Review of Lecture 2:

- **Disease** was defined:
  type of injury, continuous irritation, causal agent

Three ingredients are necessary for disease to occur:
Host, Environment, Pathogen –The disease triangle

- Disease is a condition of the host:
  Host responses to disease are termed 'Symptoms'

- Causal Agents of plant diseases:
  abiotic, biotic - fungi, bacteria, viruses, nematodes

Diseases have names!!

Name of Disease: Apple scab
Causal Agent: *Venturia inequalis*
Host: apple
Tissues affected: leaves and fruit
Primary symptom: scab-type lesion
Secondary symptoms: Defoliation, fruit deformation and drop

APS Database 'Common Names of Plant Diseases' (http://www.apsnet.org/online/common/top.asp).

Disease symptoms

- Symptoms are the plant's response to disease
- Symptoms reflect the physiological function of the plant that is disrupted or impaired

- Diseases can be categorized according to their symptoms

Examples: root rots, fruit rots, vascular wilts, abnormal growth, leaf spots

Signs

- Signs are the physical evidence of a pathogen's structure

Lecture 3: Disease Diagnosis

Reading Assignment:
Website: APSnet.org
Education Center
Main Menu
Introductory Plant Pathology
Topics in Plant Pathology:
'Plant Disease Diagnosis'
M. B. Riley, M. R. Williamson and O. Maloy
http://www.apsnet.org/education/IntroPlantPath/Topics/plantdisease/top.htm

Disease Diagnosis

- **Know What is Normal**
- **Know what is possible**
- **Collect Background Information**
- **Check for Symptoms and Signs**
- **Observe Patterns**
- **Ask Questions**
- **Laboratory Consultation &Testing**
- **Final Diagnosis**

Know what is possible

Seek out literature that categorizes diseases by host:

APS compendia on diseases of specific hosts

APS Database 'Common Names of Plant Diseases'

USDA publications →

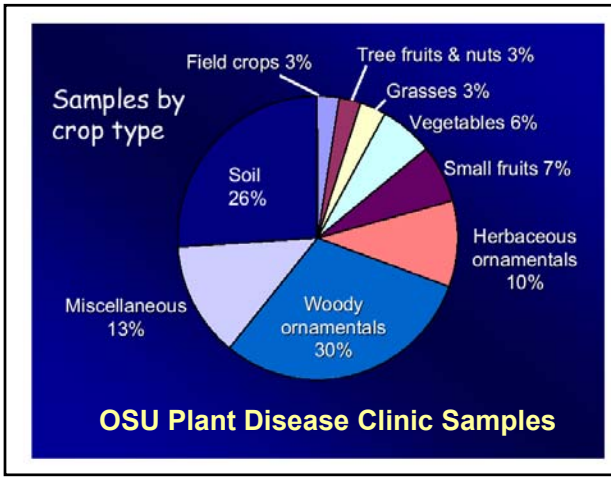
PNW online guide to plant disease control

Important diagnostic resources are becoming available on the web

- http://nt.ars-grin.gov/fungaldatabases/fungushost/fungushost.cfm

- http://plant-disease.ippc.orst.edu/

- http://www.science.oregonstate.edu/bpp/Plant_Clinic/october.htm



Collect Background information

Information that may be important:

a. identity of host to cultivar
b. planting date and environmental conditions at planting
c. seed source; seed treatment, if applicable; seed germination
d. disease history: description of first symptoms, when first noted, spread, specific factors associated with disease appearance
e. cultural practices, chemicals and dates of application
f. field and crop history
g. weather conditions during season and period of disease development

Observe Patterns: Biotic? Abiotic?

Fact: **1/3 of problem samples submitted to OSU's Plant Disease Clinic have an abiotic cause**

Symptoms of Abiotic Injury

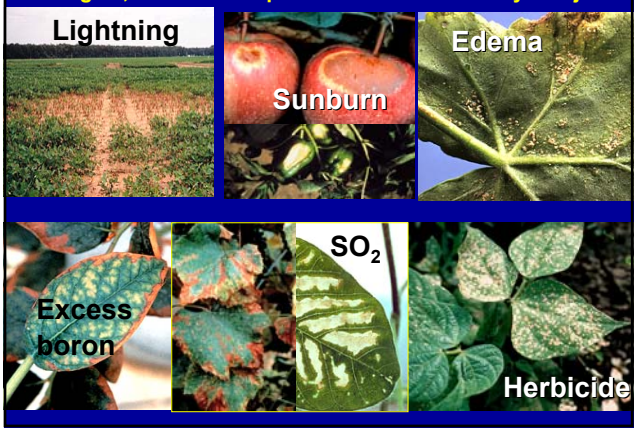
What's the cause?

Symptoms of Abiotic Injury

Note uniformity and sharp transition from healthy to injured

What's the abiotic cause?

Once again, note the sharp transitions from healthy to injured



Observe Patterns:

Abiotic causes:

a) often no spread is observed (acute, episodic)
b) **regular** distribution or uniform damage
c) **clear lines** demarcating healthy vs damaged
d) more than one plant species may be affected
e) linear stripes
f) more common near edges of host population

Biotic or abotic?

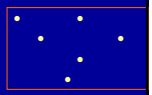
biotic causes:
symptoms are typically:

- **arranged irregularly**
- **the transition from injured to healthy is more diffuse**
- **varying sizes and stages of severity (indicative of a continuous process)**

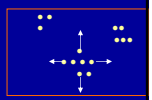
Observe Patterns:

population-level patterns observed with biotic causes:

- **random distribution**
  - observed with seedborne inoculum or if inoculum source is very far away



- **aggregated or 'contagious' distribution**
  - very common pattern
  - indicates random distribution followed by spread of disease within host population
  - foliar (polyclic) diseases



- **patch distribution**
  - characteristic of root infecting pathogens
  - often delimited by topography or soil type

Observe Patterns: Within a plant

Primary vs secondary symptoms

Primary symptoms occur at site of infection

examples: root rots, leaf spots, blights, galls, cankers

Secondary symptoms occur at site distant from the primary symptoms and usually later in time

examples: above ground symptoms of root rot, crown rot or vascular wilt, nematode damage

Within plant patterns

Root rots

Primary symptom: lesions on roots

Secondary: foliar chlorosis, stunting
root and top dieback

Wilts

Primary symptom: vascular discoloration

Secondary: unilateral wilt of leaves
defoliation
roots remain healthy

Leaf spots

Primary symptom: necrotic lesion

Secondary: chlorosis, defoliation

Stem Cankers

Primary symptom: sunken lesion

Secondary: distal branch dieback

Laboratory tests

Purpose: Identify the pathogen

Types of tests:

Microscopic observation of *signs*

Incubate disease tissue in moist chamber

Culture diseased tissues in petri dish

Biochemical tests: serology, DNA hybridization

Chemical tests for abiotic causes: pH, nutrient deficiency, etc.

Koch's posulates (if new disease)

Final Diagnosis

- Diagnosis is a form of hypothesis testing
- Diagnosis is detective work
- Multiple pieces of evidence may be required
- Evidence must be weighed accordingly