Medicines, Drugs or Poisons
- Active Compounds
  - Alkaloids
  - Glycosides
  - Oxalates
  - Resins
  - Phytotoxins

Paracelsus and the Doctrine of Signatures
- Walnuts resembled the brain – used for headache
- Liverworts used for liver ailments
- Mandrake resemble human form used to increase virility or conception
- Dicentra used for heart ailments

Alkaloids are a diverse group of compounds, which all contain nitrogen, are alkaline and possess a bitter taste
- over 3,000 types in plants
- often unique to plant species
- structurally very diverse
- physiological effects also diverse

Effects on nervous system
- mimic neurotransmitters
- mimic neuroblockers

Plant derived medicines, drugs and poisons can be classified by their active compounds
- alkaloids
- steroids
- glycosides
- oxalates
- resins
- phytotoxins

Cocaine is an alkaloid
Digitoxin is a cardioactive glycoside
Ricin is a phytotoxin
THC is a fat-soluble resin

Plant alkaloids used as analgesics
- morphine
- codeine

Opiates bind to brain receptors and block pain
- atropine - relieves pain by smoothing muscle spasms
- atropine inhibits acetylcholine
Tobacco is the source of the alkaloid, Nicotine

- nicotine stimulates the acetylcholine receptors and releases dopamine into brain
- basis for addiction

nicotine treated with sulfuric acid is a powerful insecticide

Atropine in high doses induces a sense of flying and hallucinations

- absorbed through skin
- used to dilate pupils

Cocaine produces a short-lived euphoric feeling due to the stimulation of the central nervous system

- chewed by Andean natives
- cocaine in leaves low
- purified cocaine is highly addictive

Other plant alkaloids

- Coniine
- curarine
- mescaline
- quinine

Glycosides contain one or more sugars and an active component classified by their non-sugar component

Cyanogenic glycosides

- release hydrogen cyanide
- common in Rose family
- characteristic bitter almond smell
- one cup of apple seed enough to kill

Cyanide inhibits e- transport in mitochondria

Laetrile, a cyanogenic glycoside, was a controversial cancer treatment extracted from apricot pits

Cardioactive Glycosides affect heart muscles

- active group is a steroid
- can be used to treat heart failure
- can also be deadly toxic
- sudden death from cardiac arrest can occur by ingesting foxglove, oleander or milkweed

Digitoxin is extracted from the leaves of the common garden plant, Foxglove

Aspirin is derived from an extract from willow bark

- salicin is a glycoside of salicylic acid
- ancient Greeks and native North American cultures independently discovered the analgesic qualities of willow bark
- Aspirin is synthetically produced today
- 80 million pills a day consume in US
Cancer Drugs from Plants

**Taxol (a terpene) and Vincristine (an alkaloid)** interfere with mitosis in cancer cells

Plaque commemorating the location of trees used to isolate taxol from *Taxus brevifolius* (Pacific Yew)

Vincristine comes from the common Madagascar periwinkle (*Vinca rosea*)

Marijuana produces a psychoactive resin

- ancient cultivated crop (China)
- used for medicine and fiber
- Active component is a resin
- THC (tetrahydrocannabinol)
- medical marijuana used to control pain and nausea

The caterpillar smoking a hookah in Alice in Wonderland

Hemp fiber is usually used for industrial cloth and twine

Castor Bean produces the phytotoxin, ricin, especially in seed

Oils from the castor bean have been used medicinally for centuries as a laxative. Also makes a good lubricating and lamp oil

Ricin inhibits protein synthesis by binding to and irreversibly inactivating ribosomes. Highly toxic nature has led to its potential use as a weapon of terrorism

Next time: fibers, cloth, wood and paper