Apple Botany and History

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Today's Presentation

- Historical background
- Genetic variations
- Biotechnology

Botany and History

- Family: Rosaceae
- Genus: Malus
  - ~ 28 species
- Domesticated apple:
  - *Malus x domestica*

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Center of origin

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Botany and History

- Temperate zone tree
  - In an area of the world ~ 30^0 north of the equator
  - Areas with cold winters

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Botany and History

- Mechanisms for winter dormancy, spring budbreak, and flowering
  - Deciduous, loose their leaves in the fall

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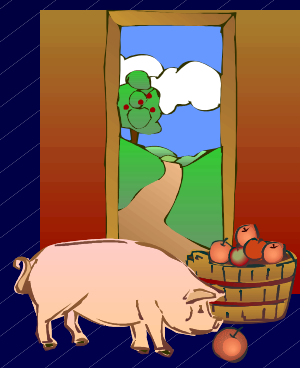
Botany and History

- Generally adapted for animal dispersal
  - Colorful fruit



Botany and History

- Much folklore and myth
- Cultivated by primitive man
- Evidence of domestication by 10th century B.C.
- In 9th B.C., in *The Odyssey*, Homer wrote about apple trees

Botany and History

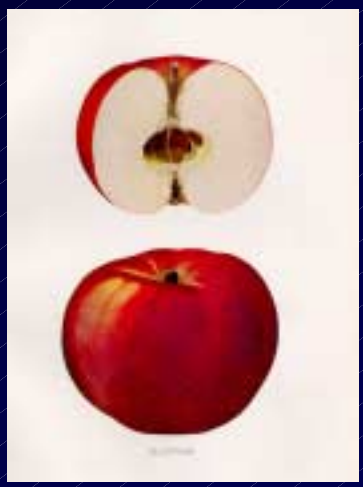
- Brought to America by settlers

Vermont Apple Industry

- Colonial - prior to 1800
  - Seedlings or ‘natural varieties’
- Cider-apple time - 1800-1875
  - in1810 :125 distillers/12300 gal brandy
- Farm orchards - 1875-1900
- Commercial - 1910-1940
- Specialized commercial - 1940-date

McIntosh

- Chance seedling
- Ontario farm (1811)
- Brought to Newport VT in 1868



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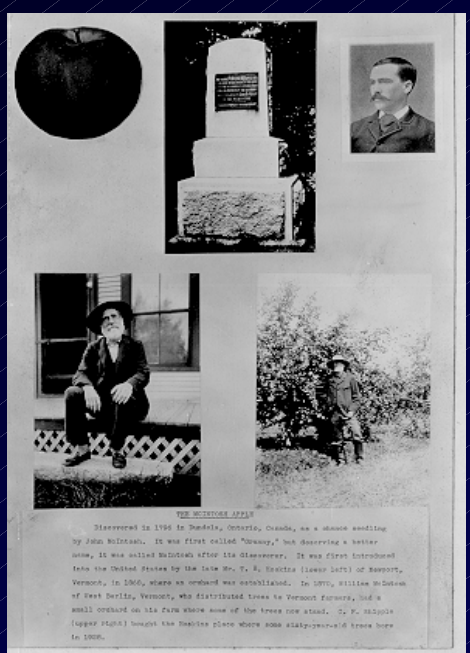

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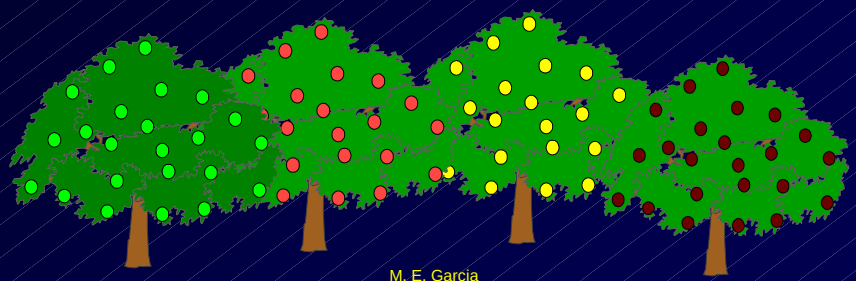
Botany and History

- The domesticated apple is genetically very diverse.
- It does not ‘come true to seed’



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Botany and History

- Most apple trees require cross pollination
  - You must have two different cultivars of apples in order to have fruit

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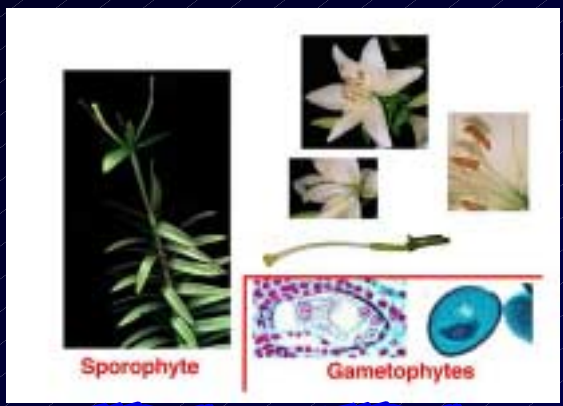
Sexual Reproduction



When the pollen grain germinates and fertilizes the egg, fertilization takes place.

After fertilization, the seed forms

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Apple propagation

- Asexual propagation or cloning
  - When you take part of one plant, place it into another plant, and let them grow together as a new organism

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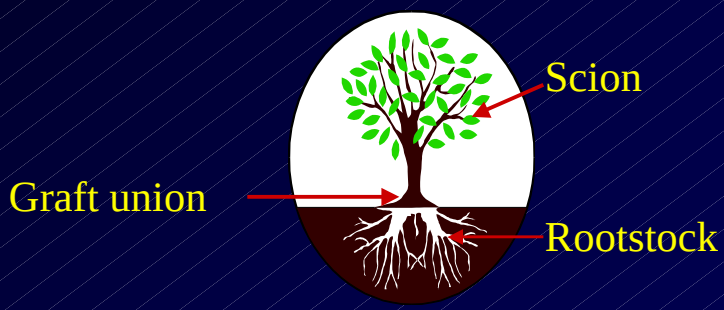
Cultivars and Rootstocks

- All commercially sold apple trees consist of two parts



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Asexual propagation used in apples

- Grafting
- Budding

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Grafting

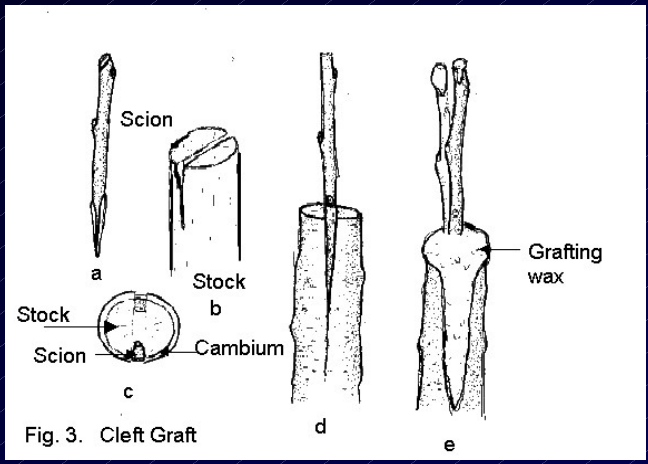

Fig. 3. Cleft Graft

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Grafting: Stock and Scion

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Cultivar and Rootstock

- What to look for in a cultivar
  - Appearance
  - Taste
  - Disease resistance
  - Insect resistance
  - Cold hardiness

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Cultivars and rootstocks

- What to look for in a rootstock
  - Hardiness
  - Soil type adaptability
  - Pest resistance
  - Overall tree size
    - standard
    - semidwarf
    - dwarf

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Apple cultivars or varieties

- 3rd century B.C.
  - 7 varieties
- 1st century A.D.
  - 36 varieties
- Today, there are approximately 10, 000 different kinds of apple
- Where do these cultivars come from?

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Origin of cultivars and varieties

Seedlings

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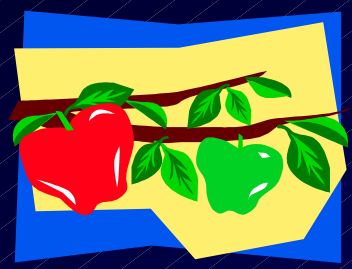
Origin of cultivars and varieties

Mutations



Bud sport

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Origin of cultivars and varieties

Breeding programs

‘Liberty’

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Disease resistance

- ‘Liberty’ is a scab resistant cultivar
- Scab is a fungal disease of apple

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Disease Resistant Cultivars

- ‘Field immune’ to apple scab and have varying degrees of resistance to other diseases
  - Liberty
  - Williams Pride
  - Redfree
  - Novamac
  - Jonafree

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Genetically engineered apples

- None to date commercially
- Involves the introduction of foreign genes

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Genetically engineered apples

- Disease resistance
- Insect resistance

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Summary

- Apples are temperate zone fruits
- Have been part of human food source for a long time
- Are part of Vermont's history and economy
- There are many different kinds of apples

Summary

- The different types of apples come from
  - seedlings
  - mutations
  - conventional breeding programs
  - in the future, from genetic engineering

Thank You

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