STAB 6143

Economic Botany and Ethnobotany

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INTRODUCTION

Ethnobotany

The word is based on two Greek roots

- ethnos (race: people: cultural group) and
- botanikos (of herbs)

a branch of botany, the study of plants, and is closely related to cultural anthropology, the study of human societies

Definition of ethnobotany :

- the study of how people of a particular culture and region make of use of indigenous plants, with a particular emphasis on traditional tribal cultures.

Economic Botany

An important branch of ethnobotany

- focuses on the commercial use of plants, especially in industrialized societies.

Definition of Economic Botany

- The study of plants and plant products that can be used for profit, such as in the field of agriculture or medicine.

Ethnobotanists aim to

- Document
- describe and
- explain complex relationships between cultures and (uses of) plants:
    - focusing, primarily, on how plants are used, managed and perceived across human societies

Uses include

- as foods (fruit, vegetable, spice) and drinks;
- shelter, clothing and textiles
- medicines;
- in cosmetics; in dyeing;
- in construction (building and furniture);
- as tools; as currency;
- in literature; in rituals and religious ceremonies;

- in social life (handicraft, musical instrument, paper, culture)
- commercial value.

In 1895, during a lecture in Philadelphia, a botanist named John Harshberger used the term ethnobotany to describe his work.

- He described his research as the study of plants used by primitive and aboriginal people.

Ethnobotanists focus their studies on the plant lore of tribal peoples for several reasons.

- These groups are often both highly dependent on and extraordinarily knowledgeable about local plants.
- They also tend to live in ecosystems, such as tropical rain forests or subtropical deserts, which the outside world poorly understands.
- Because rapid economic and cultural change increasingly threaten the traditional lifestyles of these peoples, ethnobotanists seek to record and preserve orally transmitted knowledge in danger of being forgotten.
- The botanical wisdom of tribal shamans, healers, and plant experts often plays a decisive role in demonstrating which plants might be developed as sources of food or medicine.

Ethnobotanical study of traditional plant lore has resulted in many valuable discoveries

- ranging from new methods for cultivating crops on arid lands to
- new medicines for the treatment of disease.

Ethnobotanical research has led to the development of many commercial plant-derived drugs.

- These include
    - quinine for malaria from the South American cinchona tree
    - podophyllotoxin for cancer from the North American mayapple, and
    - physostigmine for glaucoma from Calabar bean.

PLANT AND SOCIETY

The twentieth century

- A tremendous expansion and development in the synthetic industry
  - Pill happy culture

In the past

- Plant remedies or green cures
  - Herbalist and herb doctor

WITCH-HAZEL (*Hamamelis virginiana)*

- deciduous large shrub
- growing to 6 m tall.
- Native of US.

The leaves are oval

- oblique at the base, acute or rounded at the apex
- with a wavy-toothed or shallowly lobed margin, and
- a short, stout petiole;
- the midrib is more or less hairy, stout, with six to seven pairs of primary veins

fragrant flowers

- characterized by four unusual, yellowish, strap like (linear) petals.

Extract from the leaves and bark (by boiling in water)

- Astringent properties
    - ../../../../../../Documents and Settings/User/Application Data/Microsoft/Word/gl.doc - AstringentUsed to soothe dan alleviate skin irritation and vesication

Witch-hazel tea

- Use as sedatives
- to relieve diarrhea and sore throat (as gargles)

Witch-hazel water

Used as a douche in cases of vaginitis

Witch-hazel poultice

- has been employed to relieve eye inflammation and irritation of hemorrhoid

Hamamelis water (Aqua hamemelis)

- on the modern pharmacy shelf

Hamamelis water

Toner with witch Hazel (Hamamelis water) - skin cleanser, make-up remover, after shaving

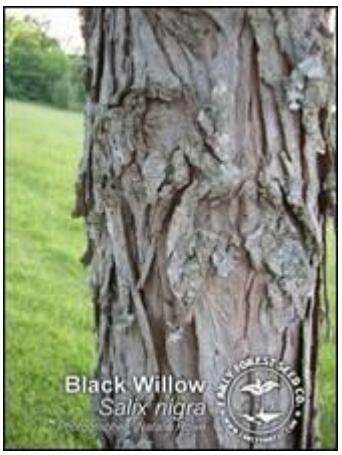
- Relief of skin irritations - Recommended for external used
- Crude drug - Natural remedies from plant - No listing of ingredients

The most successful synthetic drug on the market today – Aspirin

- Knowledge of the pain-relieving agent - has a long history
- Traceable to the use of willow bark by the ancient Greeks to alleviate pain

WILLOWS (*Salix)*

- around 400 species
- deciduous trees and shrubs
- found primarily on moist soils in cold and temperate regions of the Northern Hemisphere.



- From the willow
    - salicylic acid was eventually isolated
        - Was made synthetically in the 1850s

Marketing as an analgesic and anti rheumatic pill

- Although commercial aspirin is an entirely synthetic drug
- the prototype of this drug as a natural chemical product from plants

A great many drug – rooted in botanical history

- Synthetic
    - Minor chemical alterations or manipulations
- Great potential for the discovery of many natural chemicals, perhaps serving as models for future synthetic drugs

MEDICINAL and POISONOUS PLANTS IN HISTORY

Oldest arts, dating well into prehistory

- Human beings have tried to cure themselves of ills through the centuries
    - Herb medicine or natural medicine
        - Folk medicines of past people and cultures
- Many ancient plant remedies (ubat) for disease have turned out to have significant value for modern medicine
    - Learn something from history

EGYPT

- Their practice recorded on papyrus (*Cyperus papyrus*)
- Two famous surviving Egyptian papyri are
    - Hearst papyrus and
    - the Ebers papyrus

CYPERUS PAPYRUS (**Papyrus sedge** or **Paper reed**) -

- monocot belonging to the sedge family Cyperaceae.
    - herbaceous perennial
    - native to Africa
- forms tall stands of reed-like swamp vegetation
    - in shallow water.
- Ancient Egyptians
    - it is the source of papyrus paper
    - parts of it can be eaten
    - the highly buoyant stems can be made into boats.
        - It is now often cultivated as an ornamental plant.

Cyperus papyrus

Ebers papyrus

MEDICINAL PLANT MENTIONED IN EBERS PAPYRUS

Barley, beans, cedar, crocus, dates, garlic, grapes, lotus, myrrh, olives, onions, pomegranate, sycamore fig, tamarisk and wheat

CEDAR

- evergreen coniferous trees of the genus *Cedrus*
- having stiff needles on short shoots and large, erect seed cones with broad deciduous scales.

CROCUS

- perennial Eurasian herbs of the genus *Crocus*
- having grasslike leaves and
- showy, variously colored flowers.
    - Their color varies enormously, although lilac, mauve, yellow and white are predominant.
    - Crocuses typically have three stamens**.**
    - grow from corms (umbisi) and are mainly hardy perennials
    - They are found in a wide range of habitats
        - including woodland (hutan kayu) and meadows (padang rumput)
        -

LOTUS

An aquatic plant *(Nelumbo nucifera)*

native to southern Asia and Australia

having large leaves

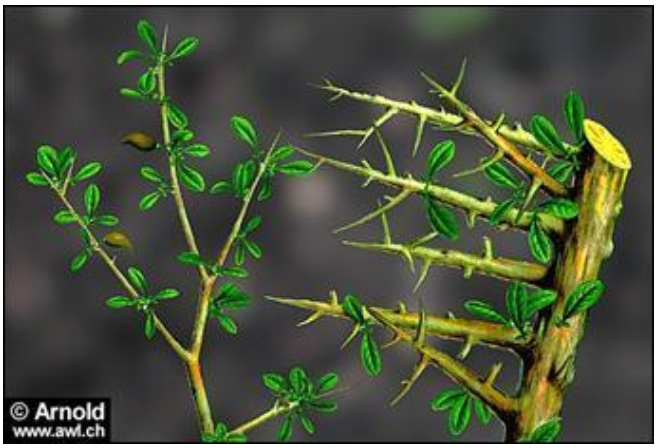
fragrant, pinkish flowers

a broad, rounded, perforated seedpod (lenggai), and

fleshy rhizomes (rizom).

MYRRH - *Commiphora myrrha*

- a tree in the Burseraceae family.
- Iused in the production of myrrh, a resin (damar)
    - made from dried tree sap
    - The tree is native to the Arabian peninsula (Oman, Yemen) and to Africa.
    - very spiny
    - grows to a height of about 4 m.
    - It does best in thin soil
        - primarily in areas with limestone



OLIVES (Zaitun) - *Olea europaea*

- A Mediterranean evergreen tree
- having fragrant white flowers
- usually lance-shaped leathery leaves, and edible drupes.

POMEGRANATE (Delima) - *Punica granatum*

- A deciduous shrub or small tree
- native to Asia
- widely cultivated for its edible fruit.
- The edible fruit is a berry (beri)
    - has thick reddish skin and around 600 seeds.
- The name "pomegranate" derives from Latin *pōmum* "apple" and *grānātus* "seeded" (from *grānum* "grain").

SYCAMORE FIG *(Ficus sycomorus)* - Ara

- grows to 20 m tall and 6 m wide
- The leaves are heart-shaped with a round apex.
- The fruit (syconium) is a large edible fig
  - ripening from buff-green to yellow or red.
    - They are borne in thick clusters on long branchlets or the leaf axil.
- Like all other figs, it contains a latex.
  - The unique fig pollination system
    - involving tiny, highly specific wasps, (tebuan) known as fig wasps
    - enter these closed inflorescences to both pollinate and lay their own eggs

TAMARISK

- African and Eurasian shrubs or small trees of the genus *Tamarix*
- having small scalelike leaves and racemes of white, pink, or red flowers.

GRAPE *(Vitis vinifera)*

- is a liana (pokok memanjat)
- growing to 35 m tall, with flaky bark.
- The fruit is a berry,

- ripens dark purple to blackish
- in cultivated plants it is usually much larger and can be green, red, or purple.
- The species typically occurs in humid forests and streamsides.

GARLIC - *Allium sativum*,

- onion family Alliaceae.
- for both culinary (masak-memasak) and medicinal purposes.
- The garlic plant's bulb is the most commonly used part of the plant.
- The bulb is divided into numerous fleshy sections called cloves.
- The cloves have a characteristic pungent (hancing), spicy flavor that mellows (lunak) and sweetens considerably with cooking

POTENTIAL VALUE

Odoriferous compound in garlic and onion

Anticoagulant and anti-thrombosis of blood

Potential value of centuries-old folk remedies (ubat) for modern medicine

AUTUMN CROCUS (*Colchicum autumnale*)

- very pretty flower
- contains a deadly poison called colchicine
  - similar to arsenic in its effect.
- Treatment of gout
  - Present day - Extract is used for this purpose

POMEGRANATE (*Punica granatum*)

Astringent fruit - As a vermifuge (ubat cacing)

Reinvestigate for its potential

PISTACHIO (*Pistacia vera*)

- Family : Anacardiaceae (cashew, mango)
- small tree
- native to some regions of Syria, Iran, Turkey, Greece and Pakistan.
- produces an important culinary nut.

MESOPOTAMIA

- Ancient civilization of Assyria
  - Located in the valley of the Tigris and Euphrates
  - Medical botany was written/engraved on large clay tablets that hardened like stone
  - Date palm was used for almost everything
    - food, medicine and building material
  - The Assyrian cultivated wheat and barley
    - Made beer
  - Apricot, cherry, and almond
    - derived from the Assyrian language

APRICOT

- A deciduous Asian tree *(Prunus armeniaca)*
- having alternate leaves and
- clusters of usually white flowers.

CHERRY

trees or shrubs of the genus *Prunus*

having pink or white flowers and

small, juicy drupes

ALMOND (Badam) - *Prunus dulcis*

- A deciduous tree
- native to Asia and northern Africa
- having alternate, simple leaves
- pink flowers, and leathery fruits.

CHINA

- Knowledge of medicinal plants in ancient China
- largely attributed to the Emperor Shen-nung
    - Father of agriculture and medicine
        - Wrote the first pharmacopoeia - The Pun-tsao
    - Plants mentioned Indian hemp (*Cannabis*), aconite (*Aconitum*), opium, poppy and croton
        - A number of poisons and antidotes (penawar) are also given
    - medium of communication of knowledge of Chinese folk medicine
        - oral tradition/communication

ACONITE *(Aconitum)*

- Also known as monkshood, wolfsbane, leopard's bane, women's bane, Devil's helmet or blue rocket (bane = poison)
- flowering plant belonging to the buttercup family (Ranunculaceae).
- over 250 species of *Aconitum*.

CROTON (Puding)

- flowering plant genus in the spurge family, Euphorbiaceae.
- a tree or shrub native to Southeast Asia.
- Croton oil
  - used in herbal medicine as a violent purgative, (julap, pencahar)
    - extracted from its seeds.
- Nowadays, it is considered unsafe and it is no longer listed in the pharmacopeias of many countries.

Ephedra

- gymnosperm shrubs
  - the only genus in the family **Ephedraceae** and order **Ephedrales**.
- occurs in dry climates over a wide area.
- The Chinese name is *mahuang*
- valued for its antihistamine properties
  - To treat bronchial asthma (lelah)
  - Alkaloid isolated from *Ephedra* – Ephedrine
  - In modern nasal spays and decongestants

GINSENG (*Panax ginseng*)

- family Araliaceae
- slow-growing perennial plants with fleshy roots
  - Another Chinese folk medicine
- Resemble a human form
  - Mystical belief
  - In relieving human disease and distress
    - Considered to be a panacea

VALUED FOR

- Relieving respiratory disease
  - digestive upset (nausea, diarrhea and indigestion)
  - diabetes
  - rheumatism
  - external sores
- Most important - Aphrodisiac (menaikkan syahwat)
  - Remedy for difficulties in "love-making"

- In US
    - Valued as a stimulant or tonic
    - Sold as a tea
- Research on ginseng is in progress - Remain an enigma (membingungkan), with little proven

INDIA

- Info on medicinal plants
  - passed down by oral tradition
- Knowledge tied in with Hindu scriptures or Vedas
  - Over the years
    - this traditional Indian medicine has become arranged in system of health care
      - known as Ayurvedic medicine
      - Ayurveda
        - means knowledge of life

SNAKEROOT (*Rauwolfia serpentina*) – Chandra (moon)

- Used to treat "moon disease" - Mental
  - Alkaloid – reserpine
    - Treating mental illness and Hypertension
- flowering plant
  - in the family Apocynaceae.
- It is an evergreen, perennial, glabrous and erect undershrub
  - grows up to a height of 60 cm.
  - Roots are tuberous with pale brown cork.
  - Leaves are in whorls of three
  - Flowers white

GREECE

- Hippocrates
  - Father of medicine
- Belief that disease had natural rather than supernatural causes
- Proper adjusment of four basic body fluids (humors)
  - Blood
  - phlegm, (kahak)
  - yellow bile and
  - black bile

Proper fluid adjusment

1. bleeding practices (phlebotomy)
2. herbal medicine
   - mentioned more than 200 plants
   - plant were used as a means of inducing death (suicide or execution)
   - Socrates
     - put to death with poison hemlock (*Conium maculatum*)

THEOPHRASTUS

- Father of Botany
- two large botanical treatises
  - most important contribution to botanical science
- *Enquiry into Plants*
  - plants are classified according to their modes of generation, their localities, their sizes, and according to their practical uses such as foods, juices, herbs, etc. (economical uses of plants rather than their medicinal uses)

- *On the Causes of Plants*,
    - concerns the growth of plants
        - the influences on their fecundity
            - the proper times they should be sown and reaped
            - the methods of preparing the soil
            - manuring
            - use of tools
            - of the smells, tastes, and properties of many types of plants.

ROME

- Plinius Secundus
    - wrote Historia naturalis
- More than 1000 plants are mentioned and some information on medical use is given

PEDANIOS DIOSCORIDES

- Military physician under the Emperor Nero of Rome
    - wrote De Materia Medica
    - An account of more than 500 species of plants

Medical value

- Medicinal preparations of the plants
  - with expected beneficial effects and
  - even possible toxic side effects
    - Regarded as the founder of pharmacognosy
- Remain the ultimate reference source of medicinal plants for nearly 1500 years
  - Used ointment (salap) of woundwort as a styptic
    - to stop the bleeding of a Roman soldier wounded in battle
  - Use of juniper berries and hawthorn root
    - as topical or oral contraceptives

WOUNDWORT (*Stachys*)

- ***Stachys*** is one of the largest genera in the flowering plant family Lamiaceae
- Common names include heal-all, self-heal, woundwort, betony, lamb's ears, and hedgenettle.
- The name is derived from the Greek word (*stachys*)
  - meaning "an ear of grain", and
  - refers to the fact that the inflorescence is often a spike.
- The name woundwort derives from the past use of certain species in herbal medicine for the treatment of wounds.

HAWTHORN (*Crataegus)*

- Also known as thornapple
  - a large genus in the rose family, Rosaceae,
  - Native to temperate regions of the Northern Hemisphere in Europe, Asia and North America
- They are shrubs or small trees
  - mostly growing to 5–15 m tall,
  - with small pome fruit and (usually) thorny branches.
- The leaves grow spirally arranged on long shoots
  - leaves of most species have lobed or serrate margins
  - variable in shape.
- The fruit, sometimes known as a "haw",
  - is berry-like, but structurally a pome

JUNIPER BERRY (stopped)

- female seed cone produced by the various species of junipers.
- It is not a true berry but a cone with unusually fleshy and merged scales, which give it a berry-like appearance.
- The cones from a handful of species, especially *Juniperus communis*, are used as a spice, particularly in European cuisine, and also give gin its distinguishing flavour.

GALEN OF PERGAMON (CLAUDIUS GALENUS)

was a prominent Roman physician, surgeon and philosopher.

the most accomplished of all medical researchers of antiquity

Galen contributed greatly to the understanding of
numerous scientific disciplines including anatomy, physiology, pathology, pharmacology, and neurology, as well as philosophy and logic.

Physician to the gladiators

Adopted Hippocratic medical practice of adjusting the four body humors

MEDIEVEL (MIDDLE AGES)

Decline of the Roman Empire - Rise of the Christian Church

The herbal of Dioscorides was accorded blind acceptance as the authoritative source on medial plants for the entire 1000 year interval of the Dark Ages

Art of poisoning - In Italy, several families made their living as professional poisoners

Methods for poisoning were devised

Application of poison as lipstick and Poison ring

Substances utilized as poison ; Mineral toxins (Arsenic, copper); Poison from venomous toad; Toxic plant – (monkshood (aconite), yew and nux vomica (strychnine)

Monkshood (*Aconitum*) was employed to poison wolves – Wolfsbane

YEW *(Taxus baccate)*

a conifer native to western, central and southern Europe, northwest Africa, northern Iran and southwest Asia.

It is a small- to medium-sized evergreen tree, growing 10–20 metres

The bark is thin, scaly brown, coming off in small flakes aligned with the stem.

The leaves are lanceolate, flat, dark green, arranged spirally on the stem, but with the leaf bases twisted to align the leaves in two flat rows either side of the stem, except on erect leading shoots where the spiral arrangement is more obvious.

The leaves are highly poisonous.

Taxus baccata (European Yew) shoot with mature and immature cones

NUX VOMICA - *(Strychnos nux-vomica)*

A tree native to southeast Asia

Also known as poison nut or vomiting nut

The tree belongs to the *Loganiaceae* family and has small flowers and orange colored fruits that are the size of an apple or orange.

Inside the fruit are five seeds surrounded by a jelly-like pulp.

The ash gray seeds are round

The seeds are coated with downy hairs that give them a satiny appearance.

The main alkaloids in the seeds are strychnine and brucine.

These alkaloids give the seeds their bitter taste.

Strychnine by itself is extremely poisonous, but when given in small doses to humans it promotes appetite, aids digestion

WITCHCRAFT and SORCERY

Inducing death

A concoction (campuran) composed of a variety of ingredients (ramuan)

Henbane (*Hyoscyamus niger*) – basis of the witches brew

Deadly nightshade or witch's berry (*Atropa belladonna*)

Mandrake (*Mandragora officinarum*)

All three contain psychoactive compounds *and* were employed by witches in rituals (upacara amal)

To induce the desired hallucinogenic state in themselves and their disciples and to cast spells (jampi, serapah)

Salve (salap, salva) prepared from one or more of these nightshades, applied to the upper thighs or genitals, could induce the sensation of rising into the air or flying (on a broom).

Jimson weed *(Datura stramonium)*

Foxglove or "witch's bells" *(Digitalis purpurea)* is known to have been used as a witch's poison.

HENBANE (*Hyoscyamus niger*)

also known as **stinking nightshade** or **black henbane**,

a plant of the family Solanaceae

originated in Eurasia, though it is now globally distributed.

DEADLY NIGHTSHADE (*Atropa belladonna*)

also known as **belladonna**

is a perennial herbaceous plant in the family Solanaceae

native to Europe, North Africa, and Western Asia.

The foliage and berries are extremely toxic, containing tropane alkaloids.

These toxins include scopolamine and hyoscyamine which cause a bizarre delirium (racauan) and hallucinations (rayan), and are also used as pharmaceutical anticholinergics.

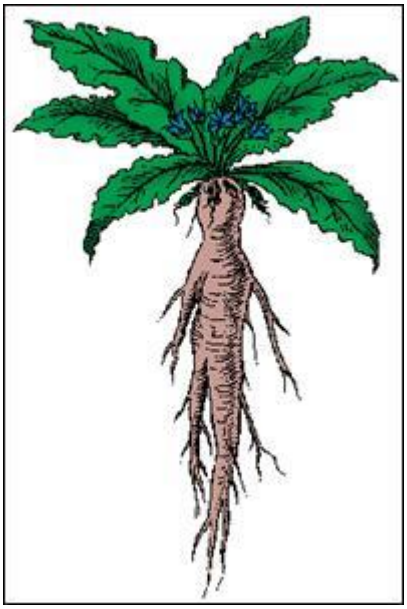
The drug atropine is derived from the plant.

MANDRAKE (*Mandragora*)

belonging to the nightshades family (Solanaceae).

contains delirian**t** hallucinogenic tropane alkaloids such as atropine, scopolamine, apoatropine, hyoscyamine

the roots resemble human figures - have long been used in magic rituals (upacara amal)



JIMSON WEED (*Datura stramonium)*

Also known **devil's trumpet**, **devil's weed**, **thorn apple**,

is a common weed in the *Solanaceae* (nightshade) family.

it is an erect annual herb forming a bush up to 3–5 ft tall.

The leaves are soft, irregularly undulate, and toothed.

The fragrant flowers are trumpet-shaped, white to creamy or violet

The egg-shaped seed capsule is walnut-sized and either covered with spines or bald. At maturity it splits into four chambers, each with dozens of small black seeds.

Parts of the plant, especially the seeds and leaves, are sometimes used as a hallucinogen. Due to the elevated risk of overdose in uninformed users, many hospitalizations, and some deaths, are reported from this use.

ARAB WORLD

some progress in botany and medicine occurred

Standing out is the name of Avicenna (ibnu Sina), a Persian

He wrote almost 450 treatises on a wide range of subjects, of which around 240 have survived.

In particular, 150 of his surviving treatises concentrate on philosophy and 40 of them concentrate on medicine.

His most famous works are *The Book of Healing*, a vast philosophical and scientific encyclopedia, and *The Canon of Medicine*, which was a standard medical text at many medieval universities.

Ibn Sina's *Canon of Medicine* provides a complete system of medicine according to the principles of Galen (and Hippocrates)

became a medical text in both the Christian and Moslem worlds.

BOTANY IN THE RENAISSANCE

fifteenth and sixteenth centuries - the invention, circa 1440, of the printing press with movable type

as a means for disseminating information (making books available to everyone)

as a stimulus for the reawakening of intellect associated with the Renaissance.

In botany, this rebirth of progress is manifest in a movement known as herbalism

Aim - to gather as much information on medicinal plants as possible

During the sixteenth century.

the "four German fathers of botany,"

Otto Brunfels, Jerome Bock, Leonhart Fuchs and Valerius Cordus,

all produced significant herbals.

herbal of Bock - Bock's descriptions were not written in Latin as were those of a number of the herbalists, but rather were composed in his native German tongue.

The herbal of John Gerard is among the most famous in the present day; however, it is considered inferior in content to some other herbals laced with myth (mitos) and superstition (tahyul, kepercayaan karut)

Gerard's herbal contains. for example, the legend of the "goose tree" the fruits of which upon falling into *the* water may change into geese or barnacles.

William Turner's herbal, which included, among many other plants, more than 200 species native to England

DOCTRINE OF SIGNATURES

a philosophy shared by herbalists from the time of Dioscorides and Galen.

Very old belief that the creator had put a sign or signature on certain valuable plants

To enable people to perceive their worth.

This doctrine states that herbs that resemble various parts of the body can be used to treat ailments of that part of the body.

Might be possible to tell what a plant might be used for, by merely looking at it

Herb with red juice – good for the blood

Yellow juice – for urinary difficulties

Plant with coiled inflorescences – good for snakebite or for the sting of a scorpion - snakeroot

Convoluted surface of walnut – brain (relieve headaches)

leaf lobing of liverleaf, *Hepatica triloba – remedy for bilious (liver) ailments*

A theological justification was made for this philosophy:

It was reasoned that the Almighty must have set his sign upon the various means of curing disease which he provided.

The concept is still reflected in the common names of some plants whose shapes and colors reminded herbalists of the parts of the body where they were thought to do good - lungwort; bloodroot; toothwort; and wormwood

TOOTHWORT (*Lathraea*)

a small genus of five to seven species of flowering plants, native to temperate Europe and Asia.

They are parasites on the roots of other plants, and are completely lacking chlorophyll.

The tootworth is also a carnivorous plant.

Most of the plant consists of a branched whitish underground stem closely covered with thick fleshy colourless leaves, which are bent over so as to hide the under surface; irregular cavities communicating with the exterior are formed in the thickness of the leaf.

On the inner walls of these chambers are stalked hairs, which when stimulated by the touch of an insect send out delicate filaments by means of which the insect is killed and digested.

The only portions that appear above ground in April to May are the short flower-bearing shoots, which bear a spike of two-lipped dull purple flowers. The scales which represent the leaves also secrete water, which escapes and softens the ground around the plant.

LUNGWORT

The scientific name *Pulmonaria* is derived from Latin *pulmo* (the lung). the spotted oval leaves of *P. officinalis* were thought to symbolize diseased, ulcerated lungs, and so were used to treat pulmonary infections

BLOODROOT

North American plant, *Sanguinaria canadensis,* of the poppy family, having a red root and root sap and a solitary white flower. Orange-red sap was formerly used by Native Americans as a skin stain for war dances and ceremonial rituals, as well as a fabric dye.

Scientists see the doctrine of signatures as superstition. There is no scientific evidence that plant shapes and colors help in the discovery of medical uses of plants

SEVENTEENTH CENTURY

Interest in herbalism continues

John Parkinson wrote Theatrum Botanicum (Theatre of Plants)

discussed 3800 plants

botany found itself to becoming more self-defined and more of a pure science discipline.

The writings of the Englishman, John Ray, in the field of taxonomy placed emphasis on the classification of plants by their own inherent natural relationships, rather than by their medical (herbal) uses.

EIGHTEENTH CENTURY

Scientific investigations characteristic of the seventeenth century come into full bloom in the Age of Enlightenment

Species Plantarum – Linnaeus

The book served to popularize botany as a discipline

In the eighteenth century, a clear distinction had developed between "regular" physicians and herbal healers

however, herbal medicine and formal medicine could still be intertwined

William Withering, an M.D. from Edinburgh University.

ability to treat certain disorders, especially dropsy (Edema) - sembab

a disease characterized by a fluid buildup in the extremities (and lungs), a weak pulse, and short of breath.

Dropsy was later to become known as congestive heart failure.

Prior to Withering, treatment of dropsy often consisted literally of puncturing patients to drain fluid from swollen tissues.

Withering learned to treat these patients, often successfully, with foxglove *(Digitalis purpurea).*

Foxglove

also known as Purple Foxglove or Lady's Glove,

a flowering plant in the family Plantaginaceae (formerly treated in the family Scrophulariaceae), native to most of Europe.

It is a herbaceous biennial plant.

The leaves are spirally arranged, simple, broad, grey-green, downy, and with a finely toothed margin; they form a tight rosette at ground level in the first year.

The flowering stem develops in the second year. The flowers are arranged in a showy, terminal, elongated cluster, each tubular, pendent, purple (also pink, rose, yellow, or white in selected cultivars). They are also spotted inside bottom of the tube. The flowering period is early summer, sometimes with additional flower stems developing later in the season.

The fruit is a capsule which splits open at maturity to release the numerous tiny seeds.

knowledge of digitalis from a midwife (bidan) and herbal healer

Her knowledge was back to the use of foxglove as a poison by witches during the Middle Ages.

From the midwife's concoction, Withering was able to conclude that digitalis was the agent effective against dropsy.

For 10 years (1 775-1 785) - Withering did extensive clinical experiments on carefully measured dosages of powdered digitalis leaf (extract).

His thorough controlled experimentation not only gave the world a major heart medicine (capable of slowing and strengthening the heartbeat, improving circulation, and moving out excess fluid), but served as a model to put pharmacognosy back on its feet.

Through the efforts of Withering, pharmacognosy regained an impetus given to it by Dioscorides more than 1706 years earlier.

NINETEENTH CENTURY

Extension of the level of phamacognosy practiced by Withering

isolating and purifying the active ingredients of the cruder (raw) plant product drugs.

Such work was undertaken very successfully by Justus von Liebeg of Germany, considered to be the father of physiological chemistry (or more appropriately, perhaps, pharmacology).

von Liebeg, following up on the work of Friedrich Sertilmer (who had isolated morphine from the opium poppy, *Papaver somniferum),* refined practices of drug isolation and purification that still have their impact today.

The middle of the nineteenth century also saw the initial production *of* simple synthetic drugs; for example, salicylic acid (the active ingredient in aspirin), a natural product obtainable from several different plants, was made synthetically in 1853.