

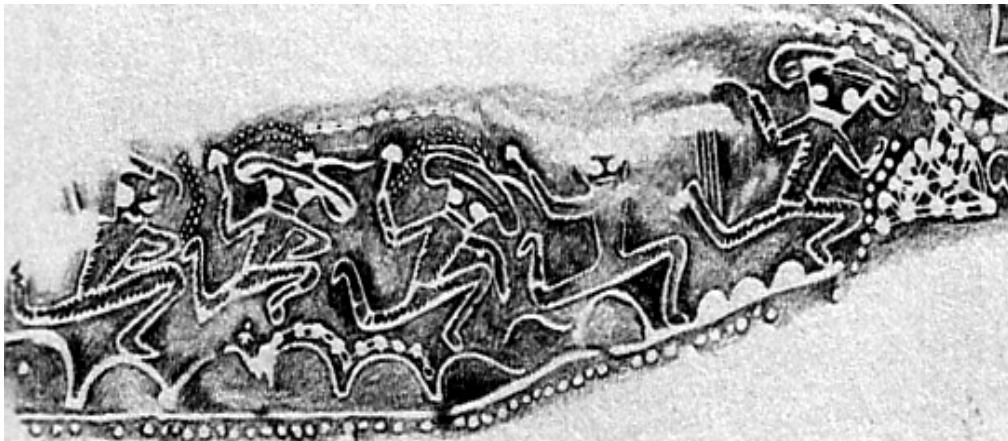
Botany of Desire Mike's View

Botany of Desire: A Plant's-Eye View of the World is a 2001 nonfiction book by journalist **Michael Pollan**. This work explores the nature of domesticated plants from the dual perspective of humans and the plants. **Four types of human desires** are reflected in the way that we grow, breed, and genetically engineer our plants. The **apple** reflects the desire of sweetness, the **tulip** beauty, **marijuana** pleasure and the **potato** sustenance.



Plants as origin of medical & psychological experimentation in humans

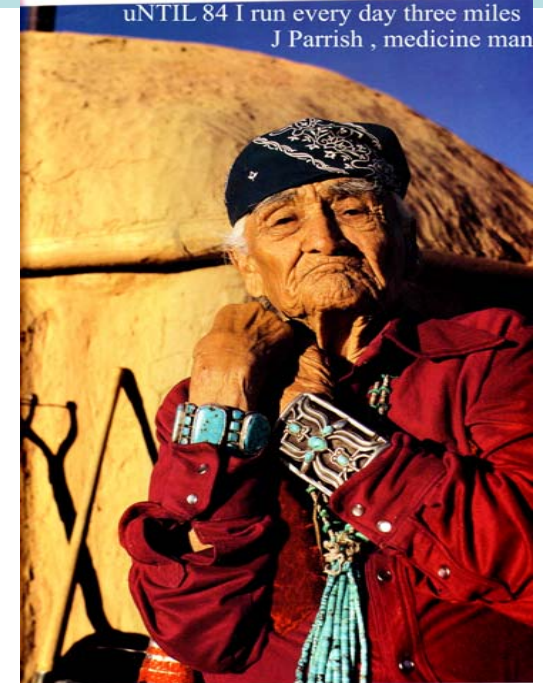
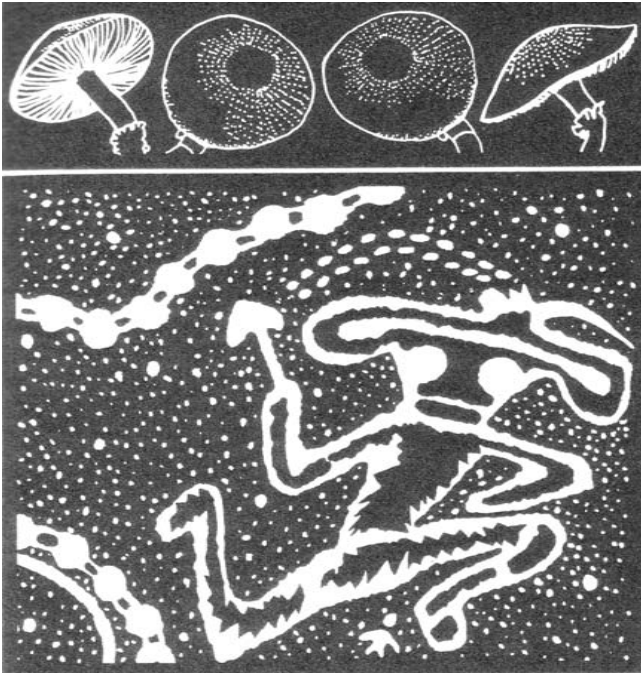
The first hallucinogens humans encountered in the African savannah: were psilocybin-containing **magic mushrooms** (*Stropharia cubensis*) settling dung of hoofed beasts (zebus) and hemp (*Cannabis sativus*) – a multi-use plant luxuriating on human dung piles. The alkaloid **psilocybin excites acuity, self-reflection, cultural activities and vocalization that might have stimulated language** – w/o doubt more important for plant gatherers than stealthy hunters.



Tassili plains in the Sahara 30 ka ago – was possibly the “Eden” (McKenna)



Medical & psychological habits



***Use of hallucinogenic plants may have stimulated cognitive activities of pre-humans and stimulated strikingly new rituals and habits (dancing, singing, extended vocalizations, painting, symbols, meditation, induced dreaming), some evidence from rock paintings in the Sahara's Tassili plains
→ culture and spirituality***

REF: Terence McKenna (1992). Food of the Gods. The search for the original tree of knowledge. Bantam Books, New York.

"Indians" cultivated two species of tobacco



Mayan Priest
blowing smoke



Nicotiana rusticum & Nicotiana tabacum



"Indians" using both pipe & rolled leaves
as well as "fire" to produce smoke!



Despite James I's characterizing tobacco smoking as "A custome lothsome to the eye, hatefull to the nose, harmefull to the braine, dangerous to the lungs, and in the blacke stinking fume thereof, nearest resembling the horrible Stigian smoke of the pit that is bottomless" (*Counterblaste to Tobacco*), the British continued to smoke and went on to develop the genteel art of blowing smoke rings.

What is a plant spirit? ask this old shaman

In all cultures plants have been seen as having an invisible inner essence or spirit. Plant spirit medicines are mood changing & can evoke joy & tranquility. They may effect body & mind, they may be essential oils, homeopathic dilutions, smells ..



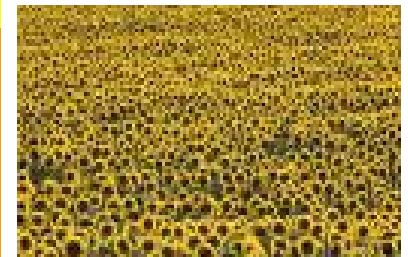
Before we reap the benefits we need to cultivate respect for the plants. Plant are living beings with unique personalities that we have to explore.



One founding principle of shamanism is that plants & humans can communicate.

What does such a claim mean?

That plants are natural does not mean safe & gentle. On the contrary they are the biochemical master kingdom & we profit from the fact that we share common threats!



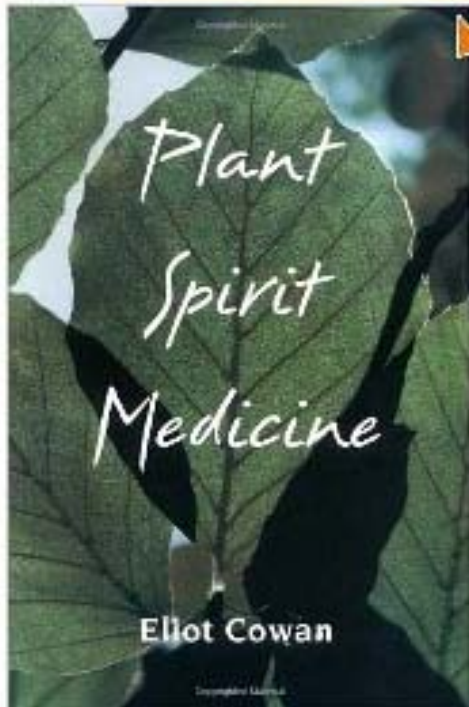
C G Harvey & A Cochrane (1999) The healing spirit of plants. An illustrated guide to plant spirit medicine. Sterling Publ., Hongkong

Plant Perceptions & Emotions



Elliott Cowan and before him many Amazonian healers claim that you do **not need to study herbalism** since the herb will only help you if you asked her to and establish communication.

The plant's spirit will tell you how to proceed.



Chinese Fleece Flower *Fallopia ssp.*



The Chinese Fleece flower is in the genus *Fallopia* in the family Polygoniaceae, a relative of the infamous Japanese Knotweed *Fallopia japonica*. The Chinese use this plant in their traditional medicine for kidney health, strong bones and hair restoration, and as a mild laxative, and it's.. Hey, wait a second...

“ I tell you, ...
it is a sign, yeah, ah ...
it's an omen!” The end of
the world is close, oh Rose

Okay, weird. It's a root that looks like a little dude. But that's a rare, onetime fluke, right? It's not like that's what this species *typically looks like* or anything?? Roots making a perfect couple made headlines in 2006 →





aura or unseen entities
identities seen in totem poles

Aura-reading exercise:



Spring wolf's spiritual education network

<http://www.paganspath.com/meta/auraex.htm> offers

Aura reading exercise: Practice is the key to developing any new skill. Spend at least 15 to 20 minutes on each exercise. Don't lose patience with yourself, just keep trying.

Trust your instincts. Sit in front of a potted plant. Choose a spot near the top or at the base of the plant. Let your eyes go out of focus. Look beyond the plant, as if you're focusing on an object hanging from a branch or leaf. *You should begin to see the white inner-aura of the plant.* Keep your focus on the white aura and try moving your perception around to the opposite side of the plant. You might try placing a small lamp behind the plant, to illuminate it's leaves and branches. Avoid to see the bulb. This illumination can help trick your physical sight to focus on the slight reflection of the light that may grow wider and soon you'll realize that what you're looking at is a colorful aura. You should see if the plant is healthy or it's beginning to develop physical problems.

What is a plant teacher? ask this old sha

Tree spirits guided the deliberations of Nordic & Germanic peoples held council under oaks (*Quercus r*)



Osha (*Ligisticum porteri*) was the major bear medicine of the Sioux, bear itself was teacher about healing plants

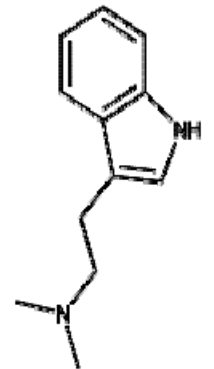


The ancient Greeks believed that their herbal knowledge was handed to them by the centaur Chiron!



...the centaur Chiron reveals secrets of plants to ignorant humans ...

Tribes of the Amazonian jungle regard a plant called ayahuasca *Banisteriopsis coapi* their professor of medicine. A tea from this plant gives them visions of the healing power of other plants. Active ingr. is dimethyltryptamine - a hallucinogenic indole



Also Australian aborigines discovered through their dream time how to capture the healing power of plants

Plant Magic? ask this old shaman



Christian Friedrich Samuel Hahnemann (1755-1843) found 1. that an extract from cinchona bark taken by a healthy person (or animal) causes the *same symptoms* as *in disease malaria* against which it is used as a *remedy*.

H. postulated **healing principle**: "that which can produce a set of symptoms in a healthy individual, can treat a sick individual who is manifesting a similar set of symptoms." This principle, short version is *like cures like*, became basis for an approach which he gave the name homeopathy.

2. Principle: If miniscule, *diluted amounts of the same cinchona* extract are taken a day or two after the inhalation of initial full-bodied extract, this miniscule dosage was found to *turn the symptoms off*.

Will a declining presence of the causative substance be sufficient to switch disease off? Is it true that less is better than a constant amount of remedy?

Homeopathy uses similar remedies as herbalists. The defining signature, however, is for a herb to cause similar symptoms? This could be called a new, more practical formulation of a **doctrine of signatures**.

Plant indicators reflect soil they grow on

Submersed plants: Elodea, Potamogeton, Ranunculus aquatilis, Alisma, Sagittaria, Myriophyllum, Callitriche

Floating plants: Lemna, Nuphar, Pondweeds

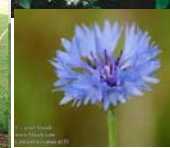
Near-water plants: Equisetum limosum (swamp horsetail), Typha, scirpus, Iris, Nasturtium, Juncus, Spiraea, Acorus calamus, Caltha palustris :

Acid soil (low pH): Campanula (bellflowers), Calamagrostis lanceolata, Centaurea cyanus, Lycopodium, Matricaria, Veronica

Alkaline soil (high pH): Geum (also wet), Lithospermum, Potentilla, Sedum, Thlaspi, Trifolium repens

Calcium (high pH): Anemone, Aster alpinus, Convallaria majalis, Carex, Gentiana, Sorbus, Trifolium, Lactuca, Viburnum

Sand: Antennaria, Calluna, Equisetum arvense, Erigeron canadensis





Some plants have been around since the beginning of recorded time (3000 BC): they saw the building of the pyramids, the rise and the fall of Rome, the Mongols, the USA and USE, they saw it all

Plants are phylogenetically (i.e. as a life form) & ontogenetically (i.e. as individuals) much older than we are, some older than our entire civilization. What does longevity mean for a species?



The Hunza – a tribe in the mountains of Pakistan – reach often 100 to 120



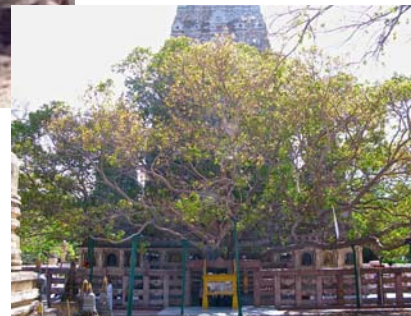
Adwaita, a Aldabra Giant Tortoise died at the age of **255** in March 2006.



Pinus aristata – the **Bristle cone pine** lives high in the mountains of Colorado & is proven to reach 5000 years



Pando The Trembling Giant) is a clonal colony of a single male **Quaking Aspen** (*Populus tremuloides*) in Utah with one one massive root system, The plant is estimated to weigh collectively 6,000 tonnes making it **the heaviest known organism and the oldest known living organisms in existence at 80,000 years of age.**^[5]

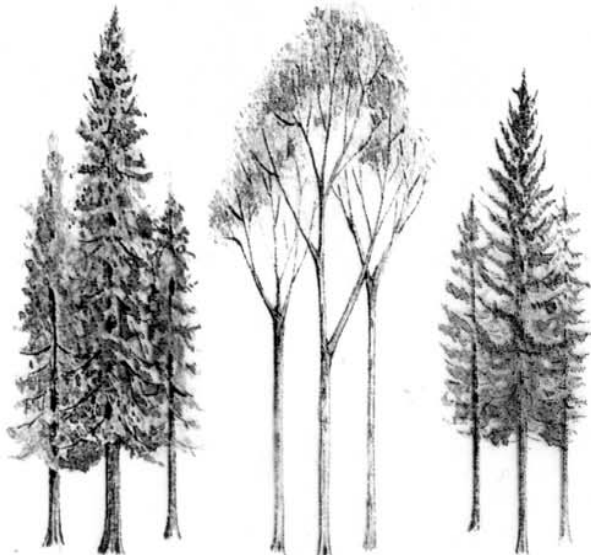


A Sacred Fig (*Ficus religiosa*) specimen, the Sri Maha Bodhi, was planted in 288 BC & is 2,293 years old, oldest flowering plant.

Trees bare witness to bygone times

Trees reach back many ages, the mammoth tree “General Sherman” is older than Jesus. They bare witness to local disasters like fire, drought, earthquakes, and the arrival of the second & third peoples

Sylvan skyscrapers

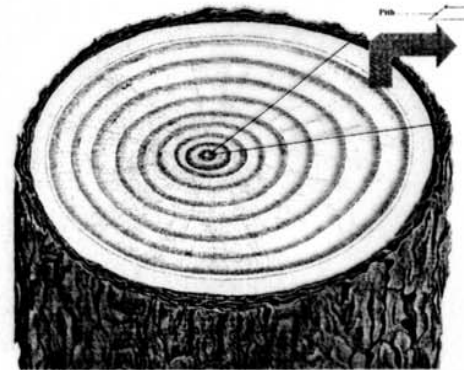


Redwood sequoia
Sequoia gigantea

Giant eucalyptus
Eucalyptus ssp.

Douglas fir
Pseudotsuga m

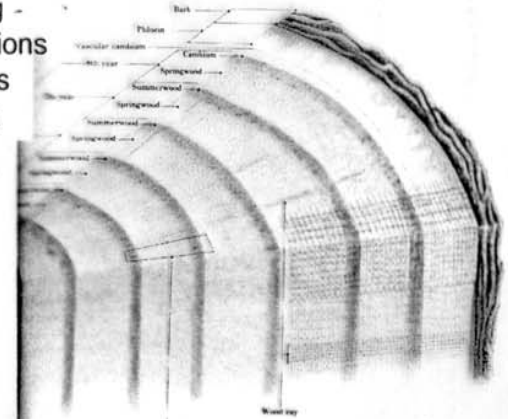
Growth rings in trees provide a living - climate record for the temperate regions of the planet that goes back as far as the age of the tree ... thousands of a



A living climate record

Growth rings not only reveal a tree's age but also record what the weather was like in each year of its life. A wide growth ring indicates that rainfall was plentiful, allowing the tree to grow rapidly. A thin ring indicates drought, when there was little water to spur

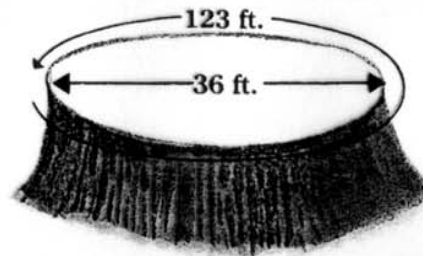
growth. Sometimes growth rings are irregular, growing faster and wider on the south side, where there is plenty of sunlight (right). Fossil tree stumps give evidence that the Earth's climate has changed many times over the last several hundred million years.



Forming growth rings

The main parts of a tree trunk are not used above and document its growth. Bark forms the protective outer layer. Just inside the bark is a thin layer from which new bark forms. This layer contains the vascular bundles with a thin layer of phloem (yellow) and xylem (white). The thin phloem layer is often mistaken for part of the bark. Between the phloem and the xylem lies the cork cambium (green). Another cambium layer, one cell thick (like brown line), is virtually invisible, yet this is where the tree trunk is growing. Cambium cells divide constantly during the growth season. Some move toward the outside of the

General Sherman's vital statistics



Diameter: 36 ft.
Circumference: 123 ft.
Height: 272 ft.
Age: 3,500 years



A bristlecone pine in California

Annuals, biennials, perennials & really old plants

Species	Age (years)
Bacteria	20 min
Annuals	1
Biennials	2
Alnus	100
Malus silv.	200
Fraxinus ash	300
Juglans walnut	400
Ulmus	500
Larix larch	600
Abies fir	800
Fagus beach	900
Picea spruce	1000
Quercus r oak	1200
Castanea	1500
Taxus yew	> 2000
Sequoia	4000
Pinus aristata	
bristlecone pine	6000
arctic lichens	>20 000

Some bacteria divide after 20 min existence & hence never age or die but grow to 13 Mio Mio cells /d. → in line this means length inc from 1 μm to 13 000 km algal cells (diatoms) live 5 days, yeast cells can live already 3 weeks.

Single-celled organisms have short life span & do not end their life as a corpse since they often directly continue life in the form of 2 daughter cells

Long life time is feature of **multicellular organisms**, which cannot continue their life as an individual but end it with the production of a multicellular corpse. This applies to both plants & animals.

In plants they oldest creatures are the largest → trees
in animals this is not so, turtles can outlive whales

Perennials

Most flowers that you plant as seeds in the spring are annuals. You must save the seeds to regenerate the species in the next spring: gladiolus, salvia, marigold, zinnias, snapdragons, sweet peas Lathyrus

Annuals

Annuals: gladiolus, red salvia, marigold, zinnia, snapdragon, sweet peas Lathyrus



gladiolus red salvia marigold



zinnias snapdragon Lathyrus

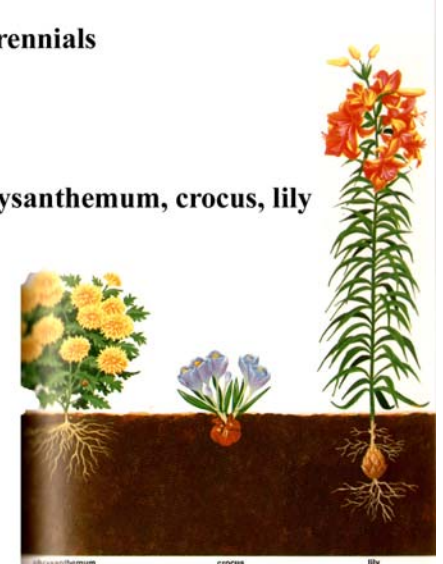
Perennials

Some Perennials

delphinium, tulips, Iris, chrysanthemum, crocus, lily



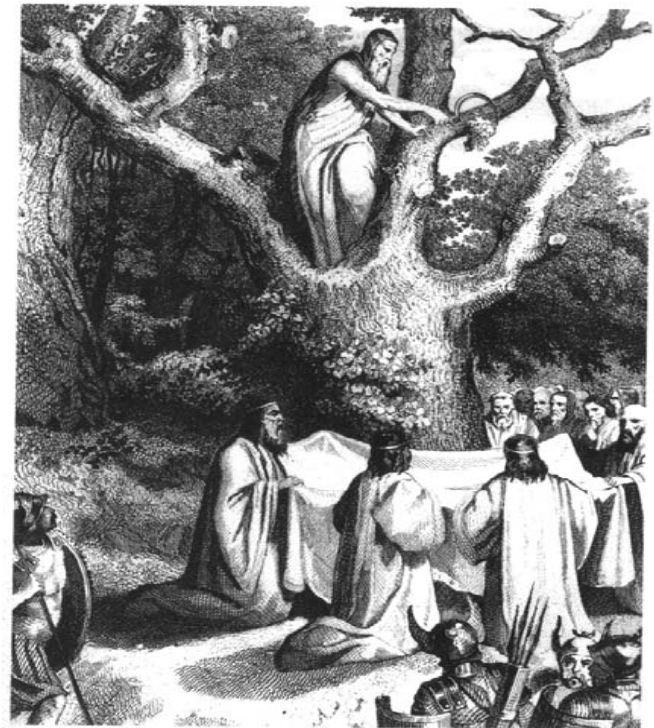
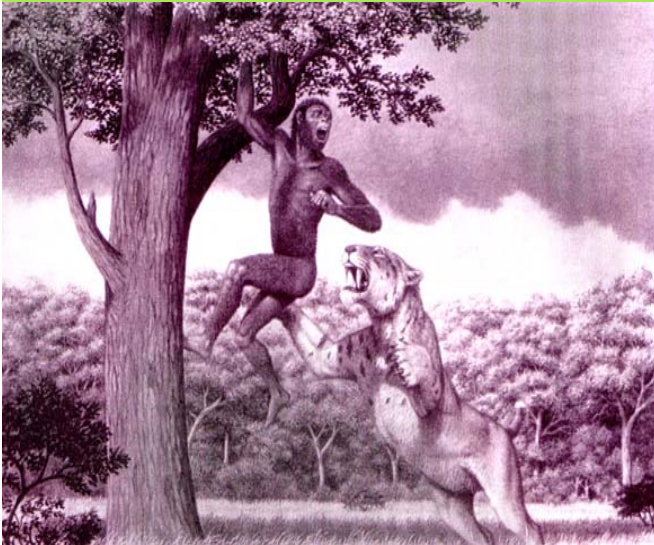
delphinium tulips iris



chrysanthemum crocus lily

Some flowers do not have to be planted as seeds every year. You plant them just once & they will bloom every year → they are perennials They survive as geophytes (bulbs, corms, rhizomes, tubers, buds) & need some protection during the cold winter weather: lilies, tulips, crocus, iris, chrysanthemum, delphinium (most crowfoots)

Trees of life – ethnobotanical archetypes



Humans are unconsciously aware of trees as their original habitat and refuge from predators. **Trees are the largest and longest living beings on the face of the planet. According to Carl Jung this might explain the concept of trees as the source of all life (archetypes)**

traict de l'Arbre qui porte des feuilles, lesquelles tombées sur terre se tournent en oyseaux volants, & celles qui tombent dans les eaux se muent en poissons.

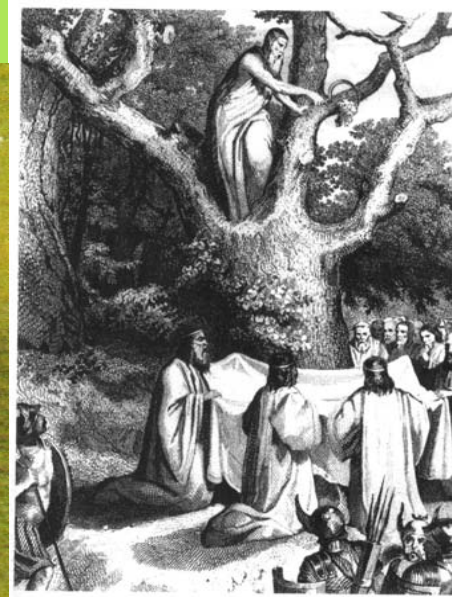


(Courtesy of Missouri Botanical Garden.)

Plants & People - Mystical features of plants

Tree -a life form different from humans and animals, from small seeds can arise huge plants, seeds germinate and plants grow only when in contact with the earth (Antheus) trees reach a much older age than humans or any known animals outlasting many of their generations and is able and predestined to record life, events and accumulate wisdom: *Ficus religiosa* in India, *Quercus robur* in Germania

==> **Circle and Tree of life** are most common, universal symbols - “archetypes of the collective unconsciousness of mankind” (Carl Jung 1956). Both symbol in seeds.



Islamic symbol Ricinus seed Celtic oak/mistletoes Hindu gods + banyan

The mystic feature of plants to improve the air we breath

Sansevieria trifasciata Mother-In-Law's Tongue:

The best Bedroom plant since it converts a lot of CO₂ (carbon dioxide) to O₂ (oxygen) at night, you could live in a completely air sealed room if you had **6-8 waist high snake plants** The snake plant also removes formaldehyde from the air.

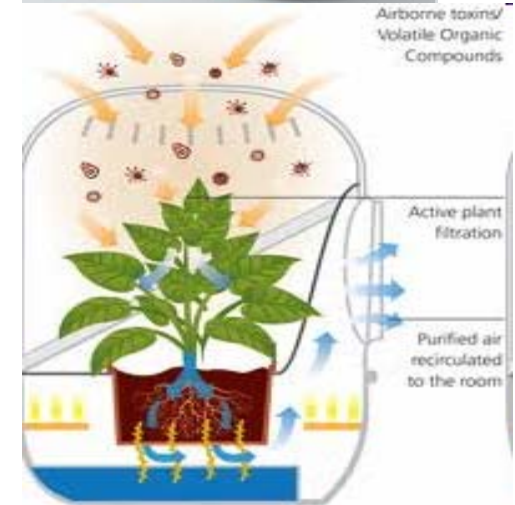
Areca palm removes xylene and other organic volatiles from glues. No need to divorce your hobby-airplane partner.



Sansevieria

&

Areca palm
Dypsis I.



A tropical vine called "the coughing bean" is sensitive to dust. When the leaves are coated with dust the leaf produces gas pressure and expels the dust with an audible paroxysm similar to coughing or sneezing

Readers Digest: Secrets of the Natural world 1993

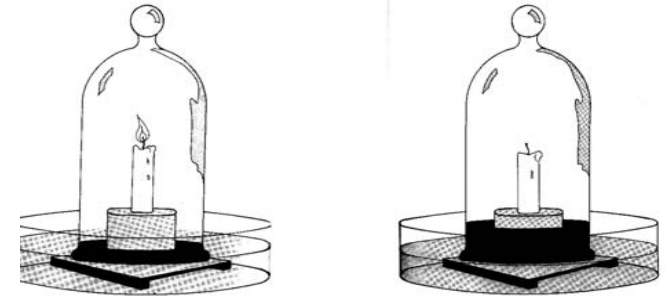
The Bel-Air indoor air filtration systems suck in dirty air and run it through a plant's leaves, roots, and a "humid bath" before releasing it back into your room, purified.

A Planet without Plants is a dead Planet

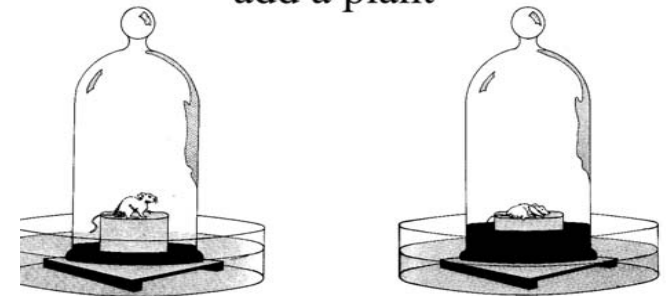
John Mavow 1640-79
Joseph Priestley 1733-1804 showed that there is something in the air that keeps candles & animals going

Fire and animals spoil air → oxidation

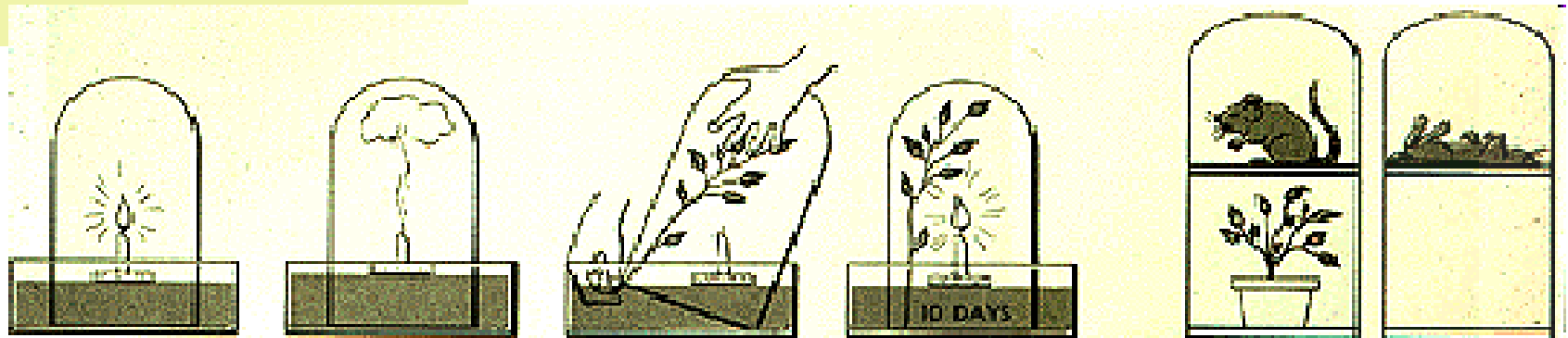
**Plants improve the air.
Oxygen was unknown then.**



add a plant

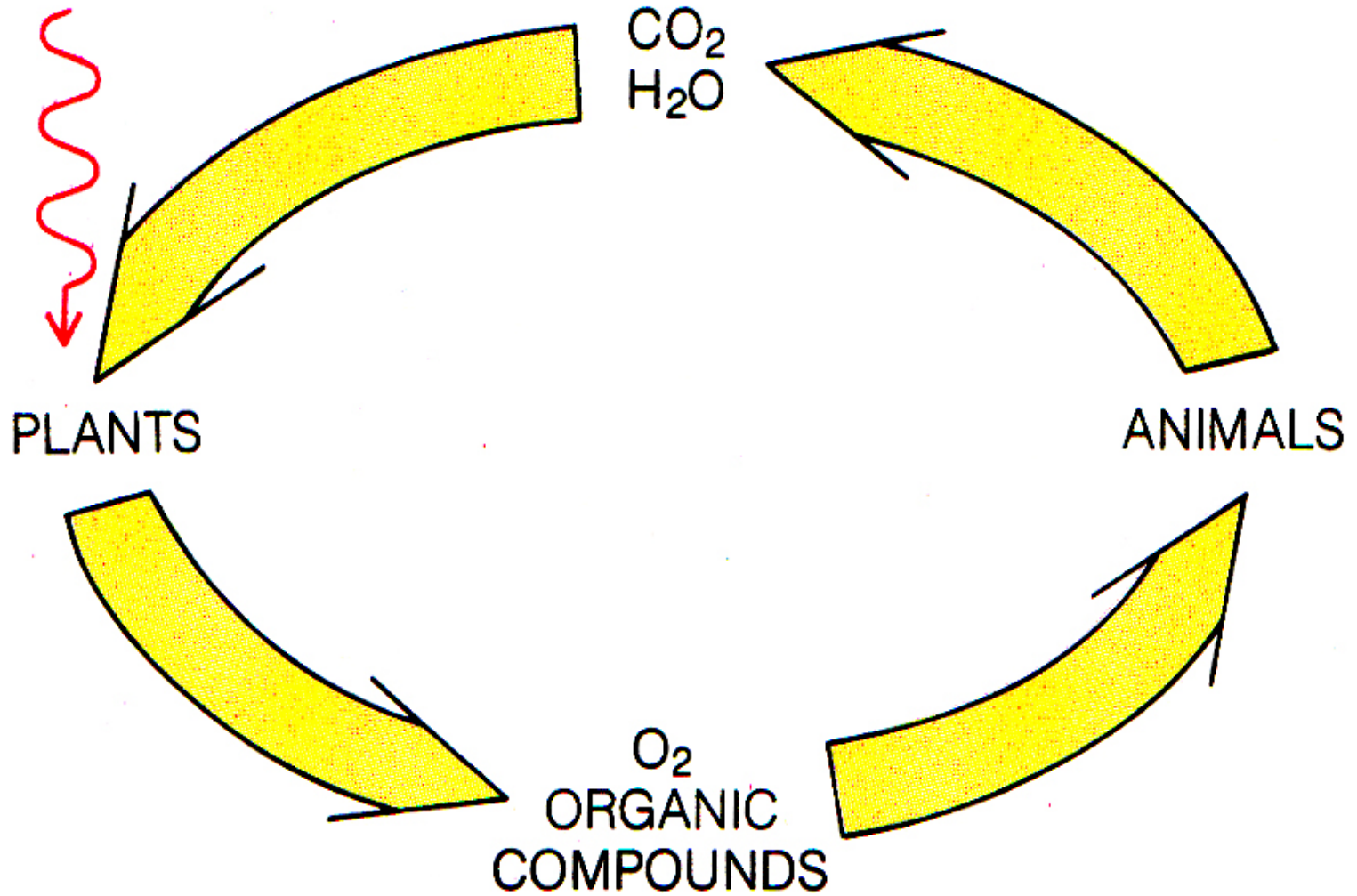


& Joseph Priestley used candles & mice to show that both need X
John Mavow (1640-79)



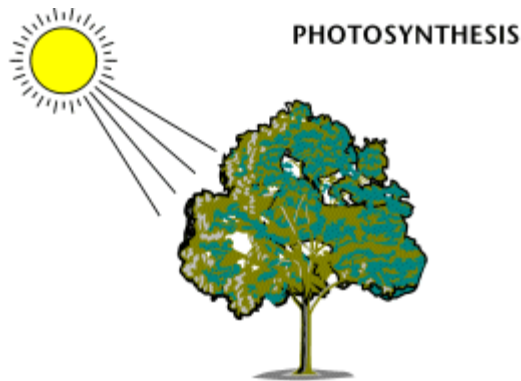
Producers and consumers

SUNLIGHT

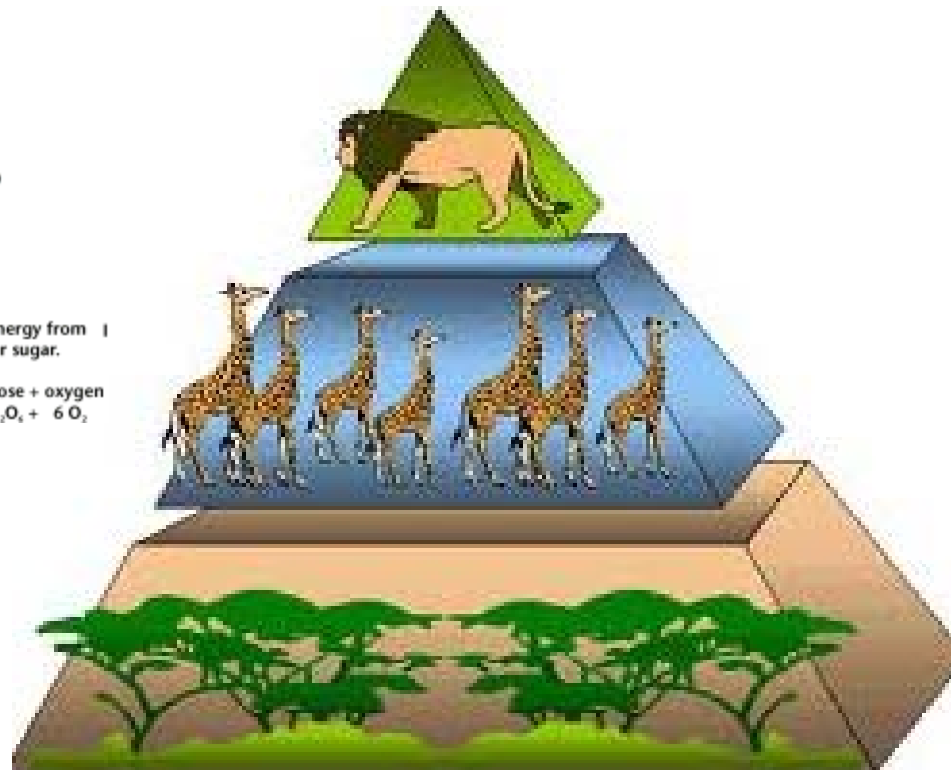


The second role of Plants on the Planet → biomass

While photosynthetic bacteria use the light energy to produce **ATP** (Adenosin Triphosphate – the universal currency of energy in living beings) **algae and plants are the major creators of biomass on the planet.** Biomass stores a certain percentage of the solar energy and most heterotrophic organisms depend on it for their existence.



In the process of photosynthesis, plants convert radiant energy from the sun into chemical energy in the form of glucose - or sugar.



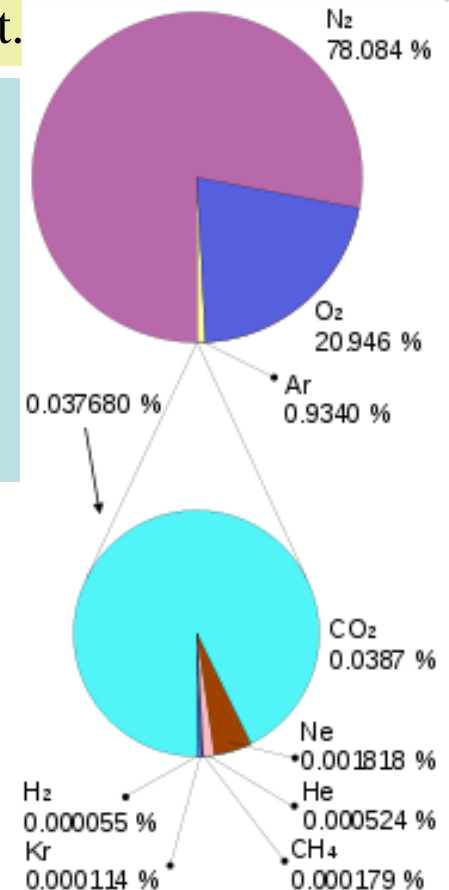
Other features associated with plants: a warmer planet

1800: geologists found a succession of geological ages with **changes in climate**. In 1837 **Louis Agassiz** was the first to scientifically propose that the Earth had been subject to **ice ages**. John Tyndall investigated the gases of the atmosphere & found that only CO_2 & water vapor absorbed heat or IR. Svante **Arrhenius** saw that human influence on carbon would eventually cause doubling of atmospheric CO_2 , reduce snow & ice cover on earth, & make the planet darker and warmer yet.



"Earth's surface is 33 degrees warmer than it would be without an atmosphere. A planet the size & distance of earth from the sun, in thermodynamic equilibrium with solar radiation, would have a surface temperature of -18 degrees C. Earth's average surface is 15 degrees C, or 33 degrees C warmer. This increase in temperature is due to **greenhouse gases (CO_2 & Water) in the atmosphere.**"

Average atmospheric pressure at sea level is about 1 atmosphere (atm) = 101.3 kPa (kilopascals) = 14.7 psi (pounds per square inch) = 760 torr = 29.9 inches of mercury. Atmospheric pressure is the total weight of the air above unit area at the point where the pressure is measured. **Thus air pressure varies with location and time, because the amount of air above the Earth's surface varies.**



A world without Plants?



Life in the dark depth of the oceans: thermal vent communities right here on our home turf

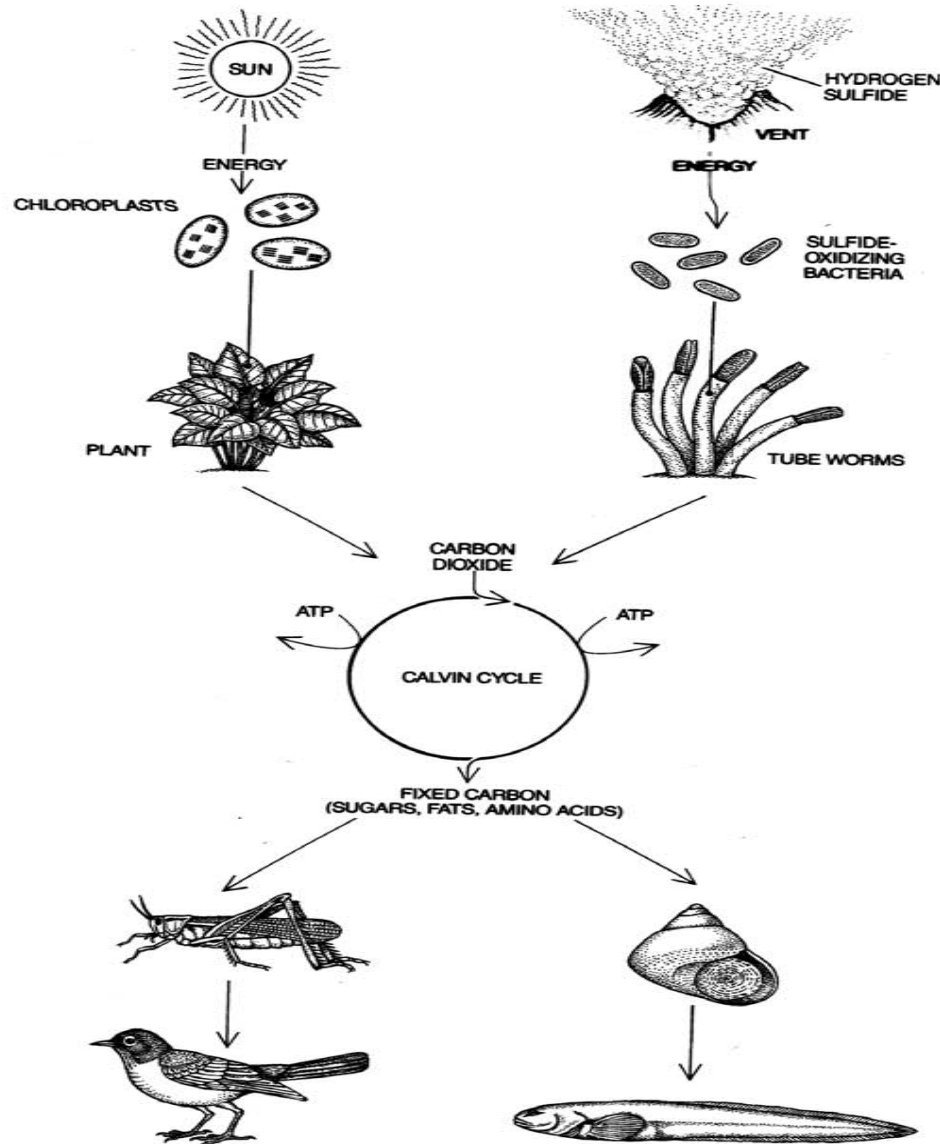


Two alternatives of life on the planet earth and else?

Two worlds of organic life

Photosynthesis

Chemosynthesis



Life in the dark
depth of the
oceans:
thermal vent
communities

Life in the
bright sun:
photosynthesis
based life forms

What kind of plants do we have on earth? A collection.



Welwitschia mirabilis is a plant living in remote areas of the Namib desert. It is in the subdivision of Gnetophyta in the Gymnosperms related to conifers. The plant is a living fossil & was named after the **Austrian botanist Friedrich Welwitsch who discovered it in 1859**. Two ever-growing leaves (**toilet paper plant**)

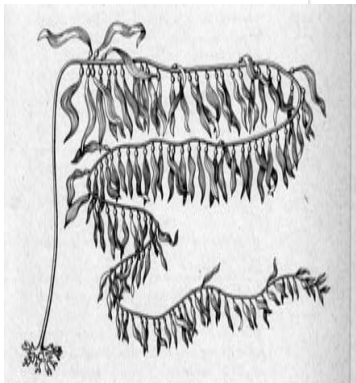


Hydnora africana is an achlorophyllous plant native to southern Africa that is parasitic on the roots of members of the Euphorbiaceae family. The plant grows underground, except for a fleshy flower that emerges above ground and emits an odor of feces to attract dung beetles and carrion beetles. The flowers act as traps for a brief period retaining the beetles that enter, then releasing them when the flower is fully opened

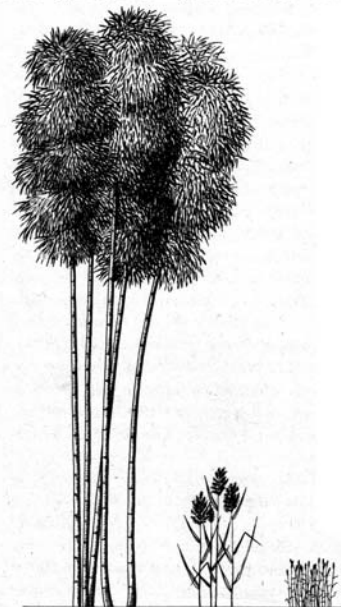
The largest plants on earth

The smallest algae are single cells, the smallest flowering plant (anthophyte) is Lemna minor or duckweed. The largest marine life form are kelps or brown algae extending the size of a blue whale.

The tallest grasses (monocots incl palms)



The longest "plant relative" on earth is *Macrocystis pyrifera* - a brown alga called "The giant kelp"



20-30m bamboo	4m reed	1.5m wheat
<i>Gigantochloa verticillata</i>	<i>Phragmites australis</i>	<i>Saccharum officinarum</i>
giant bamboo	reed grass	sugar cane
up to 40 m	up to 6 m	up to 9 m

The tallest of the tallest plants = trees



Local news: Doug fir reaches 90 m

Condos	Eucalyptus	Sequoia	Picea alba	Quercus ro	Fagus
30 m	130 m	110 m	75 m	50 m	40 m
100a	400 a	4000a	1000a	1200a	900a

The tallest seed plants are Eucalyptus trees in the Myrtaceae family. The giant redwood *Sequoia giganteum* reaches 135 m & stem thickness of 12 m, coastal or evergreen redwood *Sequoia sempervirens* has same height but lesser stems

Bizarre Plants

Monstrous + stinky (amines): *Amorphophallus titanum*, *Rafflesia arnoldii*, *Aristolochia grandiflora* (Humboldt), *Welwitschia mirabilis*, *Victoria amazonica*, Aztecs' handflower tree *Cheirostemon platanoides* (related to Cocoa tree, Humboldt), Baobab (sausage) trees *Adansonia*, boogam trees *Idria columnaris* (desert in Baja California), elephant or skunk tree *Bursera microphylla* (Baja California; tug on leaf & it burps out a foul smelling, fetid spray over a distance of 50 cm), squirting cucumber *Ecballium elaterum* shoots fruit as a rocket over 3 m distance, slimy mucilage with seeds sticks to the one who touched the fruit



WB Emboden(1974): Bizarre Plants; magical, monstrous, mythical. MacMillan P. NY

The weirdest plants on earth

The weirdest plants are often also very rare leftovers (living fossils) of bygone times. Their presence is a great treasure – a true “Jurassic Park”.



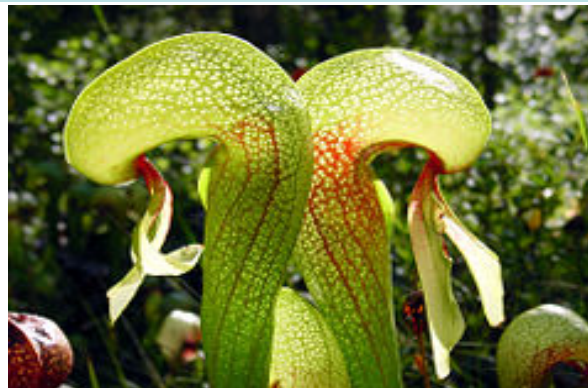
Dionaea musc. trap distribution



Welwitschia endemic to Namib



Rafflesia attracts by cadaverine



Darlingtonia is an insect trapper



Amorphophallus corpse pl

The tallest seed plants are Eucalyptus trees in the Myrtaceae family. The giant redwood *Sequoia giganteum* reaches 135 m & stem thickness of 12 m, coastal or evergreen redwood *Sequoia sempervirens* has same height but lesser stems

Bizarre Plants :Dictamnus

The burning bush *Dictamnus albus* is a member of the Rutaceae. Many plants of dry locations are known to increase production of terpenes to cool leaf surfaces by terpene transpiration.



Dictam, however, produces so much that it can undergo **self-ignition**
→ **stories of self-igniting & burning bush stories in Bible & Koran**
It is thought that droplet formation in the leaf focuses sunlight to a temperature that ignites terpenes which burn like a gas grill using the stomates as valves.

The burping skunk tree

is a member of the Burseraceae, related to frankincense (*Boswellia*) and myrrh (*Commiphora*) but unlike them it stinks (skunk tree).

The elephant tree *Bursera microphylla* is native to Northern Mexico, Southern California and Arizona, especially desert regions. It reaches 5 m in height. The foliage is made up of long, legume-like leaves which are composed of paired leaflets. It flowers in rounded yellow buds which open into small, star-shaped white or cream flowers



When you tug on a leaf **it burps and emits a fine spray over 50 cm** distance that is foul fetid smelling *caused by amines*

