Flowers are Magic

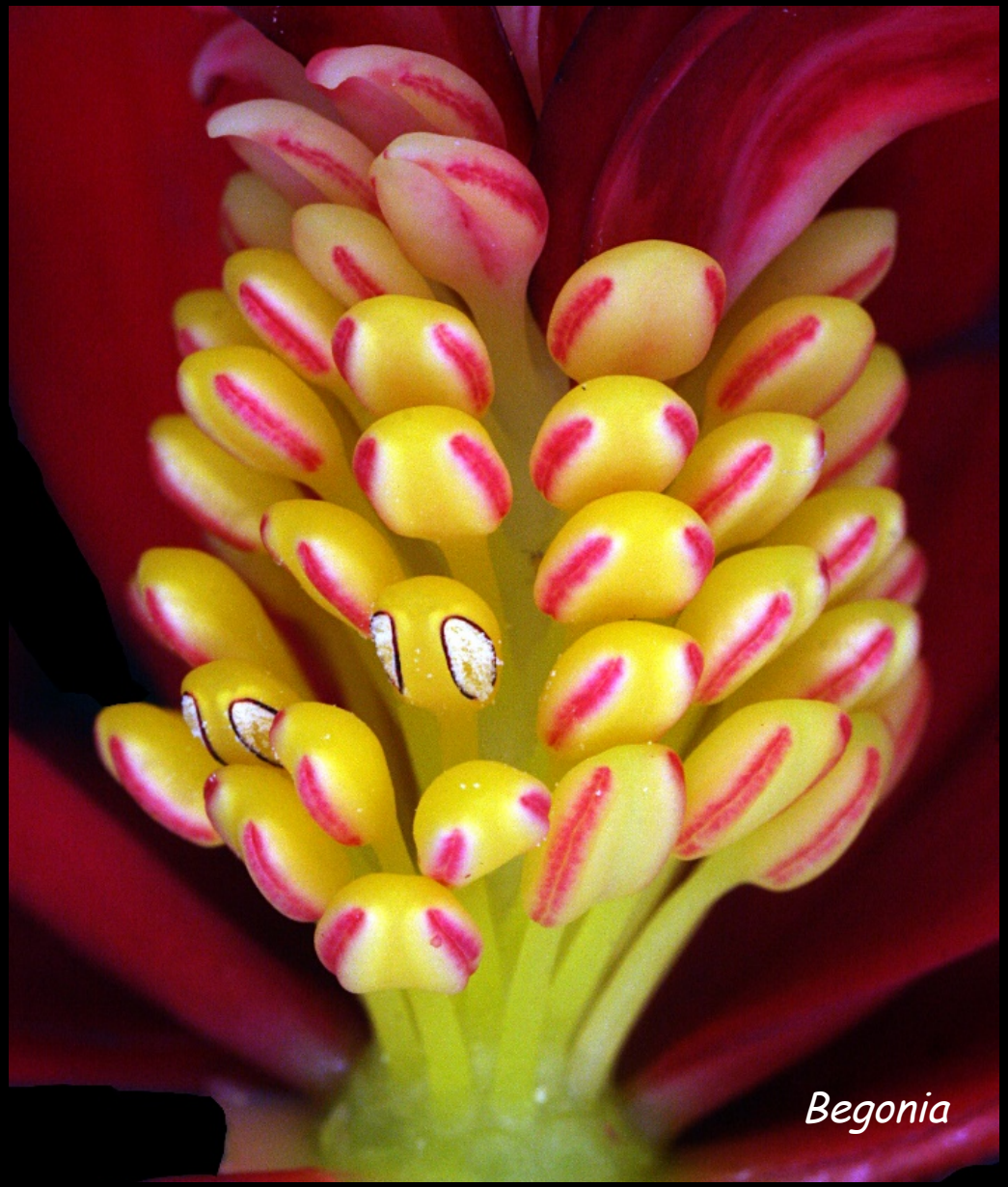
Robert Geneve
Department of Horticulture
University of Kentucky

UK UNIVERSITY OF KENTUCKY

Flowers are Magic

A closer look at floral diversity

Pollination



Begonia

Pollination

Pollination is the process of transferring pollen from the stamens to the stigmatic surface.

Deceit Pollination

Deceit pollination refers to a flower that offers no pollination reward, but deceptively entices the pollinator into visiting the flower.

It is thought that one-third of the ~30,000 orchid species employ some form of pollination deceit strategy.

Deceit Pollination

The basic types of deceit pollination strategies include:

- Mimicry of another plant that offers a food reward.
- Imitation of a floral part.
- Physical imitation of an insect.
- Brood site mimicry.
- Floral traps.

Butterfly orchid (*Psychopsis*)

Deceit Pollination

Mimicry

The most common form of food reward mimicry involves imitation of the floral features of a reward species. Floral features successfully imitated include color spectrum, shape and form, and scent.

Reward species - model

Mimic species

Deceit Pollination

Mimicry

Shooting star and elephant's head are morphologically similar and share the same buzz bee pollinators.

However, shooting star (the model) offers a nectar reward, while elephant's head (the mimic) does not.

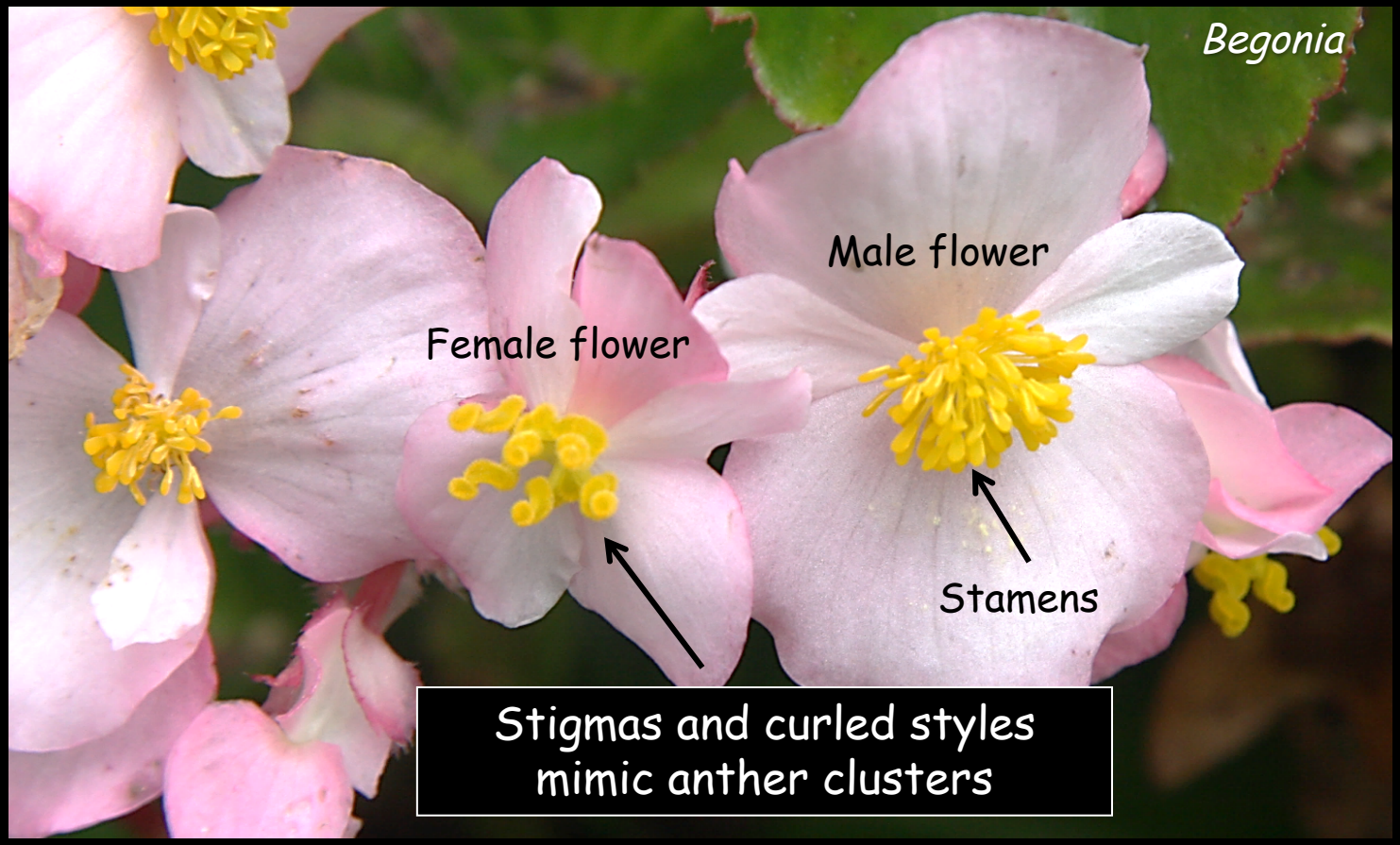
Shooting star (*Dodecatheon pulchellum*)

Elephant's head (*Pedicularis groenlandica*)

Deceit Pollination

Floral organ sexual identity

Bakerian mimicry is when the female flower that does not have a nutrient reward (nectar or pollen) is visited by a pollinator expecting the reward available in the male flower.



Deceit Pollination

Floral organ sexual identity

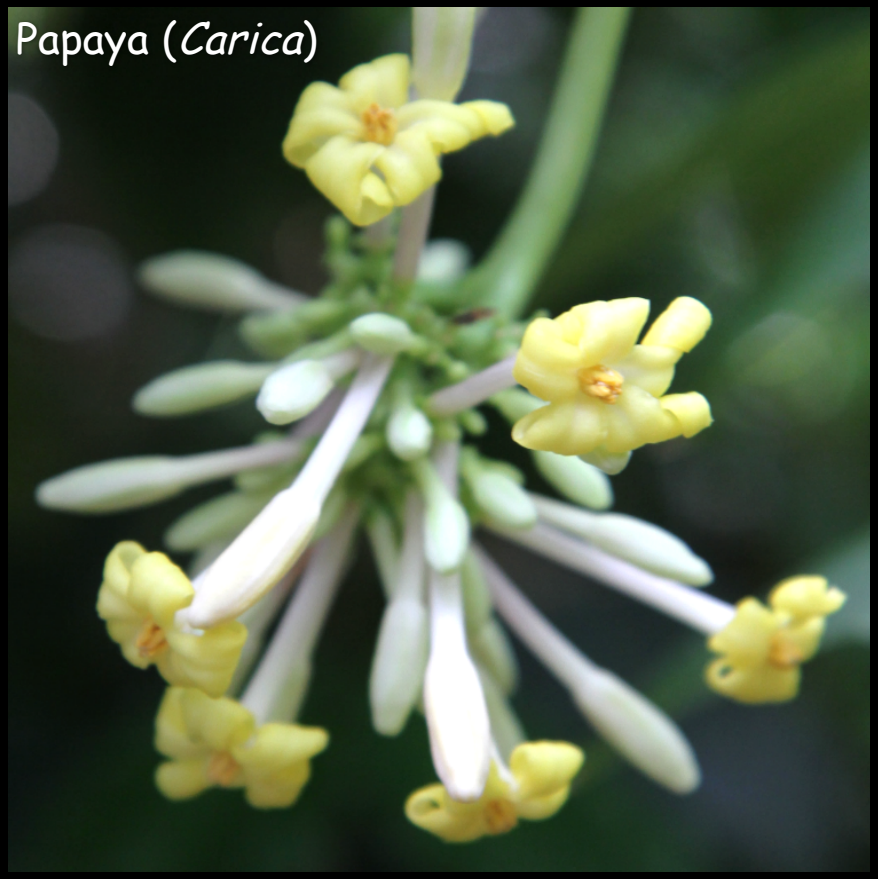
In *Pachysandra*, numerous attractant male flowers are produced above the female flowers.

Male flowers produce a nectar reward.

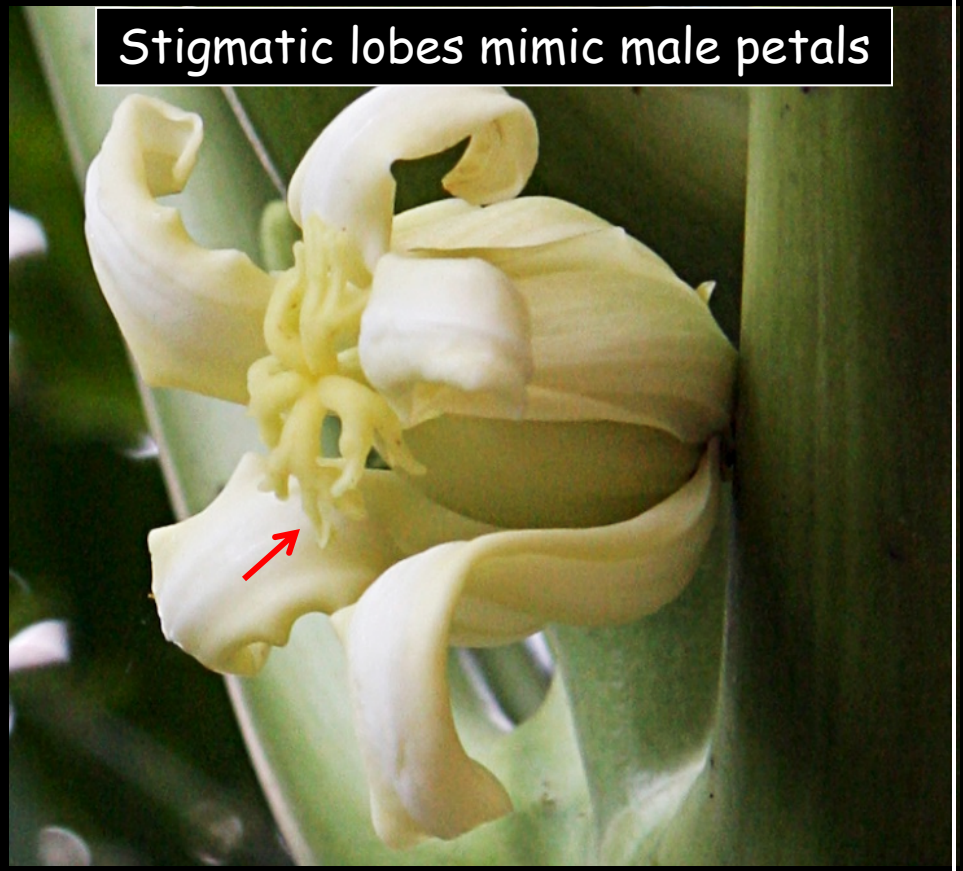
The imitating female flowers do not.

Deceit Pollination

Floral organ sexual identity



Male flowers with a nectar reward



Fleshy female flowers without a nectar reward

Deceit Pollination

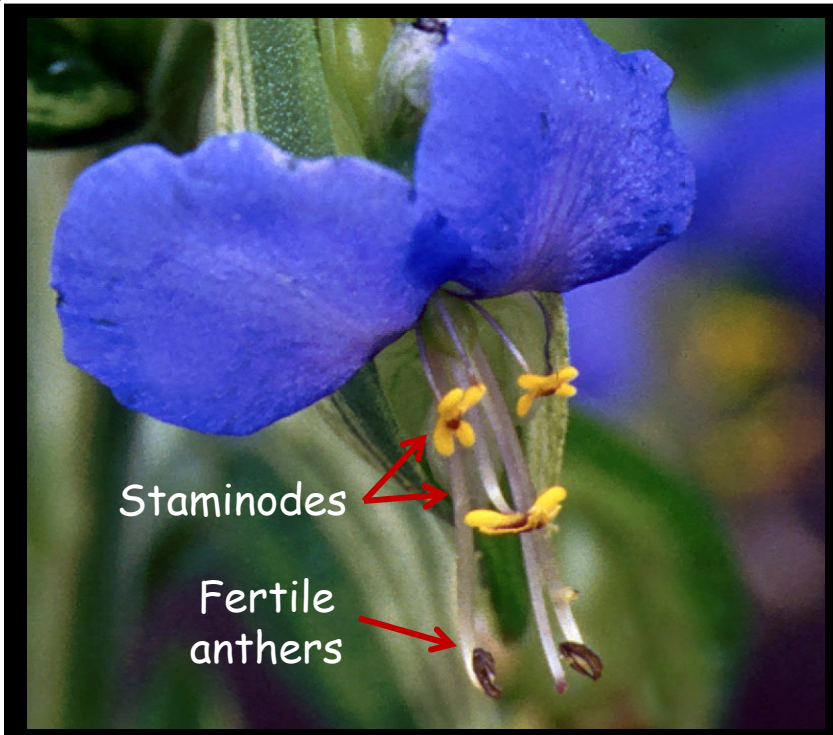
Floral organ sexual identity

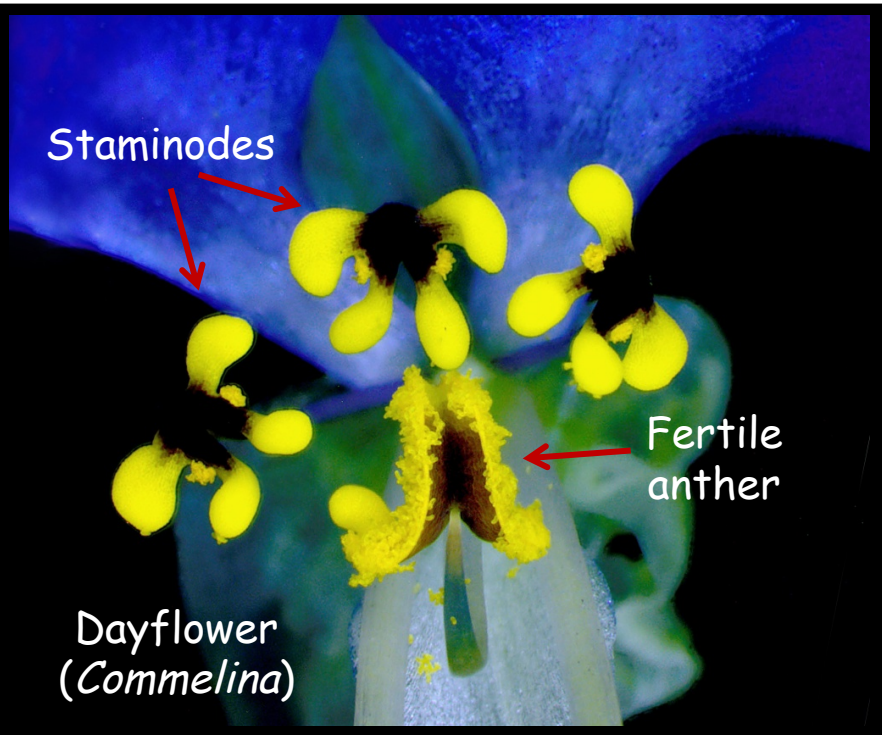
The orchid *Catasetum* produces separate dimorphic flowers.

Deceit Pollination

Floral organ mimicry - Pseudoanthers

Pseudoanthers attract pollinators, but do not offer a nectar or pollen reward.

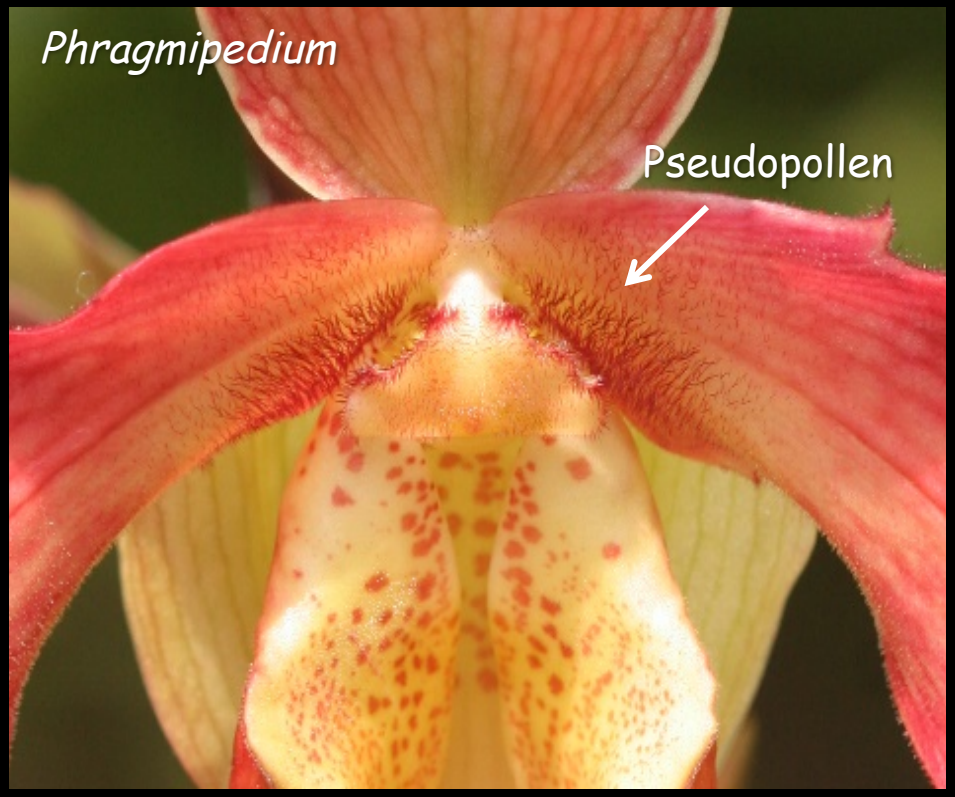




Deceit Pollination

Floral organ mimicry - Pseudopollen

Pseudopollen are trichomes on petals that resemble stamens.



Deceit Pollination

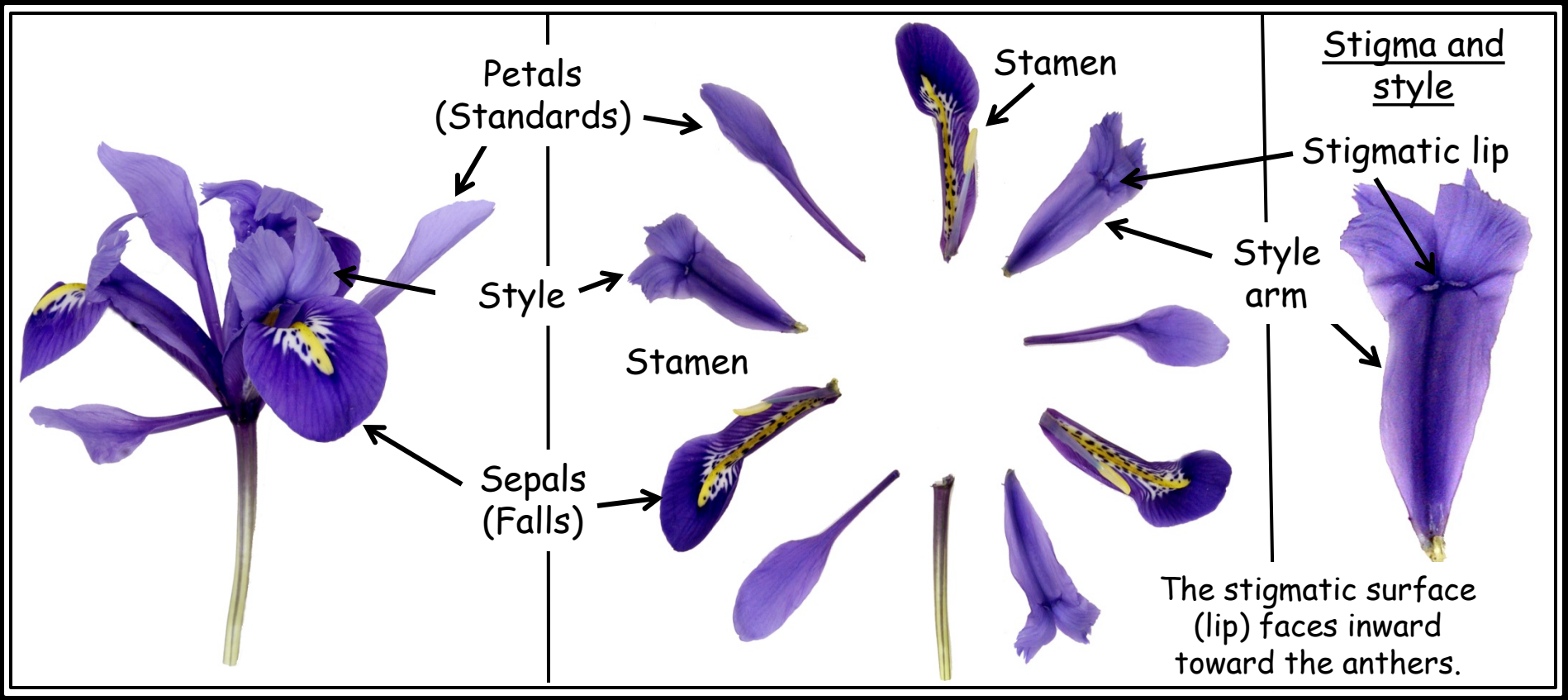
Floral organ mimicry - Pseudopollen

The "beard" in bearded iris is also an example of pseudopollen.

Deceit Pollination

Floral organ mimicry - Pseudopollen

The flower in *Iris* is highly modified. There are three sepals with a colored signal pattern that acts as a landing area for bees. There are three upright petals. The petal-like stigma and style has three segments that cover the stamens.



Deceit Pollination

Insect imitation – Prey deceit

Spider orchids deceive spider wasps into suspecting that the flowers are prey.

Spider orchid (*Brassia*)

Deceit Pollination

Insect imitation – Sexual deceit

The flowers in the orchid species, *Ophrys*, resembles a bee in shape and coloration.

The strategy is to attract male bees seeking female bee companionship.

The simulated mating moves pollinium from one flower to another.

It is estimated that over 1,000 species of orchids employ forms of sexual deceit.

Ophrys

Deceit Pollination

Brood site mimicry

Brood site mimicry is a type of reproductive deception where the flower mimics a site insects mistake for a place to deposit eggs.

Deceit Pollination

Brood site mimicry

A common feature of brood site flowers is the production of a fetid odor to attract carrion flies or dung beetles.

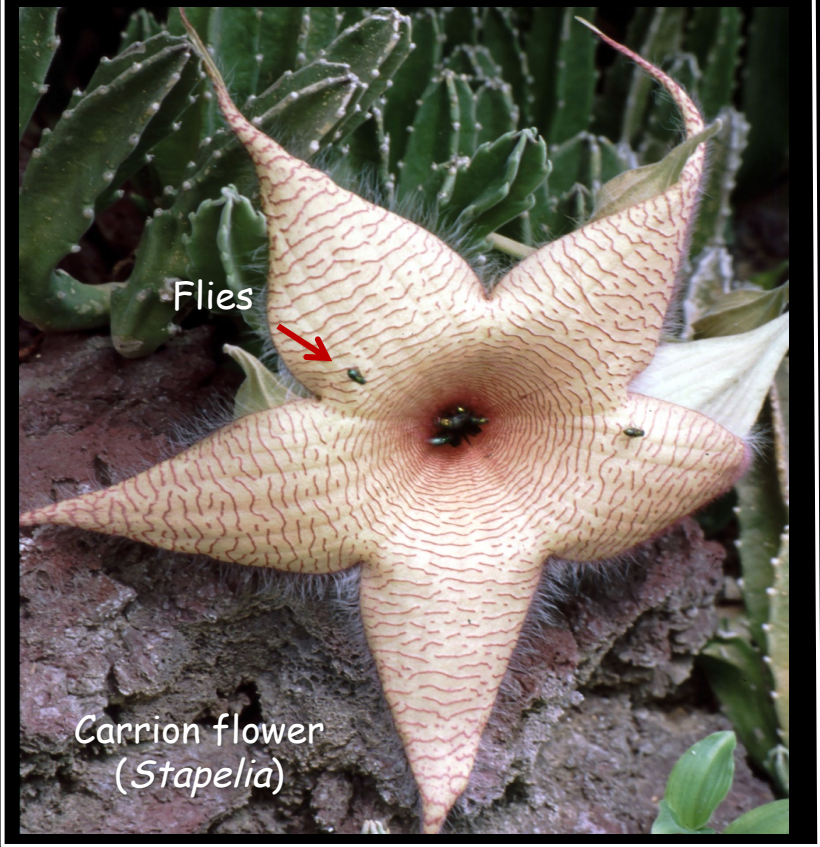

Stapelia


Amorphophalus

Deceit Pollination

Brood site mimicry

Carrion flowers have large star-shaped flowers and produce a fetid odor.



Deceit Pollination

Brood site mimicry

In addition to a fetid odor, brood site flowers are often dark colored with spots or patches on the flower surface.

Deceit Pollination

Brood site mimicry

Bat flower produces a large inflorescence with dark bracts, and almost black flowers.

These are characteristics of a fly (carrion) attracting flowering plant.

Deceit Pollination

Brood site mimicry

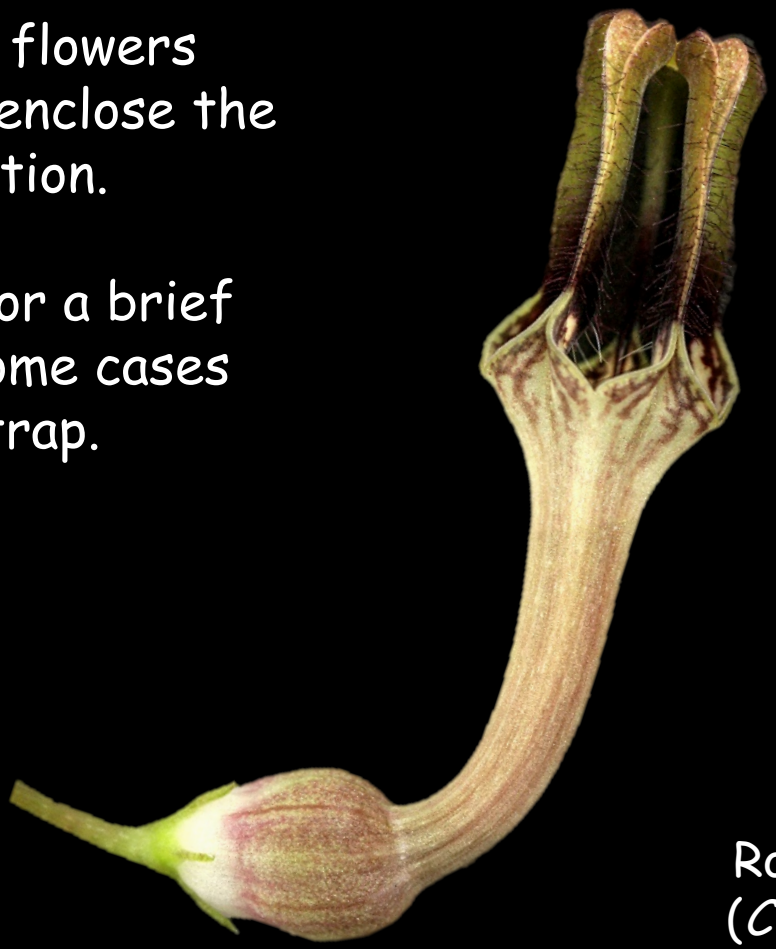
Bat flower (*Tacca*) is pollinated by mosquitoes.

Deceit Pollination

Brood site mimicry – Floral traps

In many cases, brood site flowers also present "traps" that enclose the insect to facilitate pollination.

Insects may be trapped for a brief time (1 to 5 days), or in some cases never released from the trap.



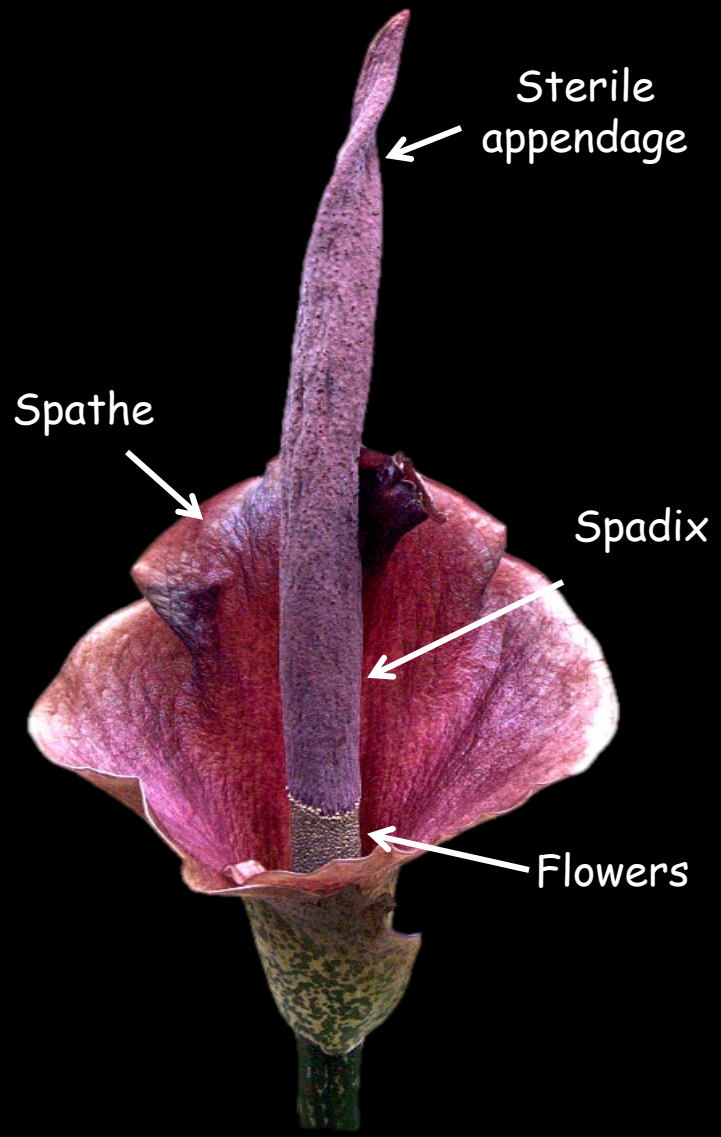
Rosary vine
(*Ceropegia*)

Deceit Pollination

Brood site mimicry – Floral traps

The flowers in *Amorphophalus*, are pollinated by large beetles attracted by their fetid odor.

The depth of the spathe chamber and its loose overhanging rim prevent the beetles from exiting before pollinating the flowers.



Deceit Pollination

Brood site mimicry - Floral traps

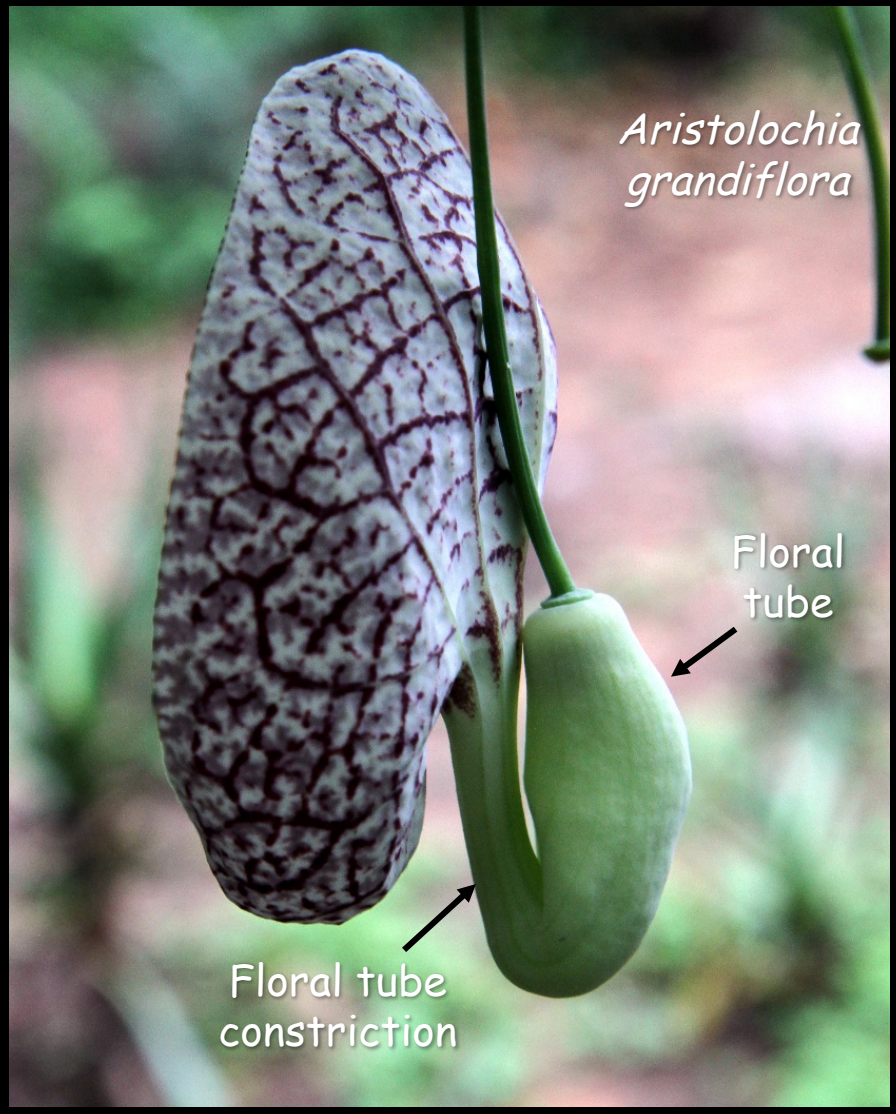
The chamber walls are lined with hairs or are slippery due to surface waxes that prevent insect escape.

Deceit Pollination

Brood site mimicry - Floral traps

Aristolochia flowers have an S-shaped floral (calyx) tube.

The upper portion of the tube has stiff, downward pointing hairs.



Deceit Pollination

Brood site mimicry - Floral traps

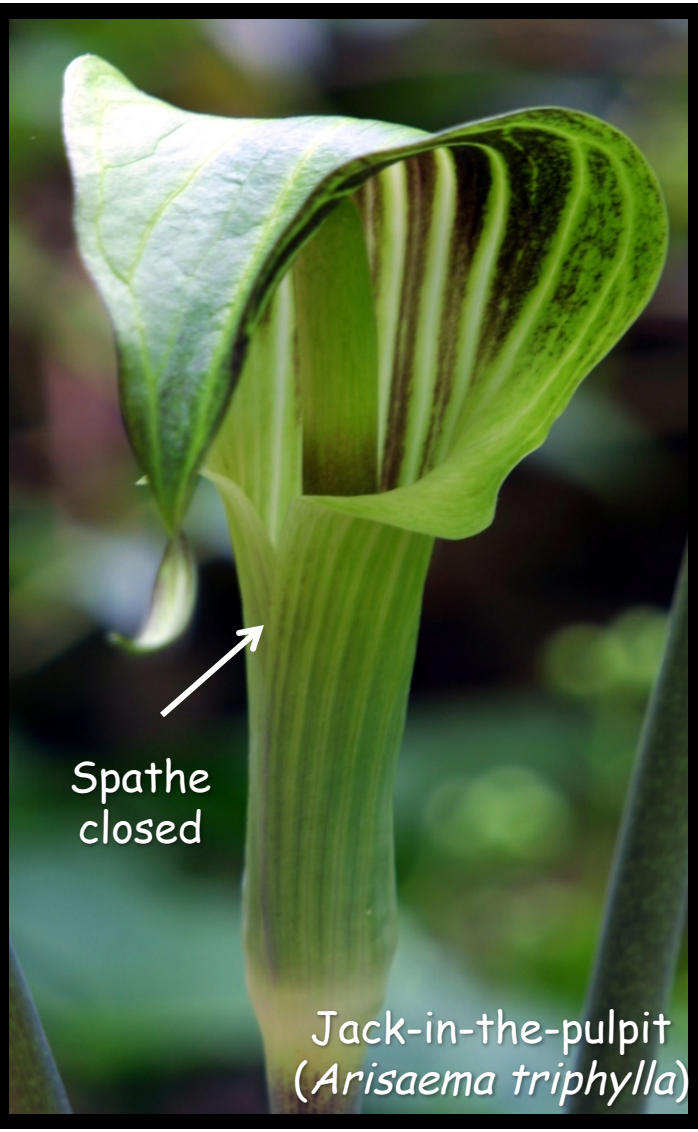
The spathe forms the floral trap in the arum family (Araceae).

There is often a constriction in the covering spathe that traps the insect in the lower chamber formed by the constriction.

Colocasia

Deceit Pollination

Brood site mimicry - Floral traps



Deceit Pollination

Brood site mimicry - Floral traps

Many slipper orchids have floral spots, bumps, hairs, colors and scents that attract hoverflies.

Deceit Pollination

Brood site mimicry - Floral traps

Hoverflies normally lay their eggs near aphid colonies because the aphids are the larval food source.

The spots on the petals mimic an aphid colony.

The hoverfly can become trapped in the slipper orchid's floral pouch and picks up pollen as it exits through the narrow opening by the column.

Deceit Pollination

Fragrance

Flower scent can also act as a reward for certain insects.

For example, male Orchid bees visit the orchid *Stanhopea* to collect the fragrance that the male bee uses as a pheromone in attracting females.

Deceit Pollination

Fragrance

Gongora and *Stanhopea* produce flowers that are pollinated as "fall through flowers".