

Flowers & Pollinators

Flowers as resources

How flowers “control” plant mating

Evolution of pollinator interactions

Diversity of Floral Form and Function

- Why are flowers so diverse?
 - Form
 - Color
 - Size
 - Arrangement
 - Sexual function
- Selection by pollinators?

Wind pollination



Cercidiphyllum japonicum
(Cercidiphyllaceae)



Andropogon gerardii (Poaceae)

Floral Rewards

- Nutritive
 - Pollen
 - Nectar
 - Oil
 - Structural tissue (petals, etc.)
- Non-nutritive
 - Resin (construction)
 - Perfume (mating)
 - Shelter
 - Brood/mating site

Generalized insect pollination



Hedera helix (Araliaceae)



Stevia (Asteraceae)



Ceanothus fendleri
(Rhamnaceae)

Beetle Pollination



Magnolia macrophylla (Magnoliaceae)

Bee pollination



Trichostemma arizonicum (Lamiaceae)



Vigna caracalla (Fabaceae)

Nectar guides



Henrya insularis (Acanthaceae)

Post-pollination color change



Krameria sonorae (Krameriaceae)



Lupinus (Fabaceae)

Stamen dimorphism



Amoreuxia palmatifida
(Cochlospermaceae)



Athrostemma (Melastomataceae)

Buzz pollination



Solanum candidum (Solanaceae)

Hummingbird pollination



*Erythrina
flabelliformis*
(Fabaceae)



*Bilbergia
venezueloana*
(Bromeliaceae)



Cleistocactus
(Cactaceae/
Portulcaceae)



*Penstemon
barbatus*
(Plantaginaceae)

Butterfly pollination?



Asclepias tuberosa
(Apocynaceae)

Hawkmoth pollination



Oenothera deltoides (Onagraceae)



Datura wrightii (Solanaceae)



Lobivia (Cactaceae/Portulacaceae)

Bat pollination



Pseudobombax palmeri (Malvaceae)

Bat pollination



Kigelia (Bignoniaceae)

Fly pollination



Matelea tristiflora (Apocynaceae)

Fly Trap pollination



Ceropegia stapeliiformis (Apocynaceae)



Aristolochia elegans (Aristolochiaceae)

Fly Deception Pollination



Stapelia plantii (Apocynaceae)

Mate Deception Pollination



Ophrys speculum
mimics a female
wasp

From van der Cingel (1995)
An Atlas of Orchid
Pollination, Plate 79

“Pseudocopulation”



*Ophrys
tenthredinifera*
mounted by a
male bee

From van der Cingel (1995) *An Atlas of
Orchid Pollination*, Plate 97

Obligate Symbiosis



Yucca schottii (Agavaceae)

Evolution of pollination systems

- Use phylogeny to reconstruct ancestral states
- Test hypotheses
 - Direction of evolution
 - Convergence
 - Reversal

Origin of moth-pollinated cactus

- *Lophocereus* (senita cactus) is moth pollinated
- Related to bat-pollinated species
 - *Carnegiea* (saguaro cactus)
 - *Pachycereus* spp. (cardon and etcho cactus)
- And, hummingbird pollinated species
 - *Pachycereus marginatus*

Nectar feeding bat

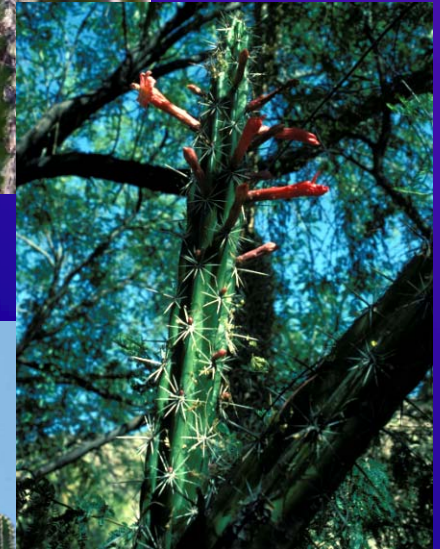
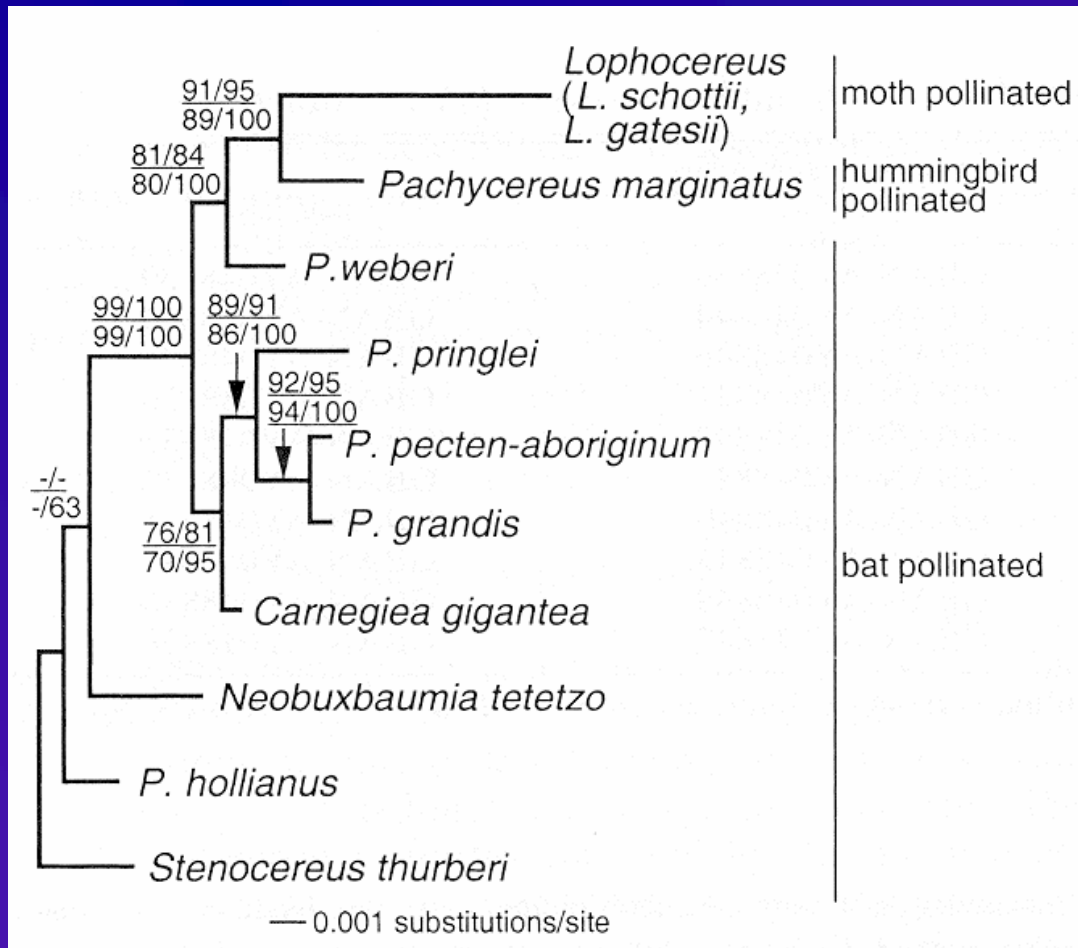
Leptonycteris curasoae



From T. H. Fleming & A. Valiente-Banuet (2002) *Columnar Cacti and Their Mutualists*, Fig. 12.3

Hypotheses

1. Senita is moth pollinated because of retention of the ancestral state
2. Senita is moth pollinated because of evolutionary reversal to an older ancestral state
3. Senita is moth pollinated due to evolution of a novel state



From S. Hartmann, et al. (2002) *American Journal of Botany* 89:1088

Interpretation

- Bat pollination is ancestral in columnar cacti
- Moth and hummingbird pollination are derived from bat pollination
- Moth pollination may be derived directly from bat pollination or indirectly through hummingbird pollination