Slide 1

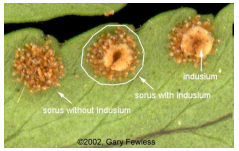
Reproductive Structures

Lecture 4/5

Slide 2

Plant Reproduction

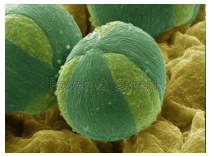
- Reproduction is the production of new individual plants
- Asexual reproduction
  - Vegetative growth
- Sexual Reproduction
- The exchange of genetic material between individuals
- Different strategies have evolved
- Non-flowering plants
  - Mosses, ferns
- Male sperm swim to fertilize female eggs
- Require water
- Short distance



Slide 3

Pollen

- Sperm cells carried from one plant to another inside of pollen
  - Gymnosperms, Angiosperms
- Pollen coat protects against desiccation
- Long distance transfer
- Either 1 or 3 pores through which pollen tube grows to transfer sperm to achieve fertilization
- Pollen coats both highly resistant and decorated
- Paleobotanists can identify species from pollen



Slide 4

Pollination

- Transfer of pollen from one individual plant to another
- Wind pollination
  - Oaks, grasses, sedges
  - Pollen grains light and smooth
  - Flowers inconspicuous no nutritive rewards
- Animal pollination
- Bees, butterflies, hummingbirds
- Pollen grains sticky
- Flowers large, scented and/or colored
- Nutrition reward
- Nectar, pollen

Slide 5

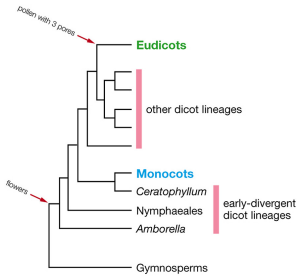
Flowering Plants

- Division Anthophyta
- 235,000 species
- ~ 350 Families
- First flowering plants appeared ~ 160 MYA
- Co-evolution with insects

Slide 6

Phylogeny of Flowering Plants

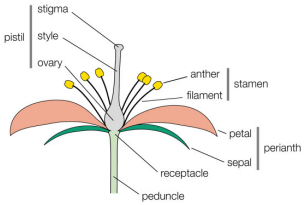
- First flowering plants had two seed leaves (cotyledons)



Slide 7

Anatomy of a Flower

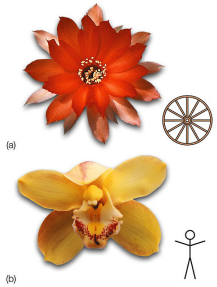
- Flower is a reproductive shoot
- Peduncle
  - Stem supporting flower
- Receptacle
  - Attachment of 4 whorls of modified leaves
- Outermost → innermost
- Sepals
- Petals
- Stamen
  - Male Parts
- Pistil (Carpel)
  - Female Parts



Slide 8

Floral Symmetry

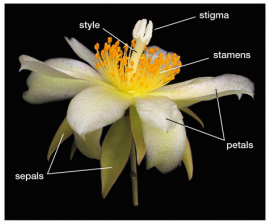
- Radial or Regular
- Actinomorphic
  - Daisy family
  - Asteraceae
- Bilateral Symmetry or Irregular
  - Zygomorphic
  - Pea Family
  - Fabaceae
  - Orchids



Slide 9

Sepals

- Outermost whorl
- Form bud
- May be green or colored
- May be free of fused into a calyx
- When colored and petal-like referred to as tepals together with petals form the perianth



(b)

Slide 10

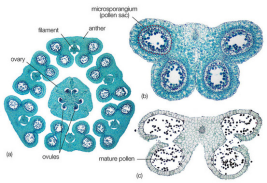
Petals

- May be green or colored
- May be free of fused into a corolla
- Function to attract pollinators
  - Color
  - scent
- Number of petals characteristic of families
- 3 - Trillium
- 4 – Crucifers, Brassicacese
- Evening Primrose Family
- 5 – most common
- 6 - Lillies

Slide 11

Stamen

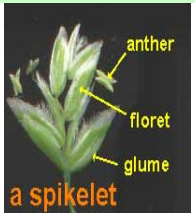
- Whorl of stamen inside of petals
- Anther
  - 4 pollen sacs which open by pores or split
- Filament
  - Positions anthers at best location for pollen transfer
- Number of stamen characteristic of a family
- Lilies 6 stamen
- Scrophulariaceae
- 2 pairs of stamens of different lengths
- Fifth sterile stamen



Slide 12

Wind Pollinated Flowers

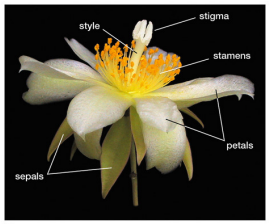
- Petals reduced or absent
- Pollen grains light and smooth
- Stigma feathery
- Wind rather non-specific
- Large quantities of pollen needed
- Grasses, (Poaceae)
- Sedges, (Cyperaceae)
- Oaks (Fagaceae)



Slide 13

Complete Flowers

- Possess all four whorls
- Sepals, petals, stamen, pistils
- Flowers with both stamen and pistils are termed perfect
- Flowers that lack either stamens or pistils are imperfect or unisexual



(b)

Slide 14

Staminate Flowers

- Only have stamen
- Produce pollen
- Corn Tassel
- Oak catkins

Slide 15

Pistillate Flowers

- Corn
- Silks of ear of corn are remnants of long styles of wind pollinated flowers one attached to each ovary
- Squash Family
  Cucurbitaceae – Pumpkins
- Pistillate flower develops into fruit
- Male flower

Slide 16

Monoecious

- Both male and female reproductive organs on the same individual
- Either in perfect flowers or
- Imperfect flowers
- oaks

Slide 17

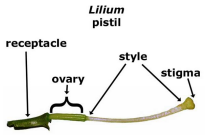
Dioecious

- “Two houses”
- Male and Female individual plants
- Flowers are always imperfect
- Coyote Brush
- Willows
- Papaya
- Cannabis

Slide 18

Pistil

- Also called Carpel
- Stigma
- Pollen attaches
- Species recognition
- May be lobed
- Style
- Ovary



Slide 19

Ovary and Ovules

- Ovary may contain more than one chamber of locule
- Ovules are egg cells
- Once fertilized develop into seeds
- Number of locules useful for field identification

Slide 20

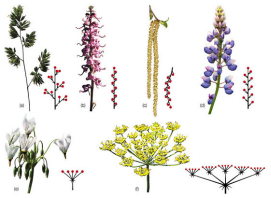
Ovary Position

- Superior
- Petals and sepals attach below ovary
- Inferior
- Petals and sepals attach above ovary
- Lily Family superior
- Iris Family Inferior

Slide 21

Inflorescences

- Multiple flowers attached to one stem or peduncle
- Flower attached directly to peduncle
  - Spikes
  - Catkins – tend to have imperfect flowers e.g. male staminate hazel flowers
- Flowers have separate secondary stalks or pedicels
  - Panicles – Peduncle branched
  - Racemes – Pedicels same length
  - Umbel – all pedicels branch from end of peduncle
  - Compound Umbel – carrots, fennel



Slide 22

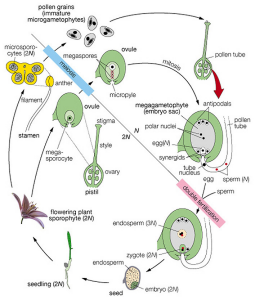
Composite Flower Heads

- Asteraceae
- Head composed of
- Disk Florets
- Ray Florets
- Under head or capitulum is an involucre composed of shingle-like bracts

Slide 23

Life Cycle of a Flowering Plant

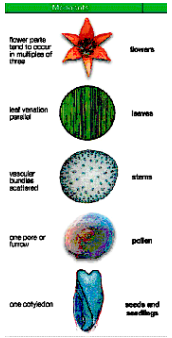
- Allteration of Generation
- Plant cells can have 2 copies of each chromosomes (diploid) or one (haploid)
- Gametes: pollen and eggs haploid
- Fertilization
- Two haploid nucleii fuse to form diploid cell
- n + n =2n



Slide 24

Monocots

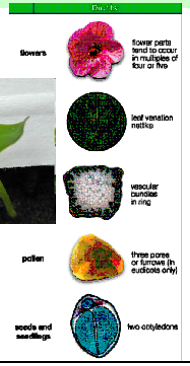
- Monocotyledons
- One seed leaf
- Leaves with parallel venation
- Vascular bundles scattered across stem
- Pollen with one pore
- Floral parts in 3s or multiples of 3
- Lily Family
- Irises
- Grasses
- Sedges
- Orchids
- Palms



Slide 25

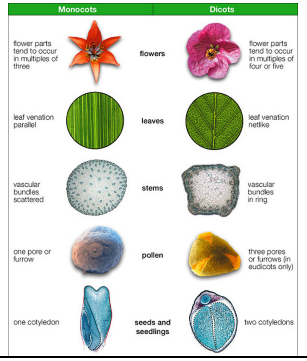
Dicots

- Dicotyledons
- Two cotyledons
- Net-like leaf venation
- Vascular bundles arranged in ring
- 3 pollen pores
- Floral parts in multiples of 4 or 5
  - Pea Family
  - Rose Family



Slide 26

Monocots v Dicots



Slide 27

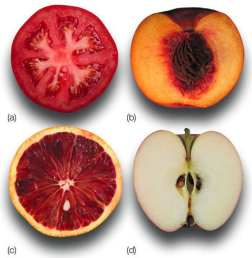
Function of Fruit

- Following fertilization
- Ovary and sometimes other structures develop into a fruit
- Ovules develop into seeds
- Function of Fruit is seed dispersal
- Fruit may be fleshy or dry

Slide 28

Simple Fruit

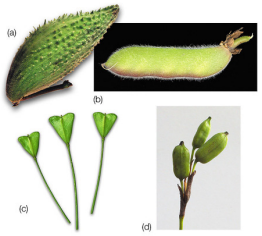
- Develops from single carpel or several fused carpels
- Fleshy simple fruit
- Berries
- Tomatoes
- grapes
- Drupes
- Stone fruit – cherries, olives
- Hesperidium
- citrus
- Pomes
- Apples and pears



Slide 29

Simple Dry Fruit - Dehiscent

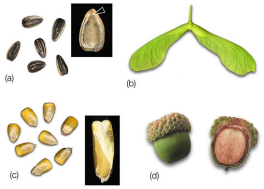
- Dehiscent dry fruit splits while still attached to plant releasing seeds
- Follicles
- Split down one side to release seeds
  - Milkweed
- Legume
  - Splits down two seams
  - Fabaceae
- Silique
  - Two fused carpels
  - Brassicaceae, Mustard Family
- Capsules
  - Most common
  - 2 or more fused carpels
  - Split open in a variety of ways
  - Important in field identification
  - Poppies,



Slide 30

Simple Dry Fruit - Indehiscent

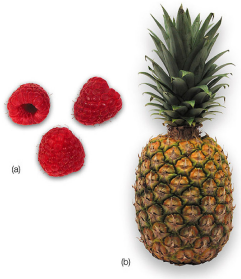
- Inehiscent dry fruit shed from plant without splitting
- Achene
  - Single seed attached at a single point
  - Sunflowers - Asteraceae
- Samaras
  - Achene enclosed in 'wings'
  - Maples, Ash
- Grains or Caryopses
  - Similar to achene but seed coat fused to fruit wall (bran)
- Nuts
- Fruit wall is hard (shell)
- Nut derived from multiple carpels in a compound ovary
- Acorns, Hazelnuts, chestnuts



Slide 31

Complex Fruit

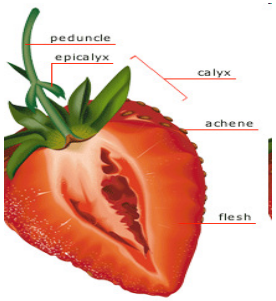
- Develop from multiple pistils or multiple flowers
- Aggregate fruit
  - One flower with many pistils – each develops into a drupelet
  - Raspberries, Blackberries
- Multiple Fruits
  - Fusion of flowers of an inflorescence
  - Pineapple

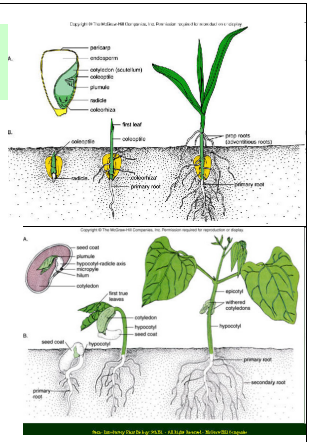


Slide 32

Strawberries

- A fruit with seeds on the outside
- Accessory fruit from multiple carpels
- Following fertilization receptacle ripens to form fruit
- Ovaries wither away exposing seeds on outside
- Hairs attached to seeds = old style of individual flowers
- Green leafy 'hull' of strawberries = calyx



Seeds

- Plant Embryo
- Germ
- Plumule – embryonic shoots
- Radical- embryonic roots
- Cotyledons – seed leaves
- Energy store