Grafting Introduction

Lecture Outline #24 - April 14, 2008

I. What is grafting? (pg 411-414)

II. Why do grafting? (pg 414-420)

- 7 reasons

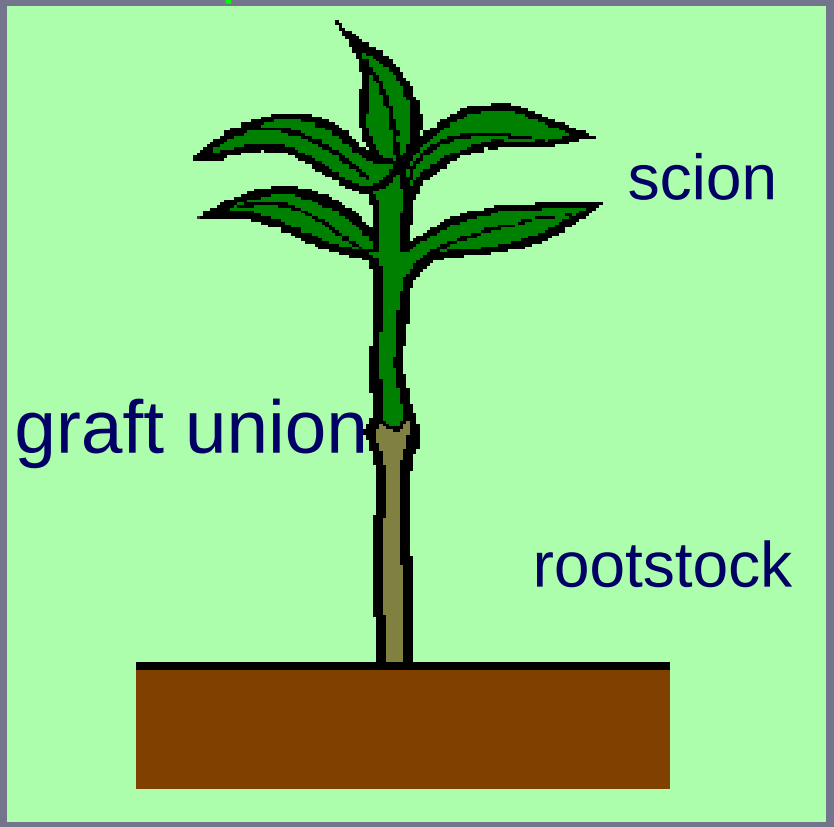
III. Graft compatibility. (pg 429-447)

- genetic limits
- symptoms of incompatibility

IV. 6 Other factors contributing to grafting success. (pg 429-447)

What is Grafting?

Grafting: joining the root system with the shoot of another plant to make a new composite plant.



Why do grafting?

Economic comparison of propagation methods:

seeds	14 x cheaper
cuttings	5 x cheaper
grafting	most expensive

Why do grafting?

1. To control for trait variation…

Compare seedling and clonal rootstocks

- seedling: may introduce variability
- clonal: uniform and contribute special characteristics
  ie. size, habit, disease resistance etc.

5000-7000 apple cultivars

Why do grafting?

2. To propagate plants that are unsuccessful by cutting propagation.

Cuttings from many fruit and nut trees will not root

Grafting is used to propagate these species:

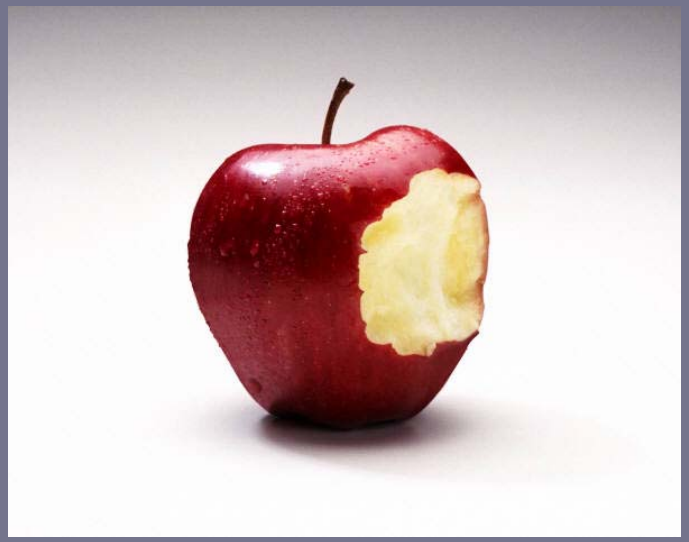
apple
peach
pear
grapes
citrus
nut crops

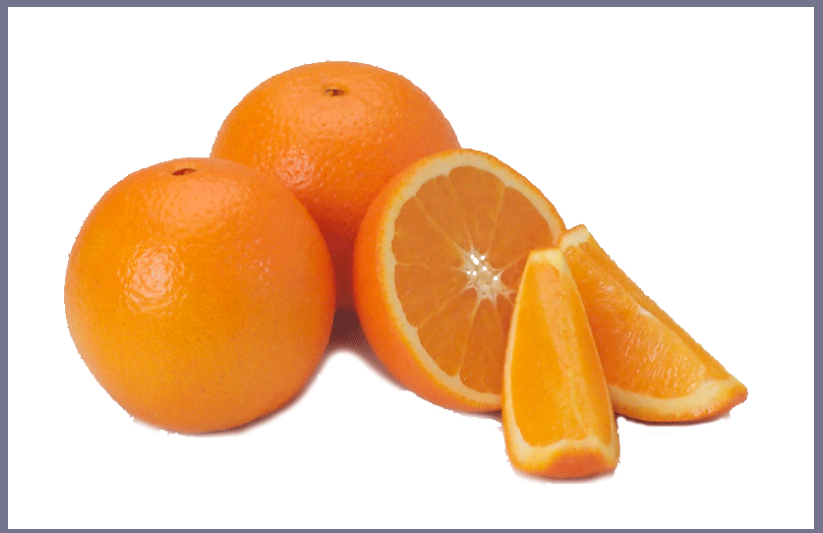
Why use grafting?

3. To introduce into a cultivar a desired trait

Desirable traits include:

- fruit size, color, taste, shelf-life
- cold hardiness
- resistance to diseases, pests

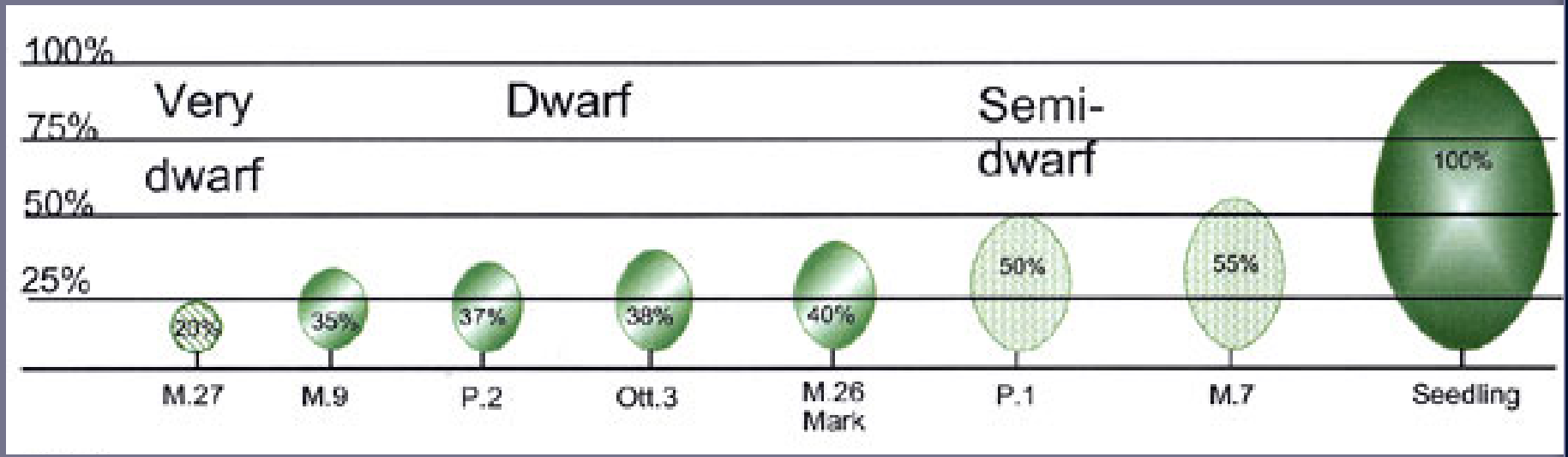




Why use grafting?

3. To introduce into a cultivar a desired trait

-both rootstock and scion may each contribute



Rootstocks can control plant size

Why use grafting?

4. To quickly obtain fruit-producing plants

- change an old cultivar with a top-selling cultivar

Topworking

Why use grafting?

5. To save a tree that has been damaged
   - bridge grafting can be used to save trees that have been girdled

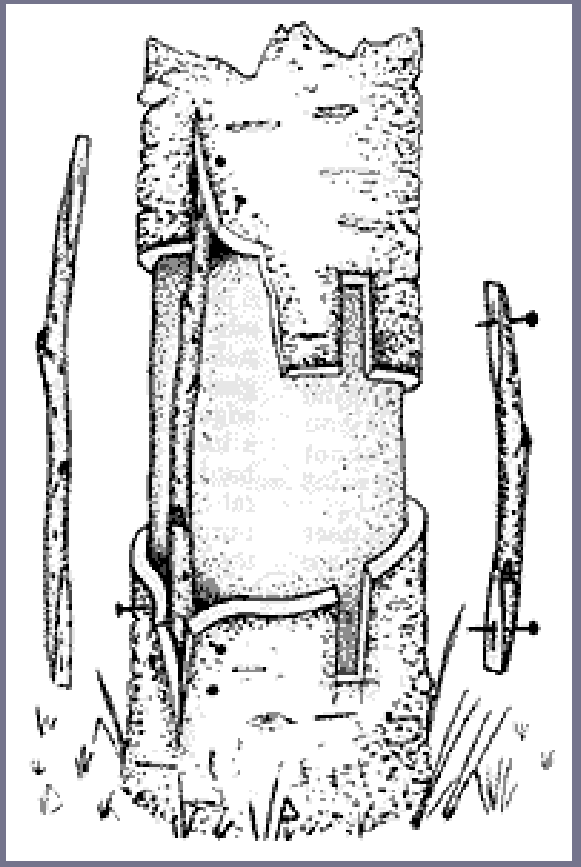


Figure by University of Minnesota Extension

Why use grafting?

6. To create plants with an elevated or weeping habit

http://www.marysplantfarm.com/shrub-frame.htm

http://www.robertbaker.com/baker_west_root_list.htm

Why use grafting?

7. To create novelty plants

http://www.istockphoto.com/imageindex/580/8/580825/Decorative_succulents.html

Graft compatibility

Genetic limits to grafting

Almost always successful

Rarely successful

different cultivars within a species

different species within a genus - Citrus

same family, different genus- Solanaceae family

different families

Symptoms of Incompatibility

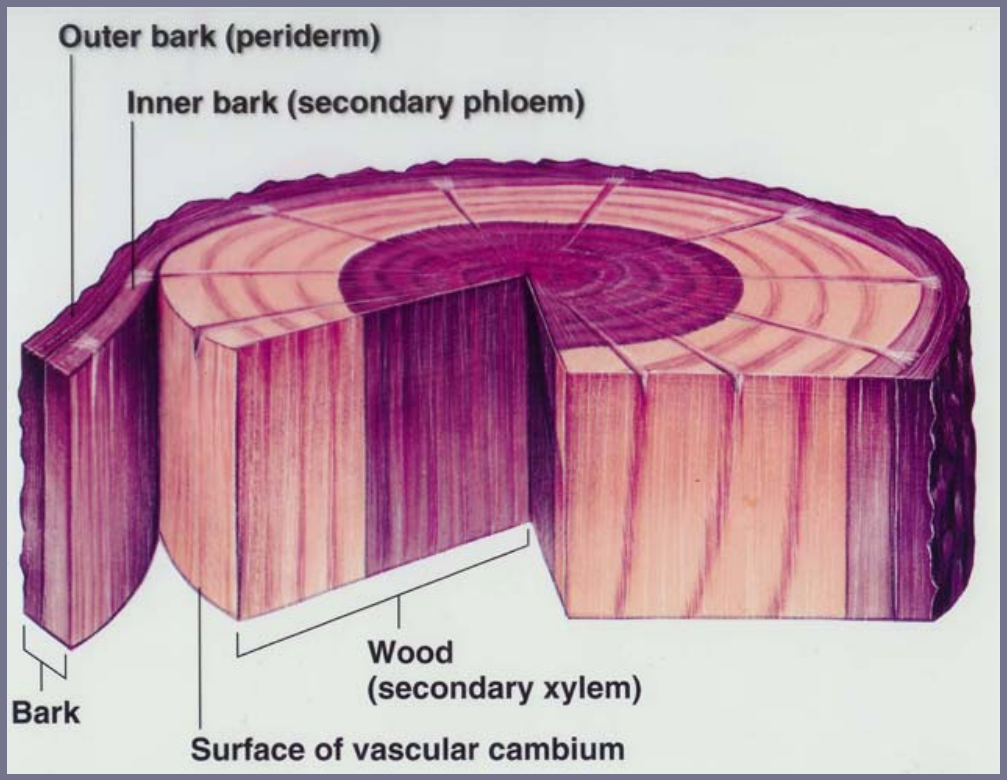
- yellowing of foliage in late summer
- shoot die-back
- suckering of rootstock
- weak graft union
- premature death

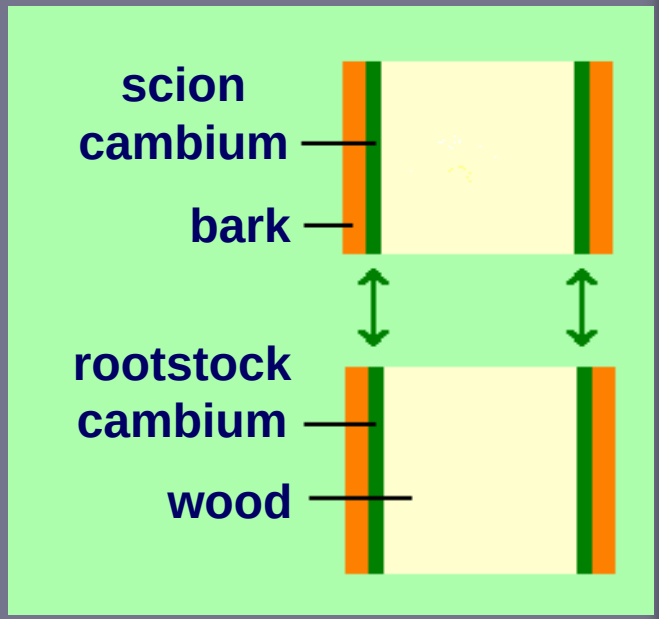
Symptoms of Incompatibility

- Graft union will not heal properly
  - delayed incompatibility can take up to 20 years

Factors Affecting Grafting Success

1. Properly aligned cambial layers

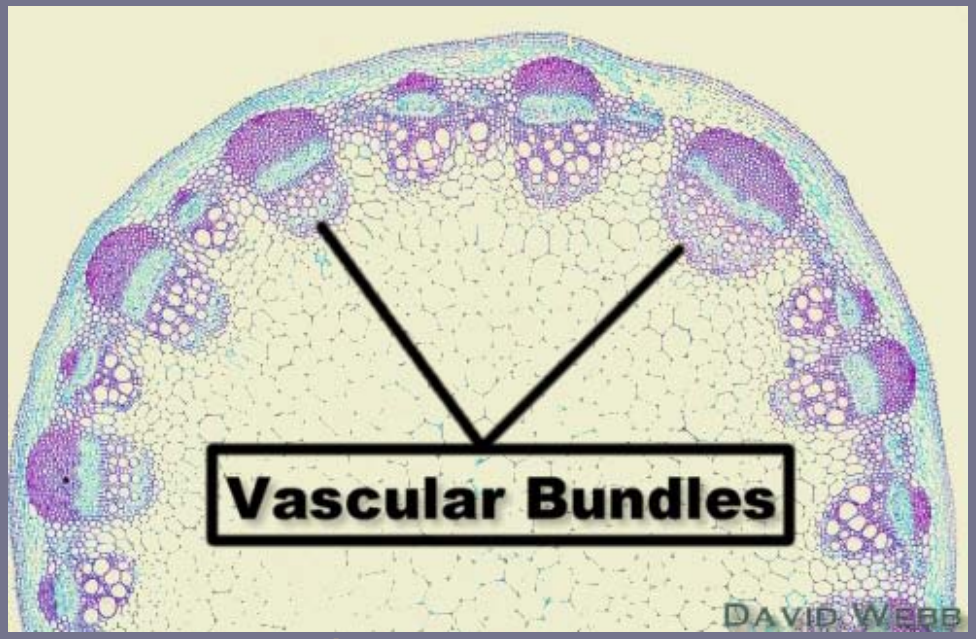




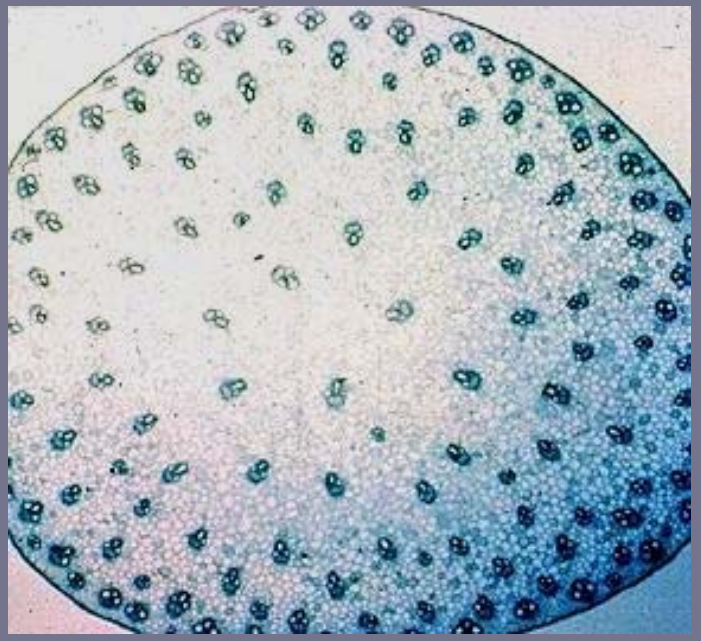
wood." Online . Encyclopædia Britannica Online.
10 Apr. 2007 <http://www.britannica.com/eb/art-66141>

Factors Affecting Grafting Success

1. Properly aligned cambial layers



dicot stem



monocot stem

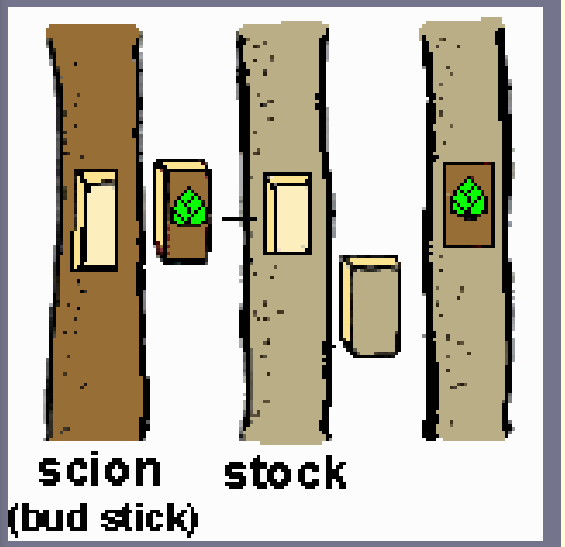
Can you graft a monocot?

http://www.botany.hawaii.edu/faculty/webb/BOT201/Angiosperm/MagnoliophytaLab99/TypDicotStemXSLab.jpg

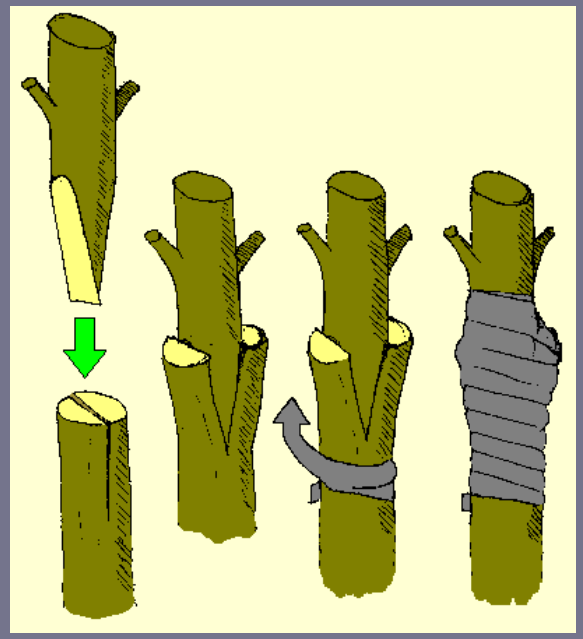
http://www.ekcsk12.org/science/aplabreview/plantstructurelab2005.htm

Factors Affecting Grafting Success

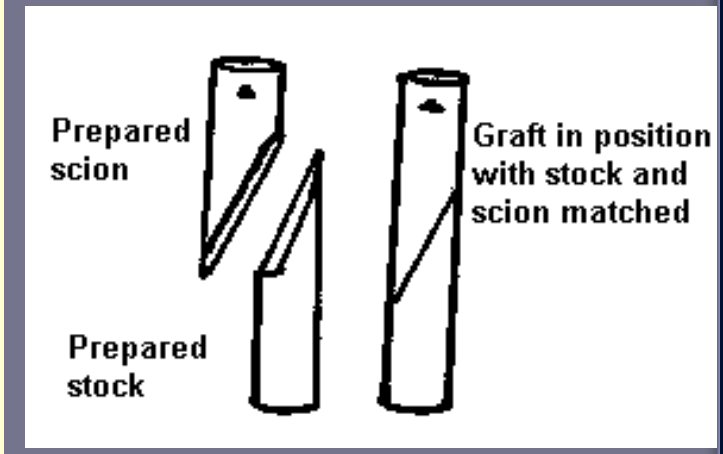
2. Type of graft
   - gymnosperms usually grafted
   - angiosperms usually budded



Patch budding



Cleft graft



Whip graft

Factors Affecting Grafting Success

2. Temperature
    - < 32°F. - no callus formed
    - 45-50°F. - callus formation is slow
    - > 90°F. - callus formation inhibited
    - > 104°F. - callus cell death

Factors Affecting Grafting Success

3. Water status

   - cut tissues must have high humidity for callus formation

Factors Affecting Grafting Success

Sealing the graft union prevents water loss

scion wood dipped in wax

union wrapped with parafilm

Factors Affecting Grafting Success

4. Growth activity of the root stock

T-budding – rootstock bark must be slipping (active)
chip budding – rootstock bark can be dormant or active

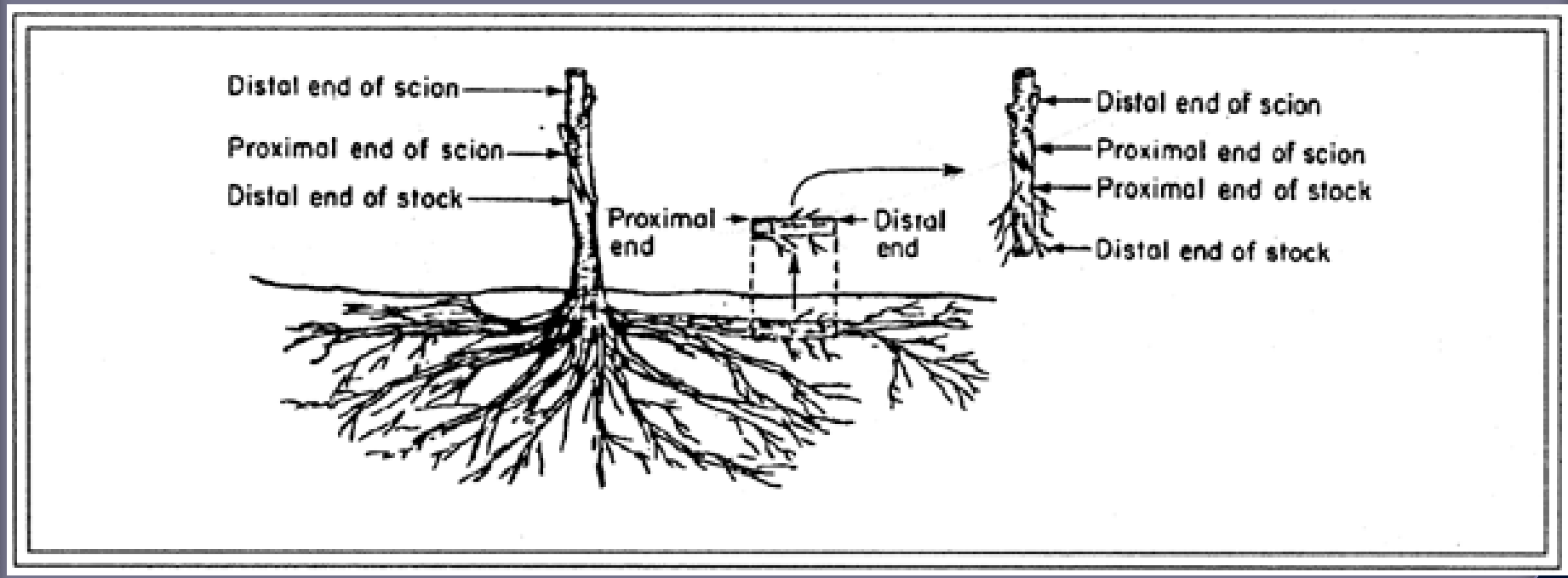
'Bleeding' rootstock more difficult to graft successfully
walnut
maple
grape

Factors Affecting Grafting Success

5. Polarity

proximal - closer to root-shoot junction

distal - farther from root-shoot junction



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Grafting tools

Grafting Pliers

Sold by CJ industries
$40