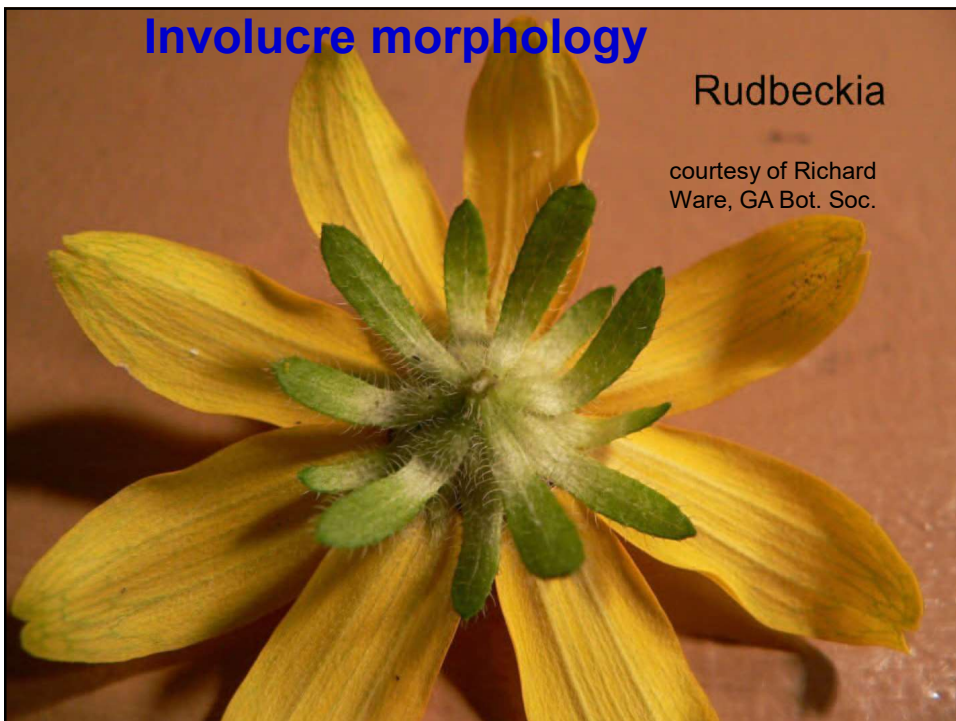
Simpson, 2006



Involucre morphology



Involucre morphology



Involucre morphology



Involucre morphology – uncommon modification

Coreopsis basalis – golden mane tickseed

Bobby's DL album

calyculus “ka lick’ u lus”
- an additional whorl of
bracts beneath (and
separate from) the
(regular) involucre; also
see *Bidens*, & *Cosmos*.



Involucre of *Chaptalia tomentosa* – sunbonnets
(the trimorphic head type pointed out earlier)



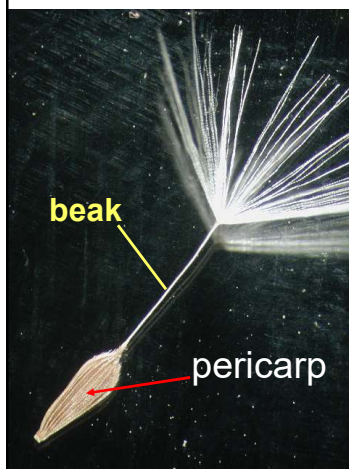
Imbricate involucre
(overlapping phyllaries)

Note also white tomentose
underside of leaves.



Pappus: modified
calyx & Cypsela

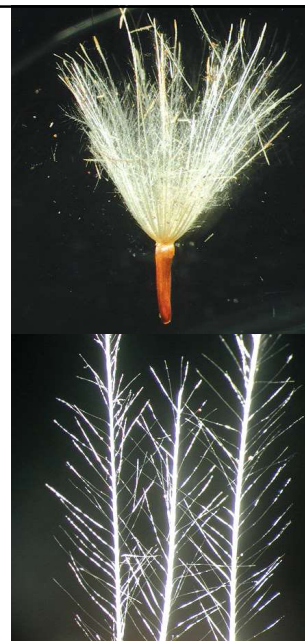
Mod. From Simpson, 2006



capillary bristles,
borne atop "beak"

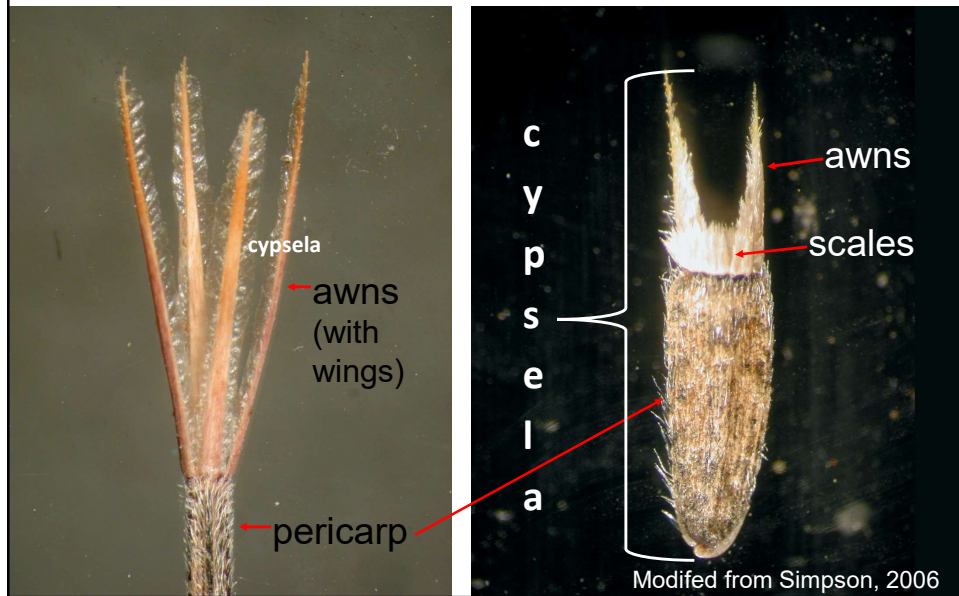


capillary bristles:
barbellate



capillary bristles:
plumose

Pappus: modified calyx & Cypsela (achene w. pappus)



Symphyotrichum – former “Aster” vs. false “Aster” - *Boltonia*

Note the difference in the involucre between the genera.

S. tenuifolium



S. cordifolium



Cypsela in 2 genera

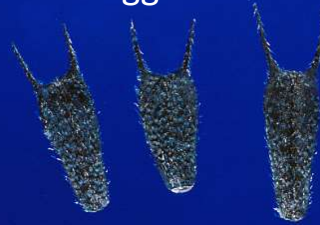


Cypsela with 2-awned pappus in *Boltonia diffusa*

DL Hattaway



Cypselas of 2 spp of *Bidens* – Beggars ticks



Judd 2008

Summary of Variations in Achenes & Pappus Structure

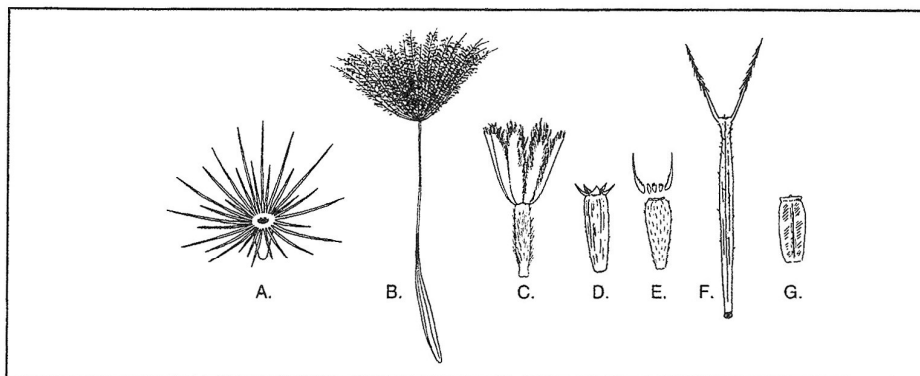
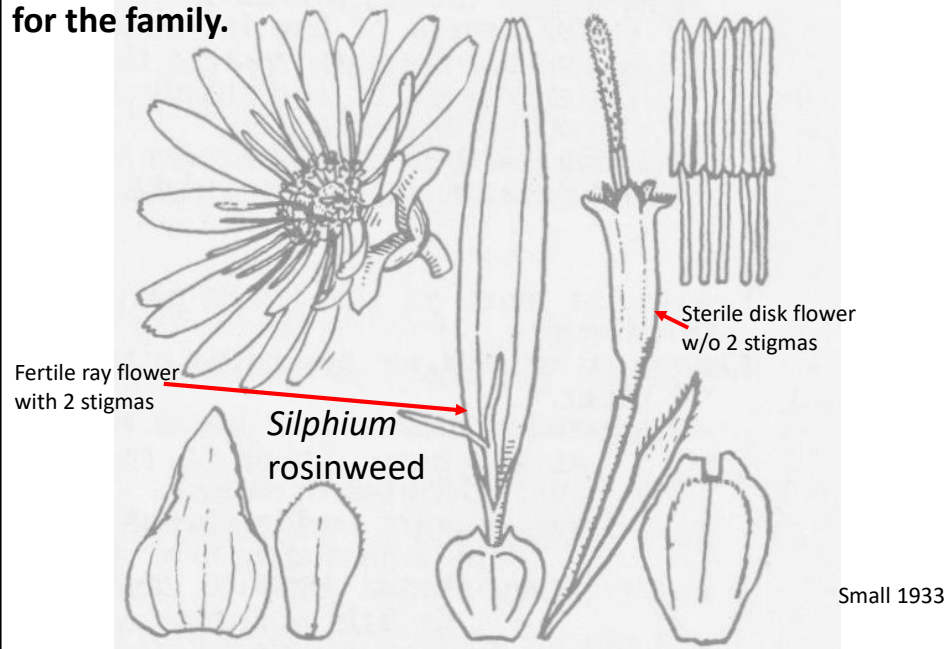


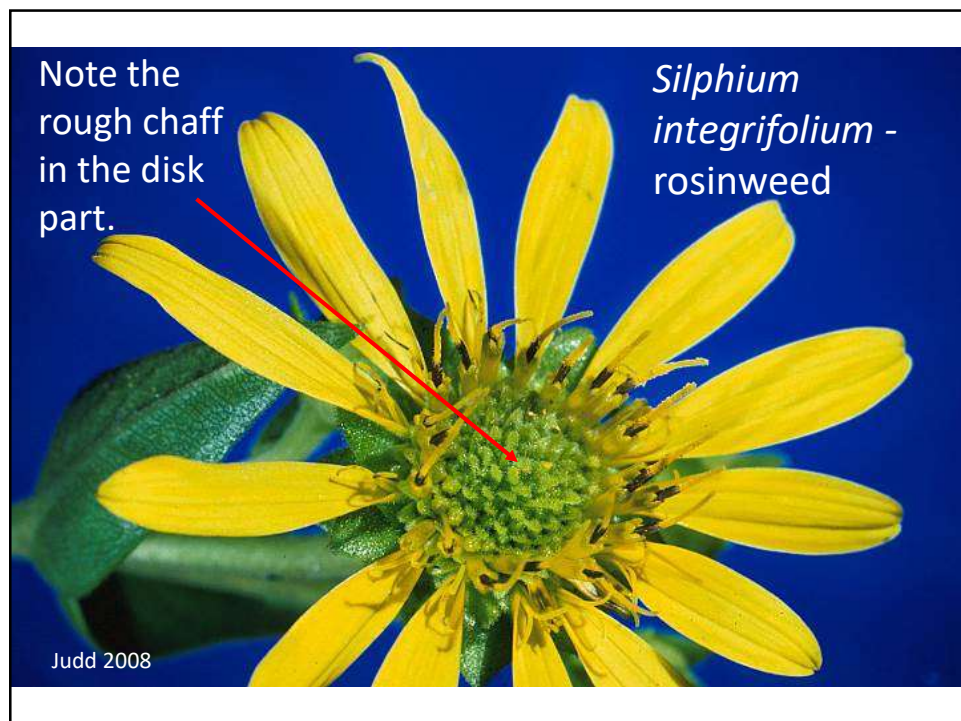
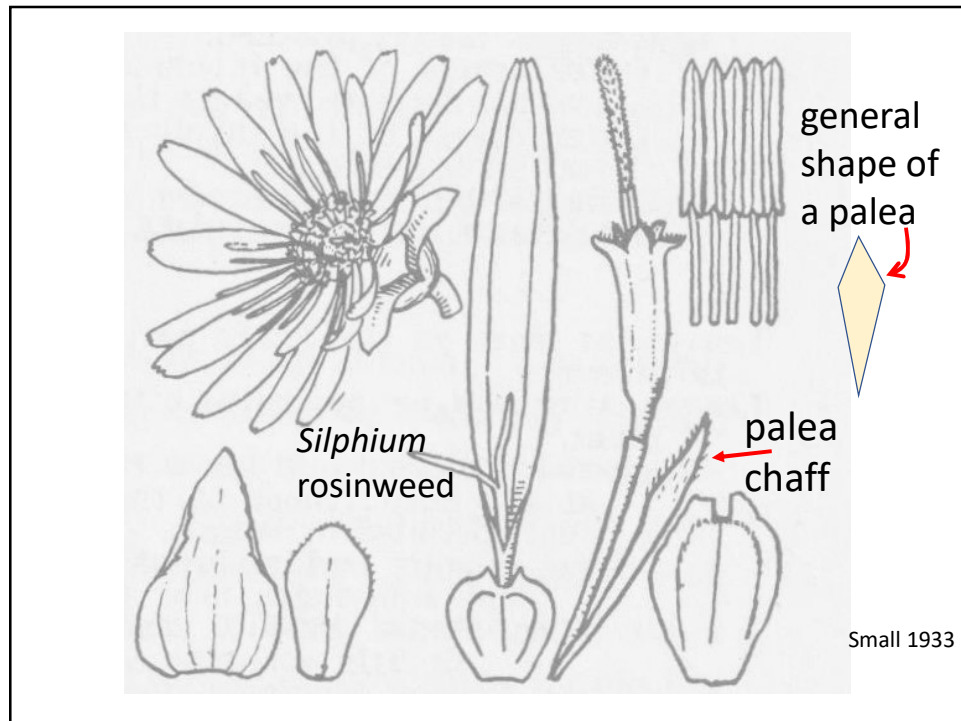
FIGURE 14-53 Variations of achenes and pappus structures. A. Pappus of simple bristles. B. Beaked achene with pappus of plumose (featherlike) bristles. C. Pappus of fringed scales. D. Pappus of a crown of low scales. E. Pappus of deciduous scales. F. Pappus of barbed awns. G. Epappose achene (without a pappus).

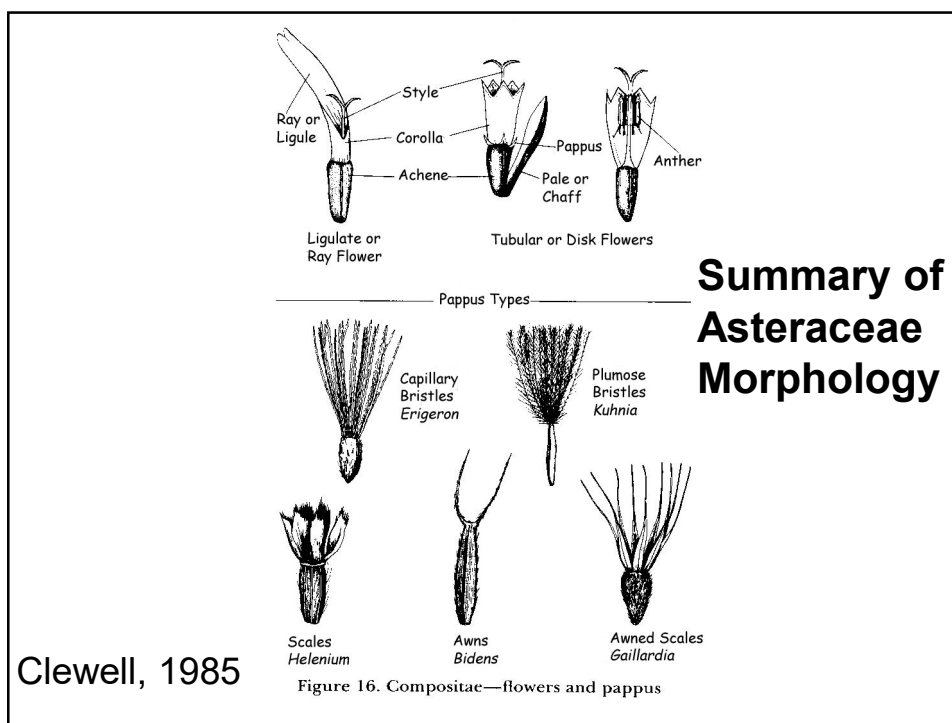
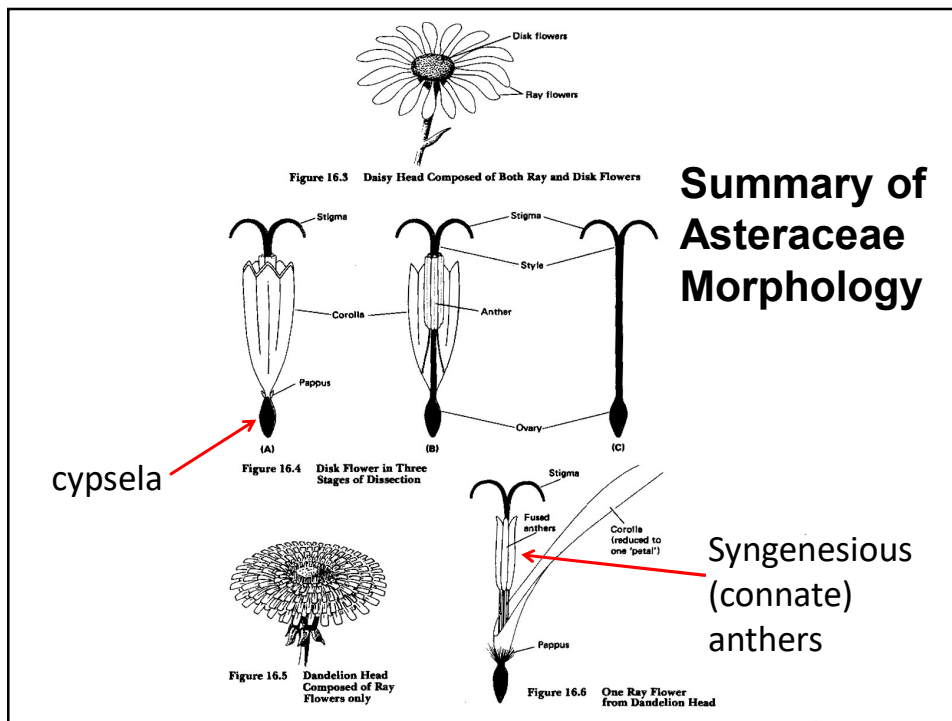
Zack Murrell 6th ed.


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Sexuality of the Head – What you see here is not the norm for the family.






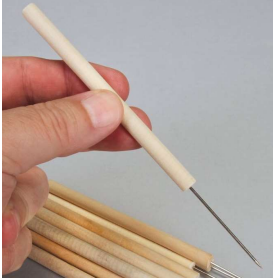






B & L Academic
StereoZoom Microscope
w. Zoom - Model ASZ45L2




B & L Academic StereoZoom
Microscope w. Zoom - Model
ASZ45L3









Tools for detail Work

- Dissecting scope w. Zoom (ctr knob)
- Loupe (10X) – can get w. light.
- Dissecting forceps (jeweler quality)
- Dissecting needles (cheap)
- Measuring ruler (metric & English)

More on Tools & Steps for Plant ID

1. books/pamphlets with keys and preferably descriptions & illustrations;
2. 10X lens (make sure you know how to use it);
3. measuring device;
4. knife or clippers
5. HIPDAD (see *Tipularia*, 2016);
6. computer or actual access to herbaria – e.g. UGA, FSU, USF; SERNEC (233 herbaria), BONAP.
7. internet tools like USDA Plants database (currently out of date but still useful).

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3 or 4 Steps in Plant ID

1. Make sure you have an avg. or typical specimen.
2. Do PLANT ANALYSIS 1st - see Plant Analysis handout. This is what Elpel (author of *Botany in a Day*) calls “Profiling Your Plant” on pg. 24 of the 6th ed.
3. Key the plant.
4. Then – “do” Post Keying Procedures (HIPDAD)

Before you Key – “Do” PA – Plant Analysis

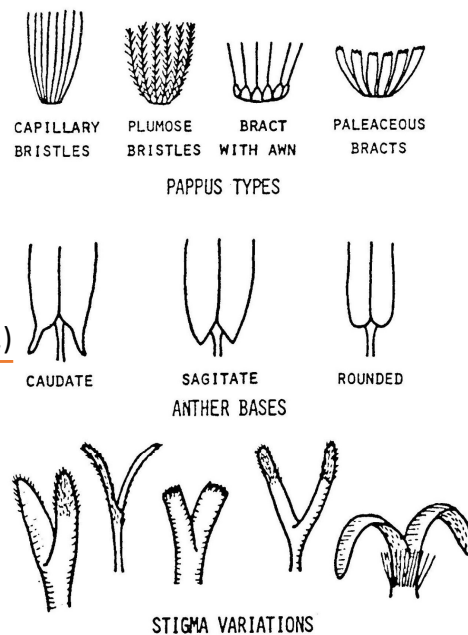
- Humans cannot multitask.
- Relates to team work bullet on previous slide – one member of 2-person team looks at plant while other reads the 2 leads to the key couplet. A third person – if available, could be the “glossary person.”
- Plant Analysis Handout (strictly for Asteraceae – see next slides)

What does Plant Analysis look like for the Asteraceae/Compositae?

1. Habit (annual, biennial or perennial (if last – herbaceous or woody))
2. Leaf arrangement (opposite etc.); focus on lower nodes
3. Involucre – imbricate or not; how many series?
4. Head type (which of 3 types)
5. Head/receptacle naked or chaffy (w. “pales”)
6. Head flat or conical – (latter like coneflower & black-eyed susans)
7. Pappus type (including no pappus – minority)
8. Sexuality of ray & disk florets – norm is perfect (or functionally staminate) disk florets with either pistillate or sterile ray florets (rarely perfect in SEUS flora).

Plant Analysis for Comps. (cont'd.)

“Esoteric” Stuff for Asteraceae Plant Analysis
(requires good magnification)
(+/- already dealt with top row; note barbellate not showing but...)



Adapted from handout Richard & Teresa Ware used ca. 2012.

**After Keying Out –“Do” Post Keying
Procedures (HIPDAD)**

HIPDAD – What Does It Mean?

H – Habitat (not to be confused with plant habit)

I - Illustrations (Photos and/or Drawings)

P – Phenology (including flowering time)

D - Distribution (or Range)

A - Abundance (e.g. Common, Occasional, Rare)

D - Description (or a Diagnosis)

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Short Practical Exercise – See *Eurybia* in Weakley
for GA – of 10 spp., how many are common in GA?