

# Plant Propagation

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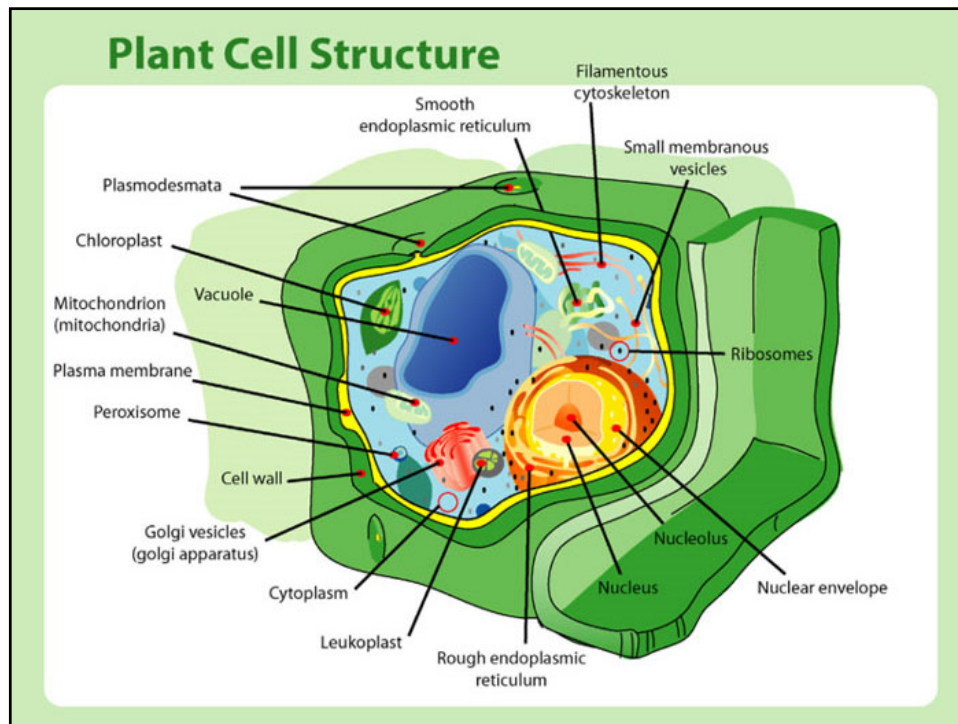
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## Plant Propagation

- Increase numbers of a species
- Perpetuate a species
- Maintain youthfulness of plant



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## Two Kinds of Propagation (Reproduction)

- Sexual
  - Pollen and egg combine genetic material to create a new, uniquely individual plant
- Asexual
  - Cloning a new individual from a part of a single parent plant



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## Two Types of Cell Division

- **Mitosis**
  - One mother cell divides to form two daughter cells that are genetically identical to the mother cell
  - This is normal plant growth
  - <http://youtu.be/4govZdjEBrs>
- **Meiosis**
  - One mother cell divides to form gametes (reproductive cells, egg, pollen)
  - No gamete formed is genetically identical to the gametes that combined to form the parent plant
  - [http://youtu.be/D1\\_mQS\\_FZ0](http://youtu.be/D1_mQS_FZ0)



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## Sexual Reproduction

- **Meiosis occurs in mother cells in flowers**
  - Chromosome number is cut in half
  - Random shuffling of genetic material (DNA) occurs
    - Pollen (male)
    - Egg (female)
- **Fertilization occurs**
  - Pollen grain lands on stigma and germinates, and deposits its chromosomes, in the egg, a seed is formed



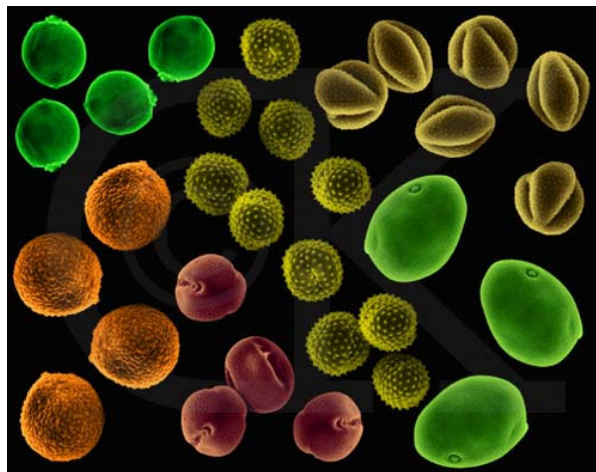
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### Lilly Flower



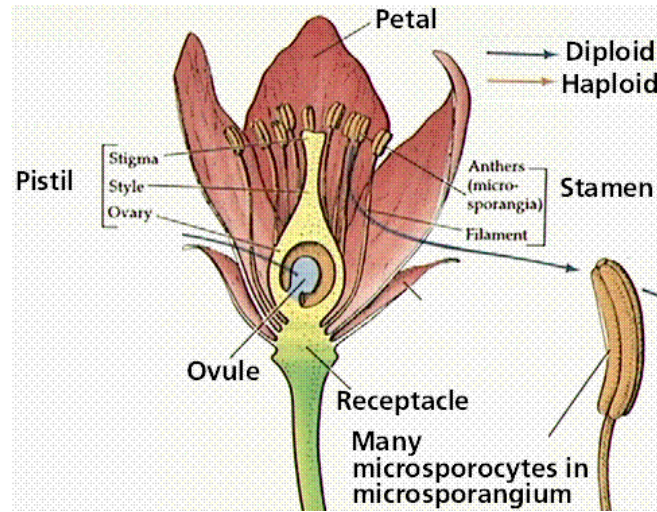
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### Pollen Grains



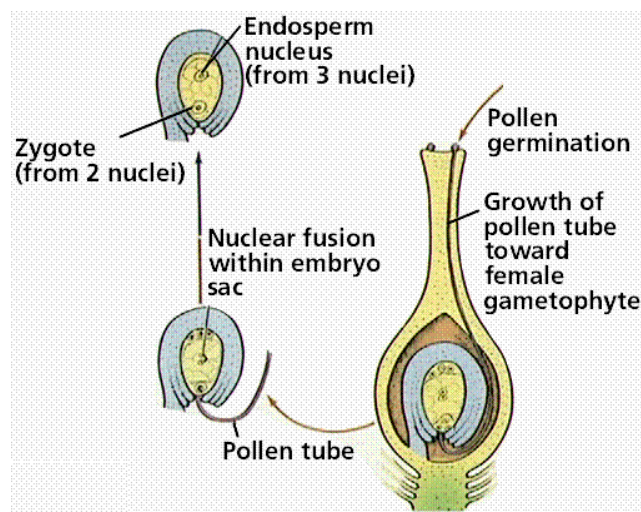
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### Fertilization I



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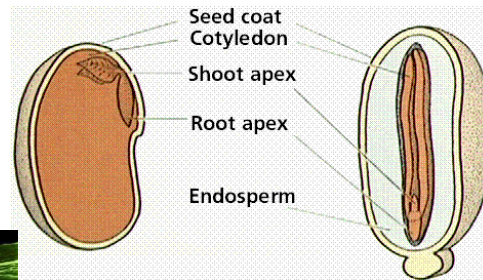
### Fertilization II



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## Seed Morphology

- Seed Coat
- Endosperm
- Embryo



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## Creating Hybrids



1. Remove anthers from the flower of the female parent prior to pollen maturation to prevent self-pollination.
2. Collect pollen from the male parent.
3. Transfer the pollen to the stigma of the female parent using a fine brush.
4. Tag the flower, indicating the date and the cross made (female x male).
5. Harvest the mature seed.
6. Plant the seed.

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## Propagation from Seed

- Use high quality seed
- Use seed that is adapted to local conditions
- Check seed purity (weeds, chaff, etc)
- Store in a cool (40oF) dry place
- Seed Saving-know what you are doing



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## Factors that affect seed germination

- Water
- Oxygen
- Light
- Temperature
- Dormancy



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## Germination - Water

- Seed coat may inhibit imbibition (absorption) of water
- Adequate supply of water is crucial after seed coat has been overcome
- Too little water and the embryo will not grow properly
- Too much water can encourage disease



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## Germination - Light

- Some seeds have a light requirement that must be met
- Others will not germinate if light is present
- Seed packets should provide instructions



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## Germination - Oxygen

- All live seeds are respiring
- Dormant seeds have a lower requirement
- Once a seed starts to germinate, aeration is critical



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## Germination - Temperature

- Some seeds are sensitive to germination temperature
- It is usually heat that increases germination (i.e. tomatoes, beans)
- Bottom heat is used in some greenhouse situations
- In the environment, soil temperature is critical for proper germination



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## Seed Dormancy

- Innate ability of a seed to germinate when conditions are optimum for survival
- Types
  - Physical (seed coat)
  - Physiological/Chemical
  - None



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## Seed Dormancy - Physical

- Seed coat – air/water cannot get in even if temperature is correct
- Can be broken by
  - Sandpaper
  - File
  - Going through an animal's gut
  - Soil microorganisms
  - Fire



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## Seed Dormancy - Physical



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## Seed Dormancy – Physiological/Chemical

- Hormones present in the seed prevent ripening or development of the embryo
- Stratification
  - Vermiculite
  - Sand
  - Paper towel



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## Starting Seeds - Media

- Free of disease, weeds, and insects
- Homemade mix
  - 1/3 sterile soil
  - 1/3 sand, vermiculite, or perlite
  - 1/3 peat moss
- Commercial potting soil
- Do not use untreated soil



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## Starting Seeds - Containers

- Buy commercial flats and containers from gardening supply companies or recycle and sanitize



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## Starting Seeds - Containers

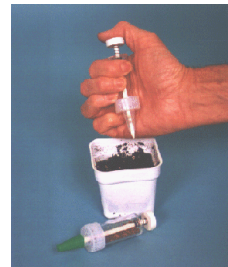
- Wood seed trays can be built
- Used commercial flats and pony packs should be sanitized in a 10% bleach solution
- Milk cartons, pie pans, etc can also be used if sanitized and holes are punched



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## Seeding

- Start seeds at proper time
- Plant at the proper depth
- Legumes should be inoculated
- Cover seed with appropriate material: perlite, vermiculite, sand
- Pre-germination is a good way to start tomatoes, peppers, and other plants that need an early start



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## Transplanting Seedlings

- Don't leave seedlings in flat or container too long
- Allow a "hardening off" period
- Be gentle with the root systems
- Give them adequate space
- Water and fertilize after transplanting



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## Asexual Propagation

- Cuttings
- Layering
- Division
- Grafting
- Budding
- Tissue Culture



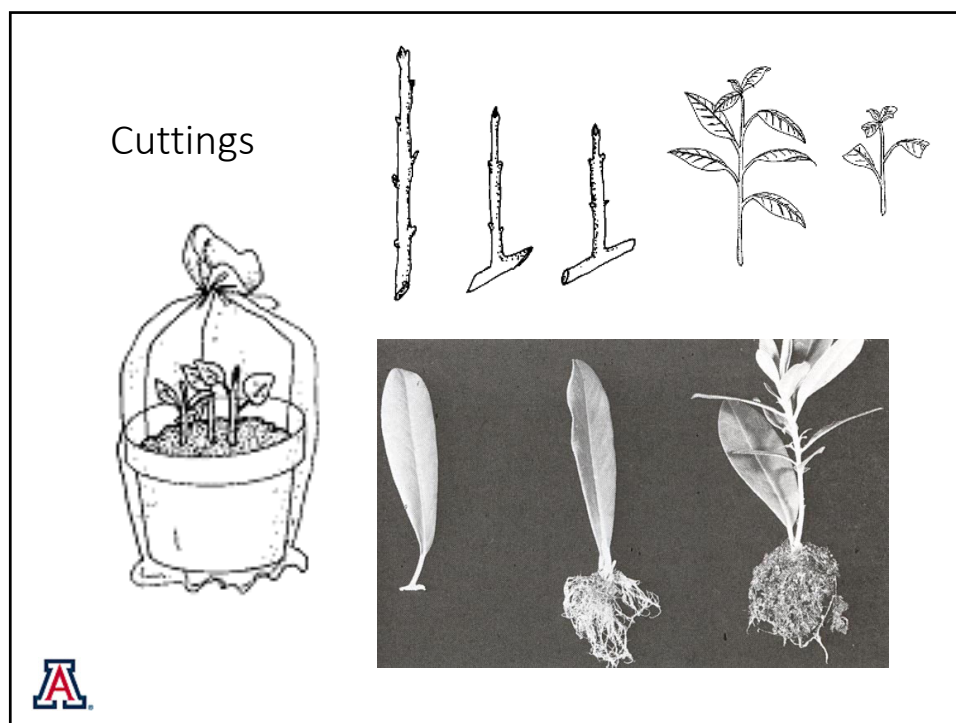
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## Cuttings

- Stem – most common
  - Tropicals – anytime
  - Hardwood – fall or dormant season best
- Others – tip, cane, eye, heel, leaf, root
- Media – appropriate for plant
- Necessary: moist environment, well aerated, and minimal disease
- Success may be increased with rooting hormones/auxins and bottom heat

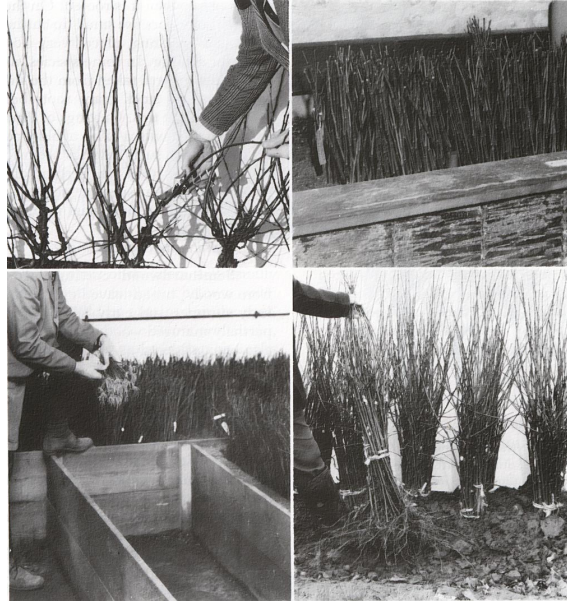


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## Production Cuttings



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## Layering

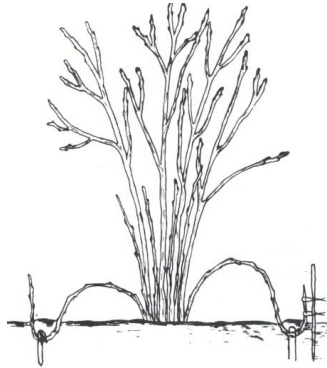
- Tip, simple, compound, mound, air
  - Stem is attached to parent plant while in contact with rooting medium



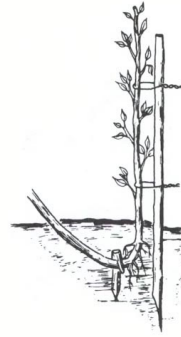
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## Layering



Shoots are bent over to the ground in early spring or fall. A second bend is made in branch a short distance from tip, which is covered with soil and held in place with wire or wood stakes. The stem is sometimes injured at the underground section which stimulates rooting. Includes notching, bending, wiring, or girdling.



Roots form on the buried part of the shoot near the bend.

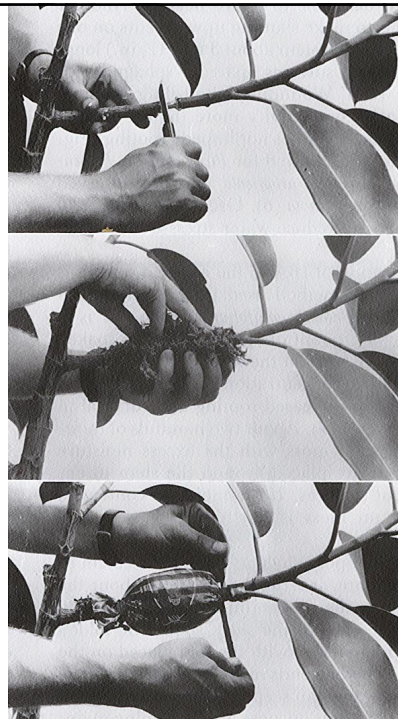


The rooted layer is removed from the parent plant.

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## Air Layering

1. Girdle stem
2. Wrap with sphagnum peat
3. Wrap with plastic bag
4. Wrap with foil to exclude light



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## Separation/Division

- Bulbs, Corms, grasses, ferns, palms, bamboo, and others
- Very easy to do



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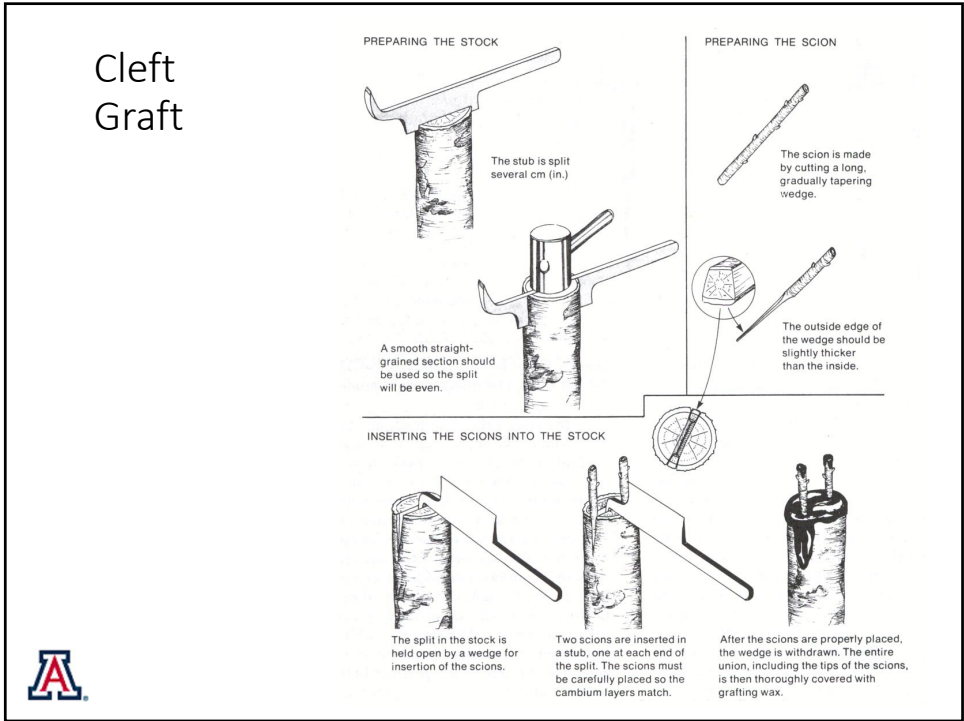
## Grafting

- **Cleft Grafting**
  - Make sure wood is correctly polarized
  - Scion 3/8 to 5/8 inch diameter
  - Use a sharp wedge to split rootstock
  - Align cambium layers of scion and rootstock
  - Cover with grafting wax
- **Whip Graft**
  - Use similar diameters and wrap with string and wax



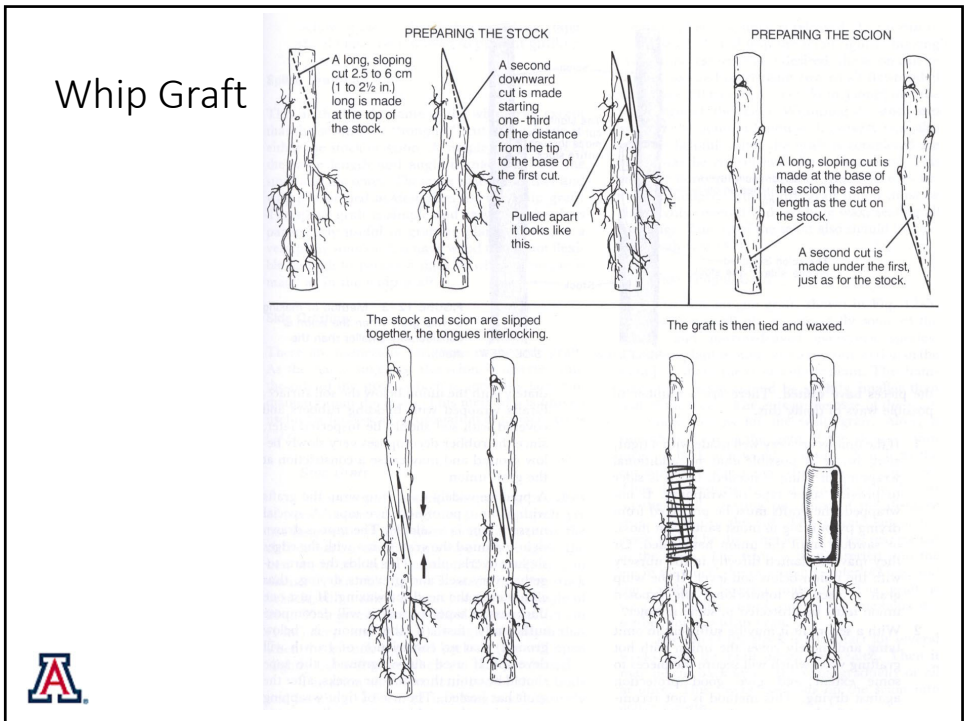
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# Cleft Graft



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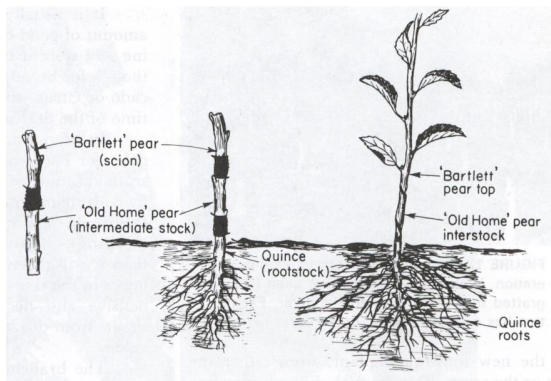
# Whip Graft



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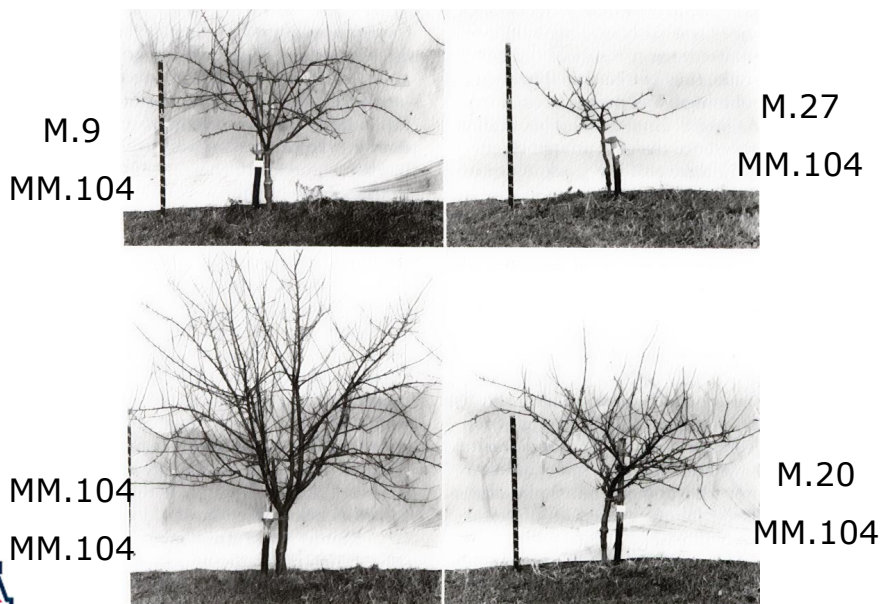
## Interstock Grafting

1. Scion
2. Interstock
3. Rootstock



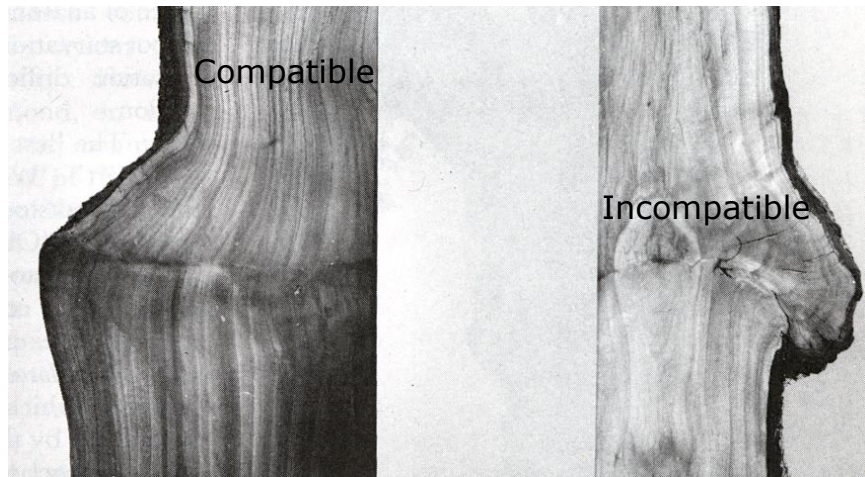
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## Interstock Grafting Scion=Pippin Apple



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### Graft Unions



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### Bridge Graft



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## Inarch Graft

- Seedlings are planted next to a valuable tree and grafted to replace weak rootstock or invigorate the tree



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## Budding

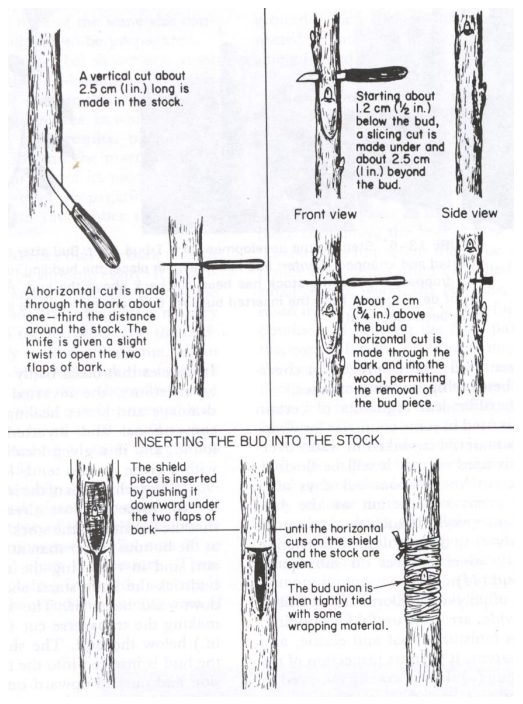
- Woody plants
- Using a bud and a small piece of bark from scion
- Especially useful when scion wood is limited
- Stronger union than grafting



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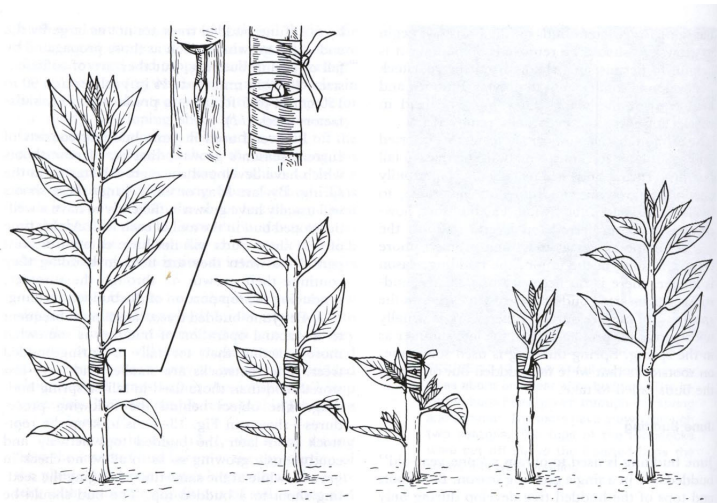
## T Budding

- Bark must be “slipping”



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## T Budding



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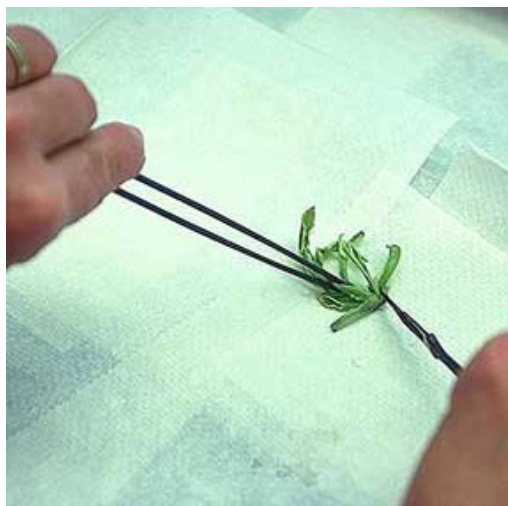
## Tissue Culture /Micropropagation

- Select desirable plant
- Sterilize tissue
- Plant in sterile media/manipulate to root and induce juvenile state
- Grow in sterile culture and propagate
- Transfer to nursery containers



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## Tissue Culture - Sterilize



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### Tissue Culture – Plant in Media



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### Tissue Culture – Transfer to Jar



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## Tissue Culture – Grow Under Lights



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## Tissue Culture – Sterile Work Area/Laminar Hood



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## Tissue Culture – Outplant to Nursery



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## Summary

- Knowing your goals and an understanding of plant reproduction is critical to plant propagation success
- Try some new things...and
- Have fun with it!



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