http://www.biltek.tubitak.gov.tr/bilgipaket/jeolojik/index.htm

Paleontology

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Lecture 6

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http://members.cox.net/jdmount/paleont.html

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Topics

1. Plantae
    - Description
    - General characteristics
    - Importances
    - Catagories
    - Classification
    - Leaves
    - Silification
    - Plants in geological times
    - Paleozoic plants
    - Mesozoic plants
    - Tertiary plants
2. Vendian Organisms
3. Annelida
4. Archaecyatid

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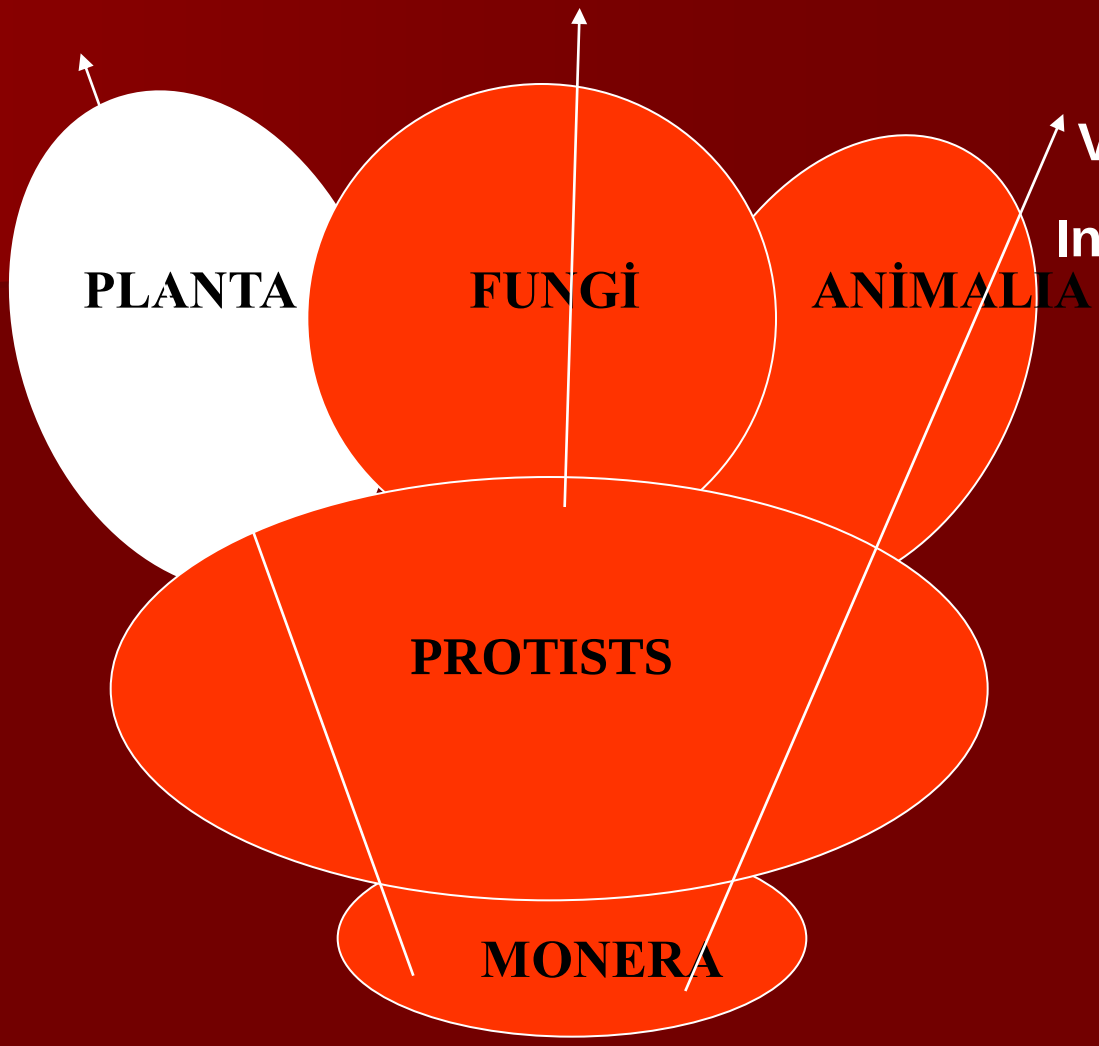
PLANTAE KINGDOM (or Plantae)

EUCARYOTIC

MULTICELLUAR

UNICELLUAR

PROK.



Vertebrate

Invertebrate

Trace fossils

PLANT KINGDOM (or Plantae)

Definition

- Precise definitions of the kingdom vary, but as the term is used here, plants include familiar organisms such as trees, flowers, herbs, bushes, grasses, vines, ferns, mosses, and green algae.
- The Plantae includes all land plants: mosses, ferns, conifers, flowering plants, and so on—an amazing range of diverse forms. With more than 250,000 species, they are second in size only to the arthropoda.

PLANT KINGDOM (or Plantae)

Characteristics

- Body type: multicellular with cell walls made of cellulose
- Food consumption: photosynthesis (absorbs light)
- Reproduction: both sexual and asexual
- Environments: land and water
- Plants have organs and organ systems. The leaves collect and absorb sunlight to convert to glucose. The leaves have a waxy coat on them to shield against water. The root system, which branches out, provides support and absorbs water. The stem provides support and the petal / flower / bud is the reproductive organ of the plant.

PLANT KINGDOM (or Plantae)

General information about plants

- Virtually all other living creatures depend on plants to survive. Because animals cannot get energy directly from the sun, they must eat plants (or other animals that have had a vegetarian meal) to survive.
- Through photosynthesis, plants convert energy from sunlight into food stored as carbohydrates. Plants also provide the oxygen for humans and animals breathe, because plants use carbon dioxide for photosynthesis and release oxygen into the atmosphere.
- Plants are found on land, in oceans, and in fresh water.
- They have been on Earth for millions of years. Plants were on Earth before animals and currently number about 260,000 species.

Three features distinguish plants from animals:

- **Plants have chlorophyll, a green pigment necessary for photosynthesis;**
- **Their cell walls are made sturdy by a material called cellulose; and**
- **They are fixed in one place (they don't move).**

http://www.factmonster.com/ipka/A0932480.html

PLANT KINGDOM (Their importances)

Importance of Plants

--- As known Plants are essential to the balance of nature and in people's lives. Green plants, i.e., those possessing chlorophyll, manufacture their own food and give off oxygen in the process called photosynthesis, in which water and carbon dioxide are combined by the energy of light.

--- Plants are the ultimate source of food and metabolic energy for nearly all animals, which cannot manufacture their own food.

--- Besides foods (e.g., grains, fruits, and vegetables),

--- Plant products vital to humans include wood and wood products, fibers, drugs, oils, latex, pigments, and resins.

--- Coal and petroleum are fossil substances of plant origin.

Thus plants provide people not only sustenance but shelter, clothing, medicines, fuels, and the raw materials from which innumerable other products are made.

http://www.factmonster.com/ipka/A0932480.html

PLANT KINGDOM (or Plantae)

In Paleontology, a tree including,

- Plant Bodies
- Leaves, and
- Spores or pollens (reproductive tissues)

are identified separetly owing to non existence of all parts in the same lithology and places.

In Türkiye,

-Lignite, generally Miocene,Tertiary in age,

seen around western and central Türkiye such as Tunçbilek, Soma, Muğla, Aydın, Çayırhan

-Bituminous coal, generally Carboniferous in age,

seen around northwest Türkiye such as Zonguldak, Bartın, Amasra

PLANTAE TAXONOMIC HYERARCY EXAMPLE

Example of Classification

The full botanical classification of a particular Lesser Spearwort with narrow leaves is

Category	Scientific Name	Common Name
CLASS	Angiospermae	Angiosperms
SUBCLASS	Dicotyledonae	Dicotyledons
SUPERORDER	Magnoliidae	Magnolia Superorder
ORDER	Ranunculares	Buttercup Order
FAMILY	Ranunculaceae	Buttercup Family
SUBFAMILY	Ranunculoideae	Buttercup Subfamily
TRIBE	Ranunculeae	Buttercup Tribe
GENUS	Ranunculus	Buttercup
SPECIES	(Ranunculus) flammula	Lesser Spearwort
SUBSPECIES	(Ranunculus flammula) subsp. flammula	Lesser Spearwort
VARIETY	(Ranunculus flammula subsp. flammula) var. tenuifolius	Narrow-leaved Lesser Spearwort

TERMS “DIVISION”, “TRIBE”, “VARIETY” ARE RELATED TO PLANTAE KINGDOM

http://theseedsite.co.uk/class.html

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PLANTAE CLASSIFICATION

Classification of organisms are based on their similarities and differences. This system of classification is also called a taxonomy and usually features both English and Latin names for the different divisions.

Clasification

- Plants are often divided into two main groups
  - -angiosperms
  - -gymnosperms

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PLANTAE CLASSIFICATION

HOW ARE PLANTS CLASSIFIED?

Science classifies living things in an orderly system through which they can be readily identified. Living things are grouped into categories of increasing size, based upon relationships within those categories. For example, all plants can be put in order from the more primitive to the more advanced. Such a ranking would look like this:

Plant Kingdom

Bryophytes: Small with leaflike, stemlike, and rootlike structures.

Disseminated by spores: mosses, liverworts, hornworts.

Vascular Plants: Larger with true leaves, stems, and roots.

1. Seedless: Ferns, horsetails, club mosses.
2. Seed Plants:
    a. Gymnosperms: Usually have cones, no flowers, seeds not enclosed in fruit: pines, spruces, firs, hemlocks, cycads, ginkgo.
    b. Angiosperms: Have flowers, seeds enclosed in fruit
        i. Monocotyledons: Leaves have parallel veins, one seed leaf: grasses, orchids, lilies, palms.
        ii. Dicotyledons: Leaves have netted veins, two seed leaves: cherry trees, maples, coffee, daisies, etc.

This informal way of describing plant classification gives an overview of how plants are classified. Botanists use a more complex system. A botanist divides the plant kingdom into Divisions, similar to the Phyla used to divide the animal kingdom. There are twelve divisions. Referring to the above ranking, three of these divisions are Bryophytes, four are seedless plants, four are Gymnosperms, and one is Angiosperms. Each Division is further divided into Classes, which are divided into Orders, which are divided into Families, which are divided into Genera (singular, Genus), which are divided into species, which is the "basic unit" of classification. Put somewhat simply, individuals in a species are able to breed with each other, while in broader categories individuals do not interbreed.

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Planta

Learn only superdivisions,

not divisions

Classification of Plants, Whittaker FIVE KINGDOM SYSTEM (1978)

KINGDOM IV - Plantae

Non-Vascular Plants

DIVISION HEPATICO-PHYTA

Liverworts

DIVISION ANTHOCEROTO-PHYTA

Hornworts

DIVISION BRYOPHYTA

Mosses

Fossil Plants

FOSSIL PLANTS

Vascular Plants

DIVISION PSILOPHYTA

Whisk Ferns

DIVISION LYCOPHYTA

Clubmosses

Spikemosses

Quillworts

DIVISION SPHENOPHYTA

Horsetails

Scouring Rushes

DIVISION PTEROPHYTA

Ferns

Seed Plants

DIVISION PINOPHYTA

Cycads Ginkgo

Conifers Gnetum

DIVISION MAGNOLIOPHYTA

Dicots Monocots

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4. KINGDOM: Plantae

4.0.1. DIVISION Hepaticophyta 8,300 (liverworts)
4.0.2. DIVISION Anthocerotophyta 350 (hornworts)
4.0.3. DIVISION Bryophyta 13,500 (mosses)
4.0.4. DIVISION Psilotophyta 3 (whisk ferns)
4.0.5. DIVISION Lycophyta 850 (club mosses)
4.0.6. DIVISION Sphenophyta 25 (horsetails)
4.0.7. DIVISION Pterophyta 8,600 (ferns)
4.0.8. DIVISION Pinophyta (gymnosperms)
4.0.8.(1). SUBDIVISION Cycadicae 160 (cycads)
4.0.8.(2). SUBDIVISION Pinicae
4.0.8.(2).1. Class Ginkgoatae 1 (Ginkgo)
4.0.8.(2).2. Class Pinatae 700 (conifers)
4.0.8.(3). SUBDIVISION Gneticae 75
4.0.8.3.1 Order Gnetales (Gnetum)
4.0.8.3.2 Order Ephedrales (Ephedra)
4.0.8.3.3 Order Welwitschiales (Welwitschia)
4.0.9. DIVISION Magnoliophyta (flowering plants)
4.0.9.1. Class Magnoliopsida 200,000 (dicots)
4.0.9.2. Class Liliopsida 60,000 (monocots)

http://home.manhattan.edu
/~frances.cardillo/plants/intro
/plntlist.html

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PLANTAE CLASSIFICATION

Example: Orchids (an angiospermae), pinus (a gymnospermae)

1. KAPALI TOHUMLULAR (Çiçekli Bitkiler-Angiospermae)
2. AÇIK TOHUMLULAR (Çiçeksiz Bitkiler-Gymnospermae)

Kapalı tohumlular gerçek çiçek üretirler ve sayıları 250 milyona yakın türden oluşan bir bitkiler alemidirler... Meşe, kayın, gürgen, karağaç gibi yapraklı ağaçlar bu gruba dahildir...

Açık tohumlular ise çiçeksiz bitkiler olarak anılırlar ve bu bitkilerde geniş bir canlılar topluluğudur. Çam, Göknar, Sedir, Ladin gibi kozalaklı ağaçlar, Sikaslar, Ginko gibi türler bu gruba dahildir...

Çiçekli bitkilere örnek;
At kestanesi

Çiçeksiz bitkilere örnek;
Bataklık Servisi

http://www.ogm.gov.tr/yaprak/bitkiler.htm

PLANTAE CLASSIFICATION

sade yaprak

bileşik yaprak

Ağaçlar, yaprakları olmasaydı yükseklere ulaşamazdı. Çünkü büyümek için gerekli şekerleri yapraklar üretir. Bir güneş pili gibi kullanılan klorofil (ki yaprağa yeşil rengi veren bir pigment maddesidir) karbon gazı ve su yardımıyla şeker üretmeye yarayacak ışık enerjisini kapma işini üstlenmiştir. [Fotosentez]

Bütün yaprakların asıl derdi, yeterince IŞIK (güneş ışığı) yakalayabilmektir. Bu nedenle farklı ortamlardaki farklı bitkiler, yüzbinlerce farklı biçim, boyut ve şekilde yaprak formu geliştirmişlerdir... Bununla da yetinmeyen bazı bitkiler yapraklarını metamorfoza uğratarak farklı görevleri de yerine getirecek yapraklar geliştirmişlerdir. (Örnek; böcek kapan bitkiler...) [Metamorfoz]

BİR SADE YAPRAĞIN;

Bölümleri	Biçimleri	Damarları

Yukarıda gördüğünüz yaprak biçimleri bitkiler aleminin **Çiçekli Bitkiler** bölümüne aittir. Bir de **Çiçeksiz Bitkiler** bölümü olup, bu gruptaki bitkilerin yaprakları, iğne gibi değişik biçimlerde karşımıza çıkar. Bu bitkilerin yaprak biçimleri ile ilgili bazı örnekleri aşağıda görmektesiniz; [Bitkiler Alemi Hakkında]

Çiçekli bitkilerin tek sap ve tek yaprak yüzeyinden meydana gelen yapraklarına genel anlamda **sade yapraklar** denilmekte, tek sap üzerinde parçalı bir yapıda, yaprakçıklara ayrılmış biçimdeki yapraklara da **bileşik yapraklar** adı verilmektedir.

Bileşik yapraklar kendi içinde; üçlü, çift tüysü, tek tüysü, katlı tüysü, elsi... gibi değişik biçimlerde görülür. Aynı şekilde yaprakların dizilişine göre de; karşılıklı, almaçlı, sarmal, çevrel, haçsı gibi değişik formlar vardır...

PLANTAE CLASSIFICATION

PLANTAE CLASSIFICATION

Gymnosperms

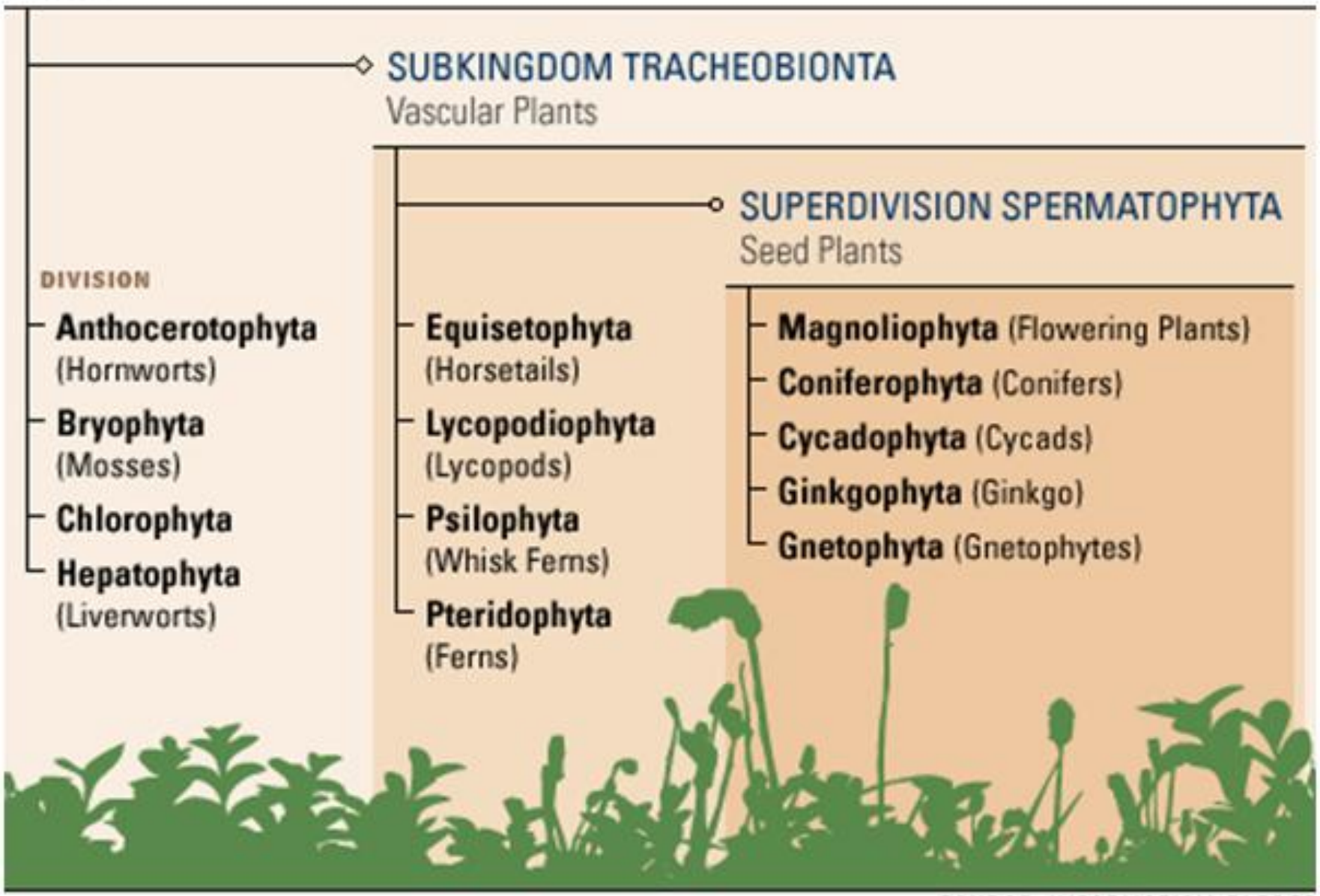
- Are divided into:
- **Coniferophyta** - is known as the dominant gymnosperm. (it includes pines ,yews, yellowwood, etc..)
- **Cycadophyta** - These are slow growing palm-like plants with leaves which are born together at the top of the trunk.
- **Ginkophyta** - this group contains only a single living species (gingko biloba from china)
- **Genetophyta**: this plats share certain characteristics with angiosperms (tropical lianas, Welwitschia mirabilis, etc...)

PLANTAE CLASSIFICATION

Angiosperms

- Include flowering plants which then are divided into:
- Monocotyledonous
- Dicotyledonous
- The seeds of angiosperms are surrounded by the wall of the ovary of the flower which forms the fruit; gymnosperms do not have this structure.

PLANTAE CLASSIFICATION



http://www.factmonster.com/ipka/A0932480.html

PLANTAE CLASSIFICATION

Non-Vascular Plants

Mosses and "allies," or related species (*Bryophyta* and allies)

Mosses or *bryophyta* are non-vascular. They are an important foundation plant for the forest ecosystem and they help prevent erosion by carpeting the forest floor. All bryophyte species reproduce by spores not seeds, never have flowers, and are found growing on the ground, on rocks, and on other plants. Originally grouped as a single division or *phylum*, the 24,000 bryophyte species are now grouped in three divisions: Mosses *(Bryophyta)*, Liverworts *(Hepatophyta)*, and Hornworts *(Anthocerotophyta)*. Also included among the non-vascular plants is *Chlorophyta* , a kind of fresh-water algae.

http://www.factmonster.com/ipka/A0932480.html

PLANTAE CLASSIFICATION

Vascular Plants with Spores

Ferns and allies (*Pteridophyta* and allies)

Unlike mosses, ferns and related species have a vascular system, but like mosses, they reproduce from spores rather than seeds. The ferns are the most plentiful plant division in this group, with 12,000 species. Other divisions (the fern allies) include Club mosses or Lycopods (Lycopodiophyta) with 1,000 species, Horsetails (Equisetophyta) with 40 species, and Whisk ferns (Psilophyta) with 3 species.

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PLANTAE CLASSIFICATION

Vascular Plants with Seeds

Conifers and allies (*Coniferophyta* and allies)

Conifers and allies (*Coniferophyta* and allies) Conifers reproduce from seeds, but unlike plants like blueberry bushes or flowers where the fruit or flower surrounds the seed, conifer seeds (usually cones) are "naked." In addition to having cones, conifers are trees or shrubs that never have flowers and that have needle-like leaves. Included among conifers are about 600 species including pines, firs, spruces, cedars, junipers, and yew. The conifer allies include three small divisions with fewer than 200 species all together: Ginko *(Ginkophyta)* made up of a single species, the maidenhair tree; the palm-like Cycads *(Cycadophyta)*, and herb-like plants that bear cones *(Gnetophyta)* such as Mormon tea.

Flowering Plants *(Magnoliophyta)*

The vast majority of plants (around 230,000) belong to this category, including most trees, shrubs, vines, flowers, fruits, vegetables, and legumes. Plants in this category are also called angiosperms. They differ from conifers because they grow their seeds inside an ovary, which is embedded in a flower or fruit.

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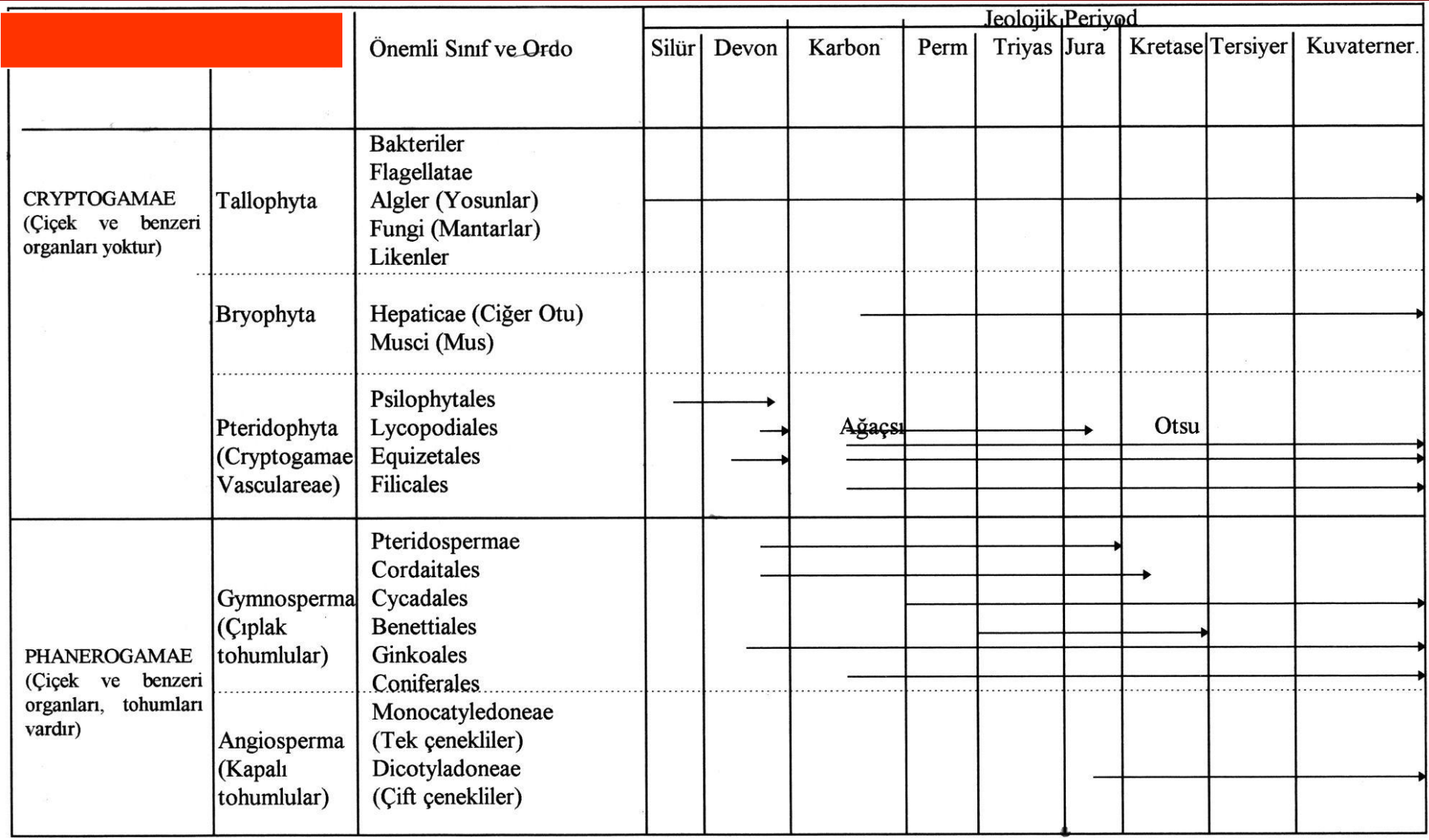
PLANTAE IN THE GEOLOGICAL TIME



Nakoman, E. 1971. Kömür. MTA yayınları, Eğitim Serisi, no. 8, Ankara, 348 s.

SILICIFICATION

Rich silicified plant fossils during some periods in the geological times are important for geological history and paleoenvironmental interpretations.

What are the reasons;

(1) Hot water effects

(2) Cooling of waters and perticipation of SiO_2

(3) Volcanic activity including rich SiO_2 ashes.

Planta

Ornatmayla kuvars, agat, veya ametist haline gelmiş muazzam ağaç gövdeleri Yellowstone parkında (ABD) taşlaşmış bir orman meydana getirmiştir. Osnabrück (Almanya) kömür havzasında bulunan **Sigillaria** köklerinin, Glasgow (İskoçya) dolaylarındaki Whiterich, Victoria Park'ta Alt Karbonifer yaşlı **Stigmaria**'ların ornatma yoluyla fosilleştikleri bilinmektedir (Şekil.15).

Şekil 15. Bütün gövdesi silisleşmiş (fosilleşmiş) bir ağaç (Yunanistandan)

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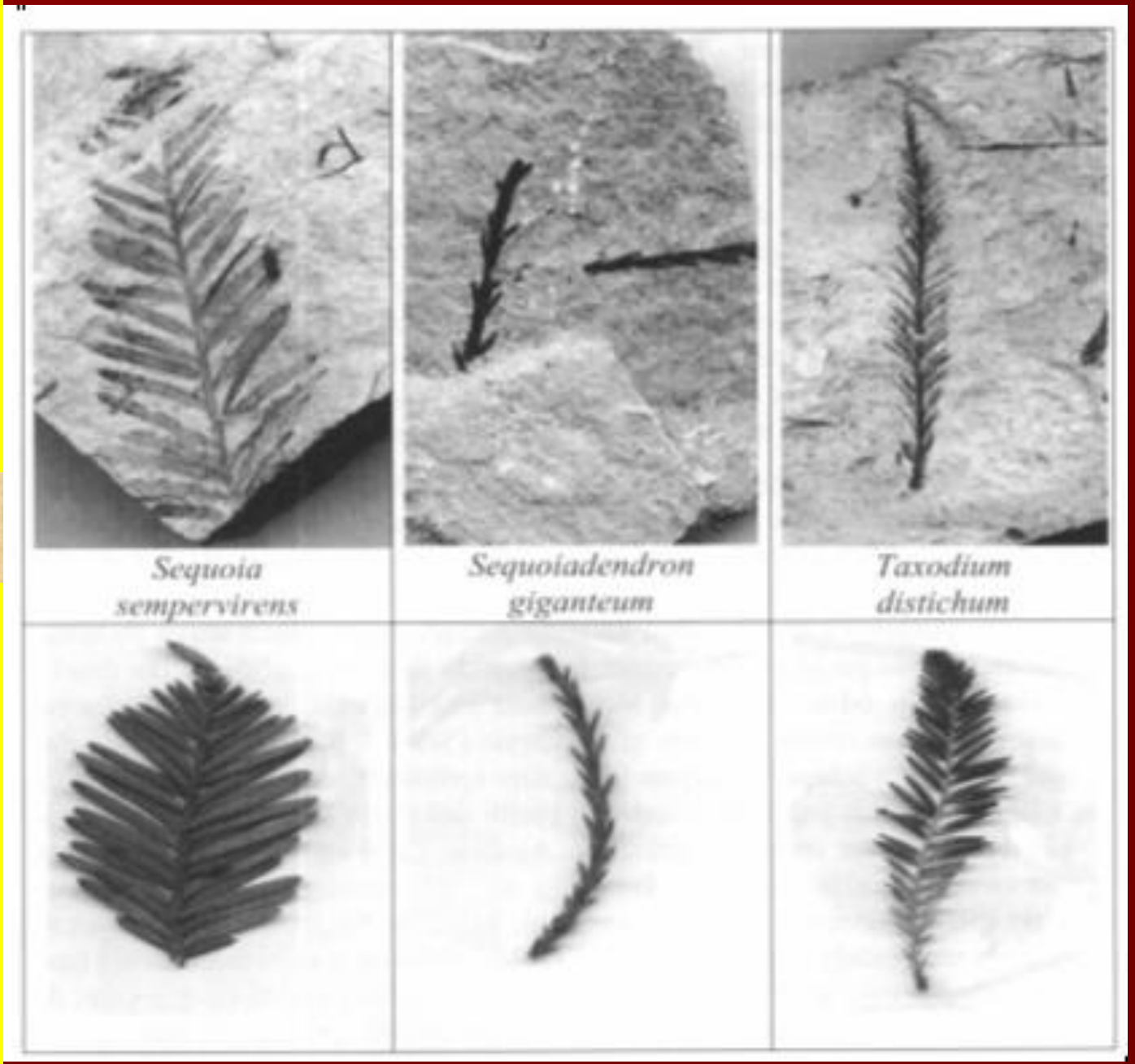
Planta



Fossil Plants - There are five representative divisions

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Primitive fossil vascular plants

1. Division Rhyniophyta
2. Division Zosterophyllophyta
3. Division Trimerophytophyta

Primitive fossil seed plants

1. Division Pteridospermophyta
2. Division Bennettitophyta (Fossil cycads)

http://home.manhattan.edu/~frances.cardillo/plants/intro/plantmen.html

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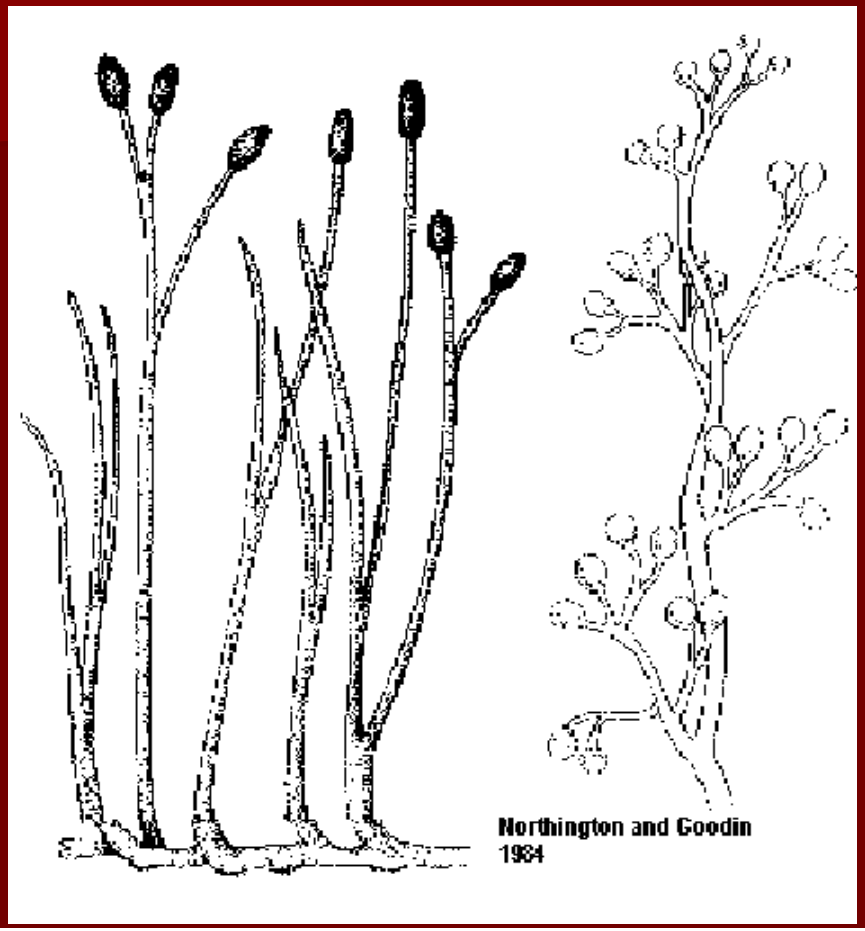
FOSSIL PLANTS



Division Rhyniophyta

The Rhyniophyta comprise the oldest known division of vascular plants during the Silurian period of 400 million years ago. The shoot is leafless and dichotomously branched in the genus Rhynia. Cooksonia is the oldest known vascular plant.

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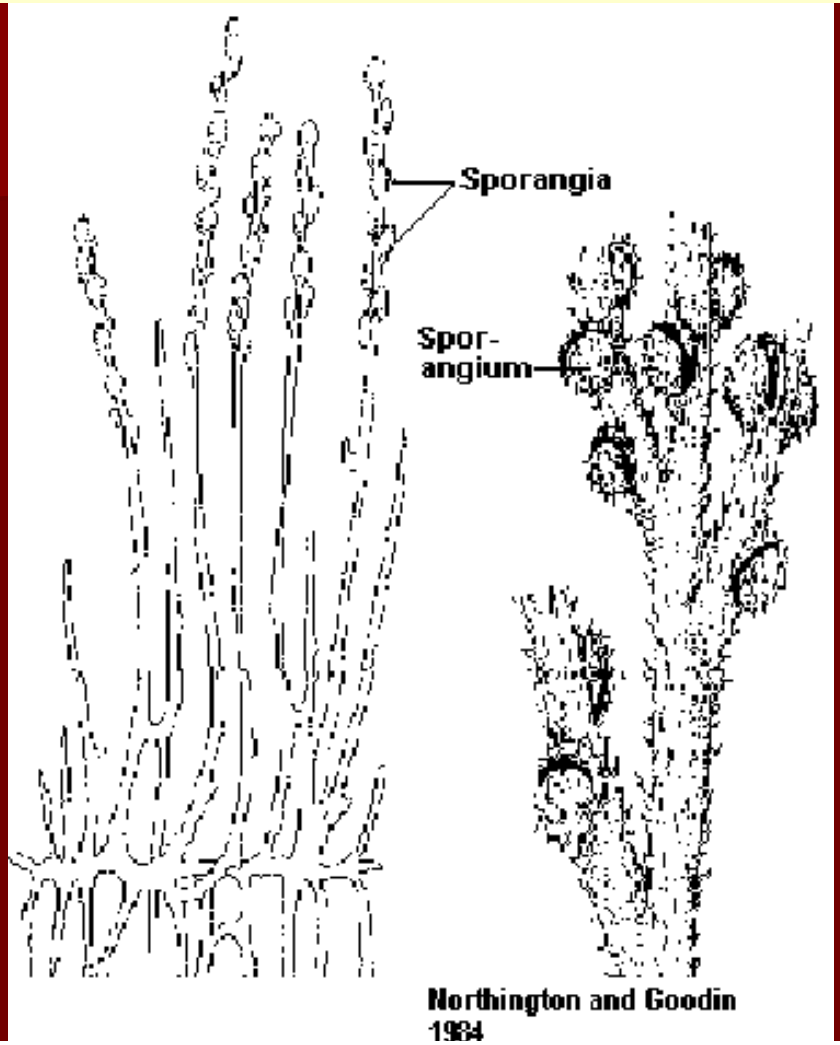
FOSSIL PLANTS



Division Zosterophyllophyta

Plants of the Zosterophyllophyta were leafless and dichotomously branched, but frequently lateral branches further differentiated into one axis that grew upward and another downward. In Zosterophyllum, the sporangia were borne laterally on short stalks.

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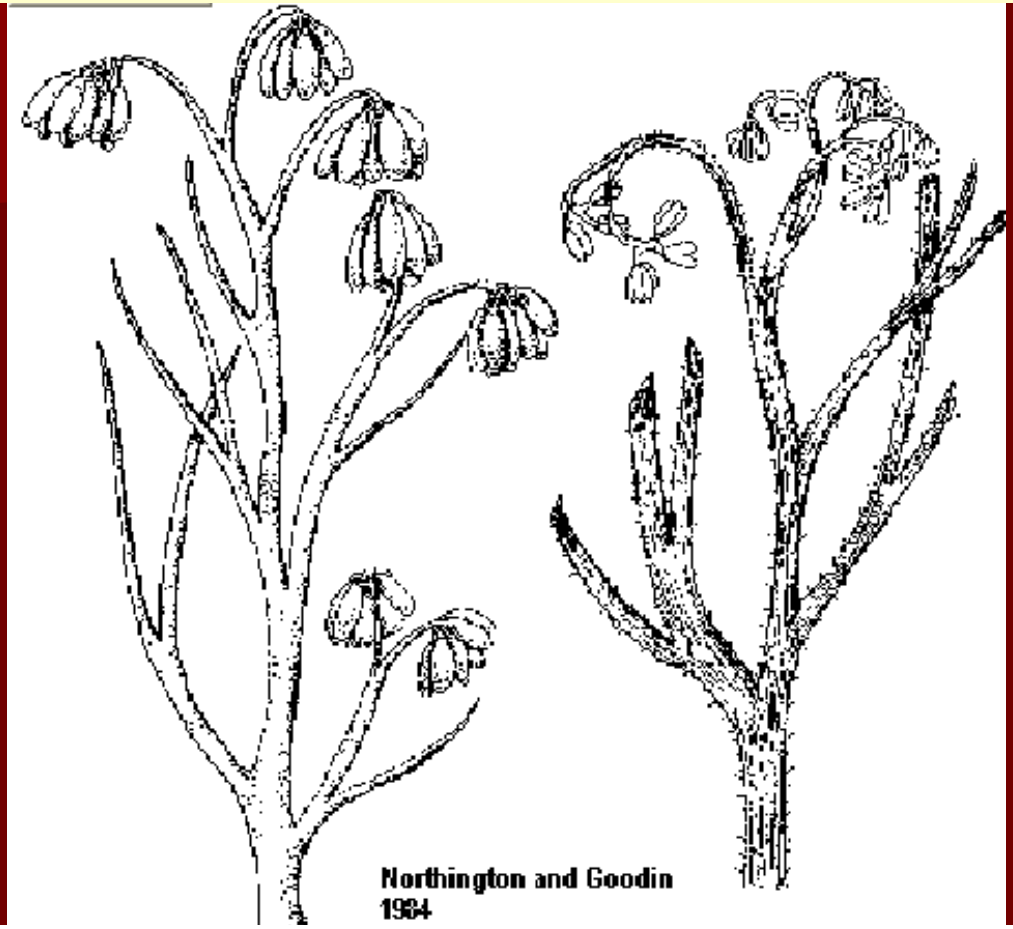
FOSSIL PLANTS



Division Trimerophytophyta

Trimerophyta specimens are believed to have evolved directly from Rhyniophyta and are found in the fossil record of 360 million years ago. Slightly more advanced, they were leafless but branched more profusely than Rhyniophyta. Some branches terminated in an elongated sporangium.

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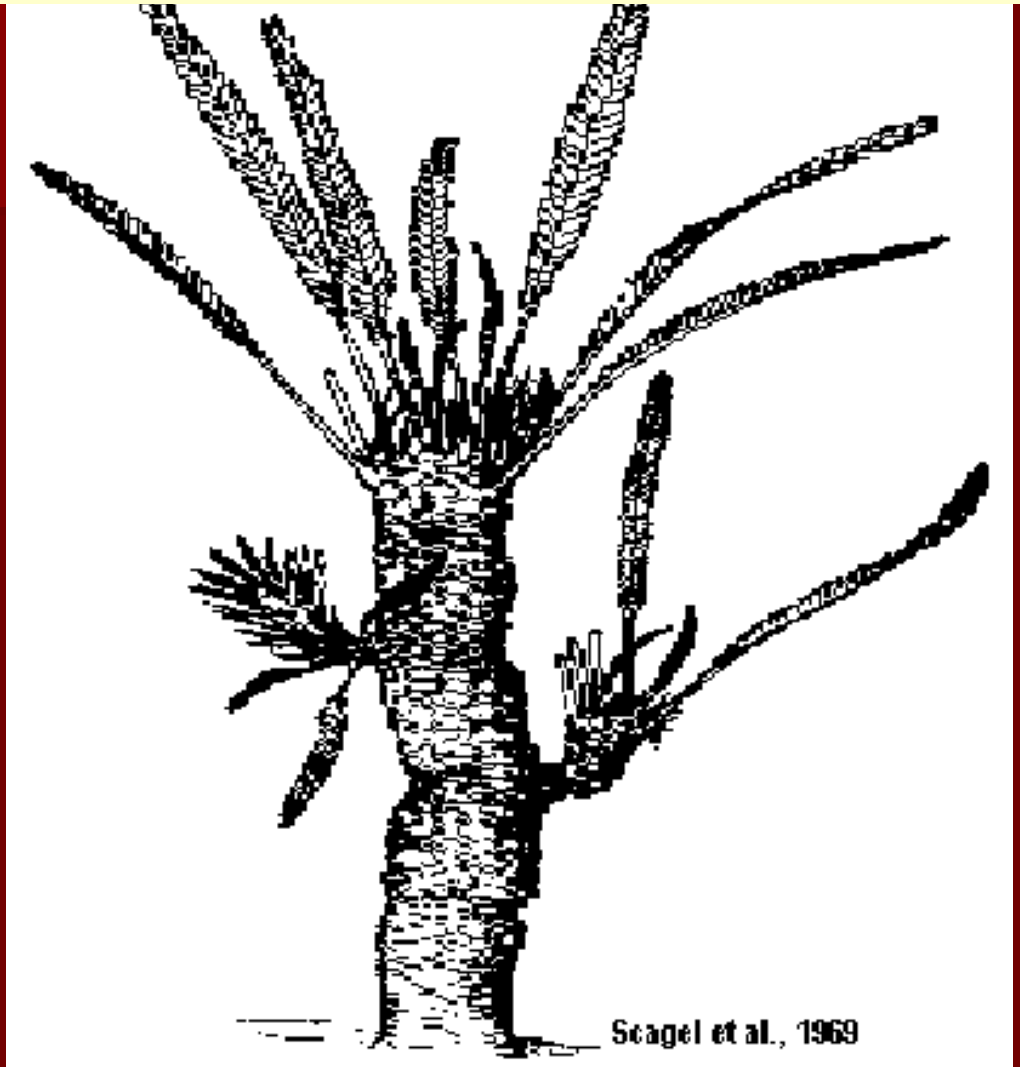
FOSSIL PLANTS

http://home.manhattan.edu/~frances.cardillo/plants/intro/plantmen.html

Division Pteridospermophyta

The seed ferns were not really ferns at all, but primitive gymnosperms. Their fossilized remains are found frequently in sediments from the Carboniferous period. Their bizarre appearance resembles that of ferns. They were the size of shrubs and small trees.

FOSSIL PLANTS



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Division Bennettitophyta

It is generally believed that the Bennettitophyta and the Cycadophyta evolved from the pteridosperms. The Bennettitales, which led to the development of a flower-like organ became extinct at the end of the Cretaceous. The Cycads evolved unisex cones and persist to the present as nine genera.

Paleozoic Era
Later Devonian Period
375 million years ago

A forest in later Devonian time: precursors of the ferns, horsetails and club mosses.

Paleozoic Era
Carboniferous Period
350 million years ago

The great coal age:giant horsetails(Calamites), relatives of the club mosses (Lepidodendron), and the seed ferns (Cycadofilicales).

Paleozoic Era
Permian Period
275 million years ago

A colder,drier period than the Carboniferous: early conifers, seed ferns, end of the era of the giant horsetails (Calamitales).

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FOSSIL PLANTS

Mesozoic Era
Triassic Period
225 million years ago

Plants of this age include: precursors of the Ginkgo tree and Maidenhair fern, cycads with pollen bearing cones, and early conife

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Planta

Carboniferous

Selected genera from the Carboniferous aged plantae leaves

Lepidodendron sp.

Sigillaria sp.

Calamites sp.

Asterocalamites sp.

Annularia sp.

Asterophyllites sp.

Pecopteris sp.

Neuropteris sp.

Alethopteris sp.

Paleozoic plants

PLANTS PLAYED ROLE FOR PALEOZOİC AGED COALS

I. CRYPTOGAMAE

Bu cins altında toplanan bitkilerin çiçek ve çiçeğe benzer organları yoktur. Karbonifer devrinde günümüzden çok daha fazla gelişmişlerdir.

Tallophyta : En basit bitkisel yaratıklar olup, tek filamanlar oluşturan birçok veya "tal" adı verilen topluluklar halindeki hücrelerden meydana gelmişlerdir. Yaprak ve kökleri yoktur. Tatlı veya tuzlu sularda yaşarlar.

a. Bakteriler :

b. Algler

Bryophyta : Kökleri olmayan damarsız bitkilerdir. Genellikle karasal olup, fosilleri nadirdir.

Pteridophyta (sporlu eğrelti otları) : Köklü, damarlı fakat çiçeksiz bitkilerdir.

3a. Lycopodiales : bataklıklarda yaşıyan bitkilerdir. Karbonifer devrinde boyları 25 ila 35 m ye ulaşan ağaçlarla temsil edilirler.

Paleozoic plants

Lepidodendron: Boyları 25 ila 35 m arasında değişen büyük bataklık ağaçlarıdır. Yerden itibaren dallara kadar gövde düzgün bir silindir şeklinde uzanır. Gövdelerinin üst kısmında dikotomik olarak gelişmiş dallar bir şemsiyeyi andırır şekilde yayılırlar. Lepidodendron'un yaprakları prizmatik değnekler şeklinde olup tek bir nervür'e (damara) sahiptir. Üreme organları olan kozalaklar dalların ucunda bulunur.

Sigillaria: 25 ila 30 m boyunda bataklıklarda yaşayan Karbonifer devri ağaçlarıdır. Gövdeleri, çapı 1 m yi aşan silindir şeklindedir. Dalları nispeten az sayıda olup dikatomiktir. Üreme organları yaprak ve dalların hemen altında olup ağacın gövdesine bir taç (yaka gibi) şeklinde ilişmiştir. Yaprak yataklarının şekli ve durumuna göre stratigrafik yönden önem taşıyan türlere ayrılmaktadır. Vestfaliyen'nin bazı bölümleri bu türlerle karekterize edilmektedir.
Sigillaria ve lepidodendron'un fosilleşmiş köklerine *Stigmaria* ve *Stigmariopsis* adı verilmektedir.Kökler gövdeye dik haç şeklinde çıkmaktadır.

Calamites: 20-30 m uzunlukta olup, günümüzdeki bambu ve kargılara benzeyen büyük ağaçlardır. Gövdeleri mafsallı (bölümlü) olup, boydan boya çizgiler taşır.

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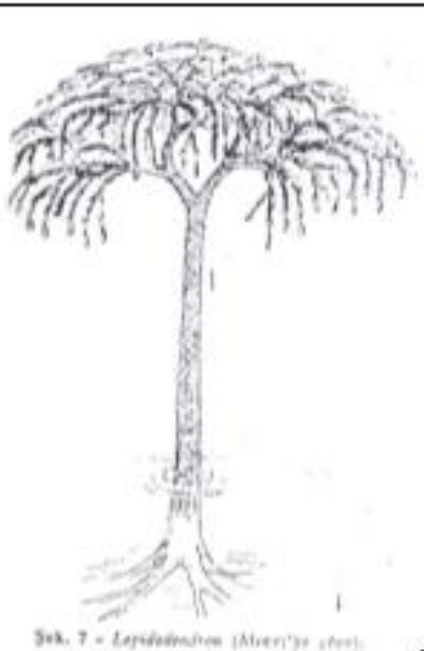
Lecture 6

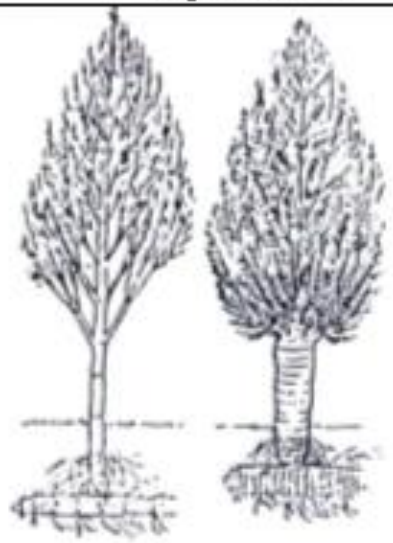
Planta

Carboniferous

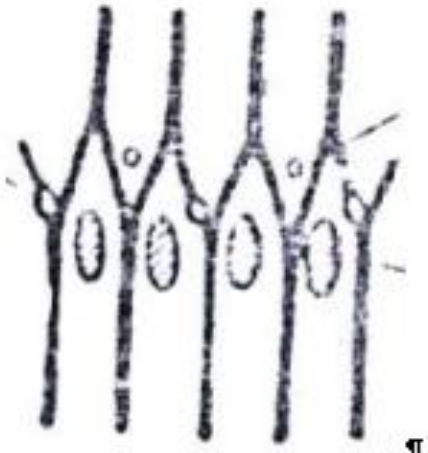


Lepidodendron

Sigilleria



Calamites (c)



Calamites gövdesindeki, boğum yerleri (d)

Şekil 19. Paleozoik Yaşlı Cryptogam Ailesi bitkileri

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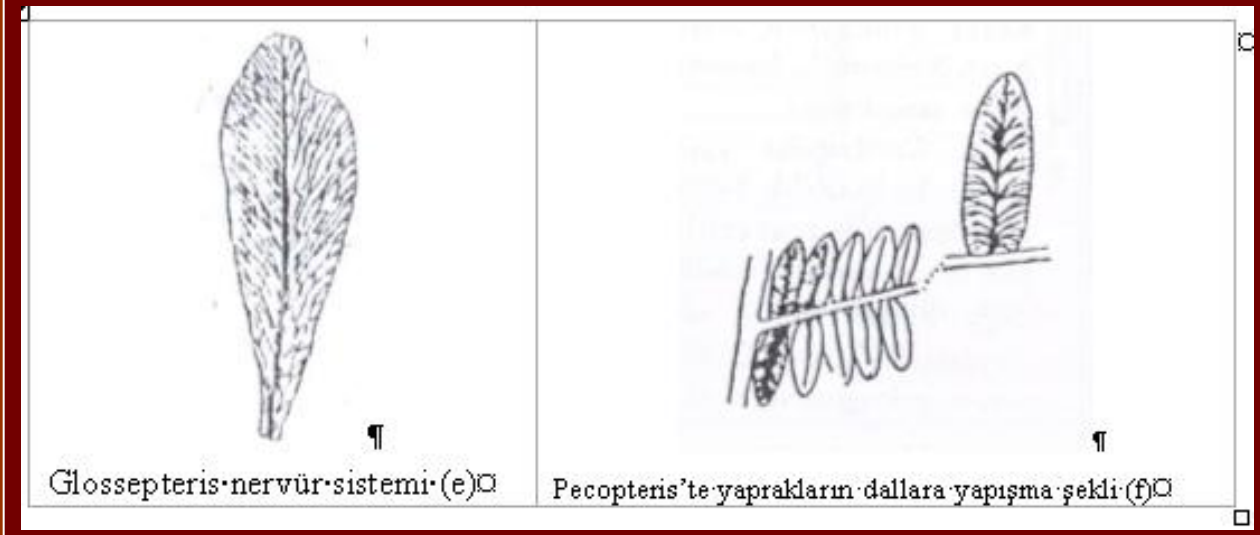
reticulated vasculars

Carboniferous

3b. Filicales : Paleozoikde çok gelişmiş eğrelti otlarıdır. Kömürlerin oluşumuna çok önemli bir katkıda bulunan bu floranın karekteristiği dallara nazaran yaprakların çok gelişmiş olmasıdır.
daima net olarak görülen bir nervür (damar) ve bu nervürden pinülün çevresine doğru
Pecopteris : "**Pinü**l" adı verilen yapraklar dallara geniş bir şekilde yapışmışlardır. Pinülerde dik olarak yol alan yan nervürler vardır (Şekil 20).
Glossopteris : Bu fosiller Gondvana kıtasını paleobotanik yönden temsil etmektedir. Yaprakları az çok oval olup, alt kısımlarına doğru bir darlaşma gösterirler. Orta nervür çok belirli ve düzdür.



Glossepteris nervür sistemi (e)

Pecopteris'te yaprakların dallara yapışma şekli (f)

Planta

Carboniferous

II. PHANEROGAMAE

Üstün yapılı çiçek ve tohumlu bitkileri temsil eden cins'dir.

Gymnospermae: Çıplak tohumlu, erkek ve dişi üreme organları aynı çiçek üzerinde bulunmayan bitkilerdir.

1a. Pteridospermae: "Tohumlu eğrelti otları" olarak da isimlendirilen bu sınıfın bütün cinsleri fosildir.Karbonifer devrinde Filicales ve Lycopodiales'lerle birlikte oluşturdukları muazzam ormanlar kömürlerin meydana gelmesinde başlıca etken olmuştur. Önemli tiplerinden bazıları aşağıda verilmiştir.

Planta

Carboniferous

Alethopteris: Otsu bir karekter taşıyan pinülleri (yaprakları) alt kısımlarında birbirlerine yapışık olan bu tipte orta nervür genellikle kalın ve gayet belirgindir. Yan nervürler ise pinüllerin kenarına dik olarak ulaşır.

Neuropteris: Bu tipin pinüllerinde orta nervür, pinülün üst kenarına kadar ulaşmaz. Yan nervürler aralarında birçok daha küçük nervüre ayrılırlar. Dala bir tek noktada bağlanan pinüllerin alt kısmı kalp şeklindedir

Mariopteris: Uzun dalların gayet düzgün bir dikatomi ile bölünmesi bu tipi karekterize eder. Pinüller ekseriya hafifçe eğik olup parçalı bir çevreye sahiptirler

Sphenopteris: Bu tipe ait pinüllerin şekline günümüzde yaşayan eğrelti otlarında sık sık rastlanmaktadır.Nervürler, toplu ve küçük olan pinülerin üzerinde belli belirsiz haldedirler. Bu nervürlerin düzensiz ve çok ince olması tipin en önemli özelliklerinden biridir.

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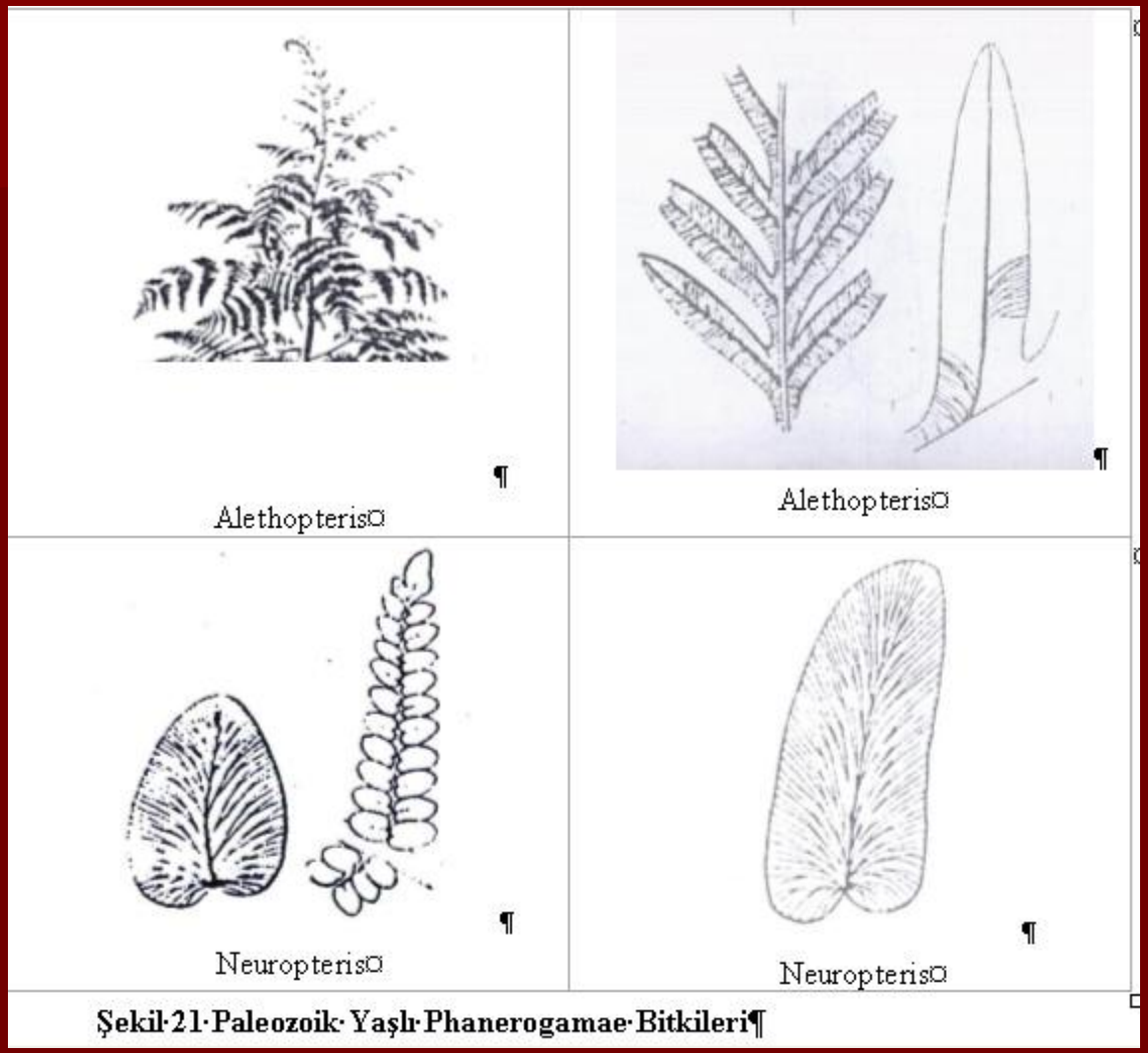
Carboniferous



Şekil 21 Paleozoik Yaşlı Phanerogamae Bitkileri

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Planta

Carboniferous

Mariopteris pinülü ve orta nervür

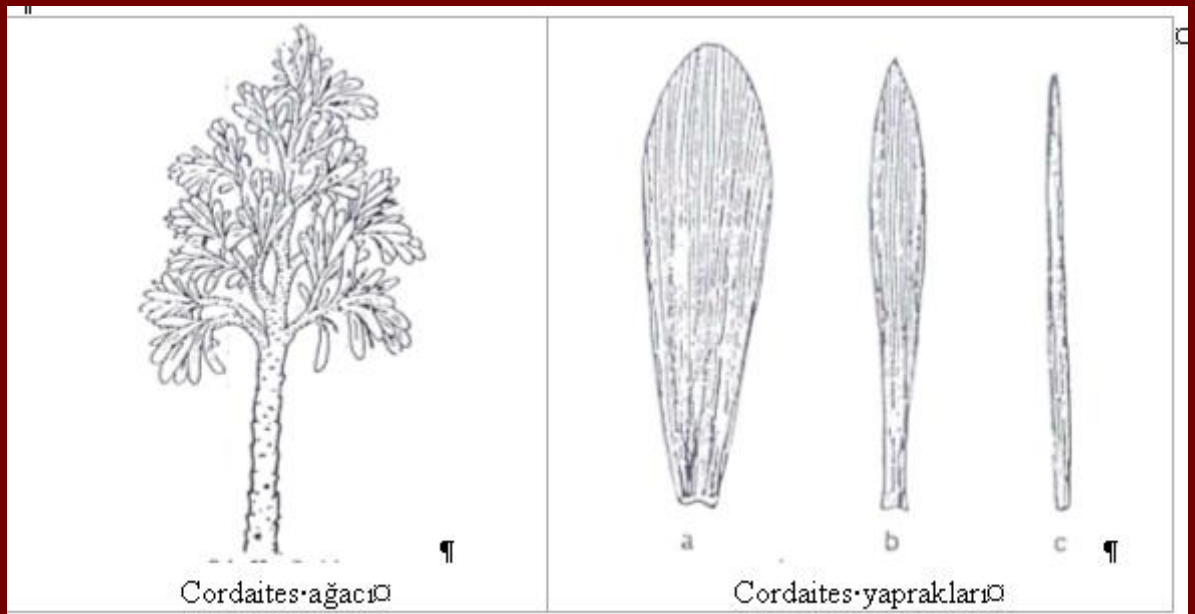
Eğrelti otlarına benzeyen Sphenopteris'te düzensiz ve ince nervürler

Şekil 22. Karbonifer Bitkileri

Planta

Carboniferous

1b. Cordaitales: Yaşayan örnekleri olmayan, Devoniyende ortaya çıkmaya başlayan bu bataklık bitkileri 30-40 m boyunda olup çıplak bir gövdeye sahiptir.Bazılarının uzunluğu 1 m ye yaklaşan, genellikle 15-20 cm büyüklüğünde yaprakları vardır. Ucu mızrak veya kürek şeklinde olan bu yapraklar üzerindeki nervürler, birbirine paralel olarak dizilmiştir

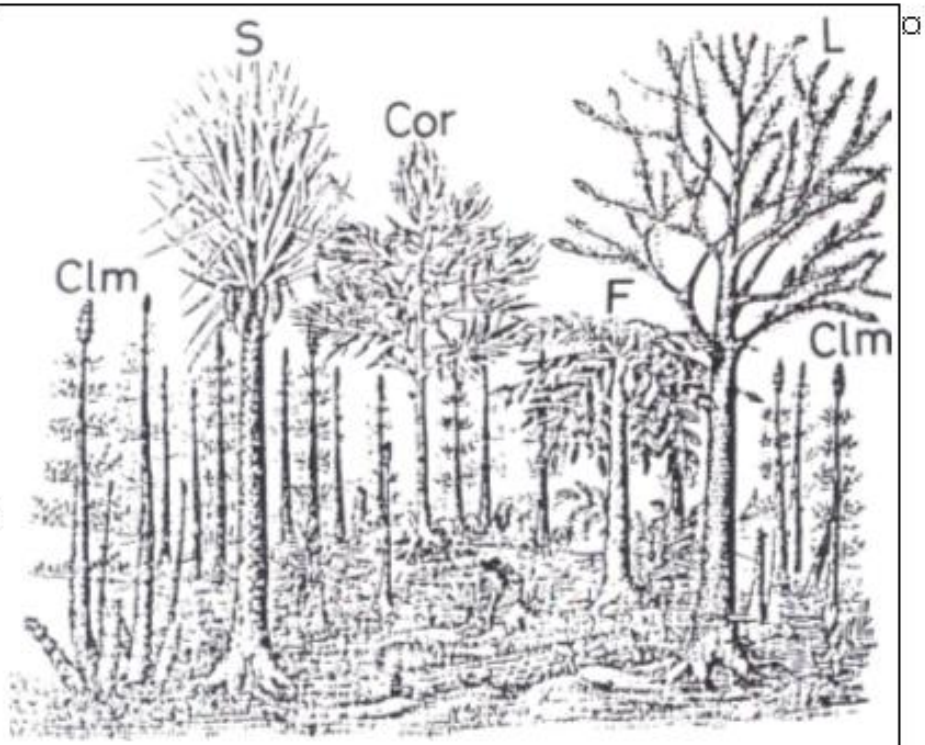


Şeki 23. Paleozoik yaşlı Phanerogame Bitkileri

Planta

Carboniferous

.....¶
Linopteris¶
Annularia·¶
Neuropteris¶
Spenophyllum¶
Alethopteris¶
Dictyopteris¶
Diplotmena¶
Pecopteris¶
Lepidodendron¶
Odontopteris¶
Caulopteris¶
Ptychopteris¶
Plinthiotheca¶
Cordaicarpus·¶
·*vePalmopteris*¶
·türü·bitki·¶
Fosilleri·bulun-¶
muştur¶



Most prevailing Carboniferous Plants
(After Mildrid Marvin)
(Clm) = Calamites; (Cor) = Cordaites;
(L) = Lepidodendron; (S) = Sigillaria; (F) = Tree Fern

····Şekil·28.···Olağan·Karbonifer·Bitkileri¶

Karadon·katı·araştırmacılar·tarafından·Bohemya·kömür·havzasındaki·Schwadowitz·

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Planta

Mesozoic

PHENEROGAMAE
Gymnosperma:

1a. Cycadales: Bu bitkilerin günümüzde yaşayan örnekleri tropikal iklimli bölgelerde silindirik bir gövdeye ve karekteristik şekilli büyük yapraklara sahiptir. Bu yapraklarda tek bir nervür görülür

1b. Benettiales : Yalnız fosil örnekleri olan bu ağaçsı bitkilerin gövdeleri 3-4 m uzunluğunda kalın ve masif bir görünüşe sahip olup, yaprakları palmiyelerinkine benzer

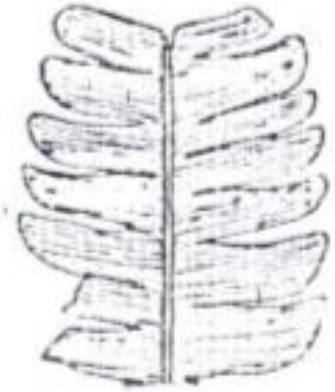
1c. Ginkoales: Günümüzde Darwin'in yaşayan fosil diye adlandırdığı Çinde ve Japonyada yetişen Ginko biloba türünden başka örneği olmayan bu sınıfın Üst Devoniyende ortaya çıkdığı düşünülmektedir

1d. Coniferales: Kozalaklı bitkiler olup Triyas ve Jura'da gelişmeleri maksimum bir seviyeye ulaşmıştır. Jurada Araucaria'lardan oluşmuş muazzam ormanların varlığı bilinmektedir. Bilinen türleri arasında

Araucariaceae: İnce uzun iğne şeklinde yaprakları vardır.
Cupressineae
Taxodieae: günümüzdeki örneği Sequoia gigantea'ların boyları 100 m yi aşar.

RECENT PLANTAE EXAMPLES

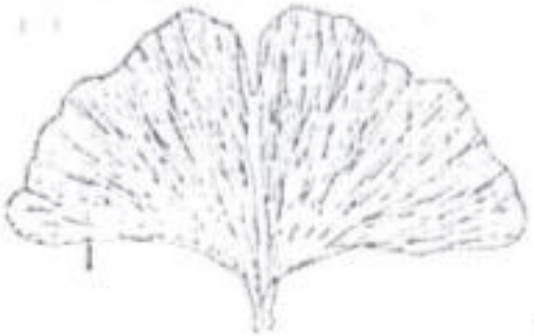
Cycadites (c)



Benettiales

Şekil 25 Paleozoikden günümüze kadar gelen bazı bitkiler

Avustralyada yaşayan Ginko türü



Ginkgo Biloba

Şekil 26. Yaşayan Fosil Gingko

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Planta

Mesozoic

MESOZOİK KÖMÜRLERİNİN OLUŞUMUNDA ROL OYNAYAN BİTKİLER

Paleozoikde olduğu kadar önemli olmamakla birlikte, Mesozoikde kömür oluşumu devam etmiştir. Alpler'de, Macaristan'da, İran'da, Çin'de ve Avustralya'da Jurasik devrine ait önemli kömür yataklarının varlığı bilinmektedir. Türkiyede'de ekonomik değeri az birkaç kömür yatağı bulunmaktadır. Paleozoikde ortaya çıkıp önemlerini kaybetmemekle birlikte Mesozoikde devam eden bitki divisio'ları şunlardır

→ 1.·CRYPTOGAMAE¶
→ ¶
→ *Tallophyta*¶
→ *Bryophyta*¶
→ *Pteridophyta*¶
→ *Equisetales*¶
→ *Filicales*¶
→ Pteridospermae¶
→ ·*Gymnospermea*··{ ·····¶
→ ··Cordaites¶

¶

¶

Şekil·27.Equisetum

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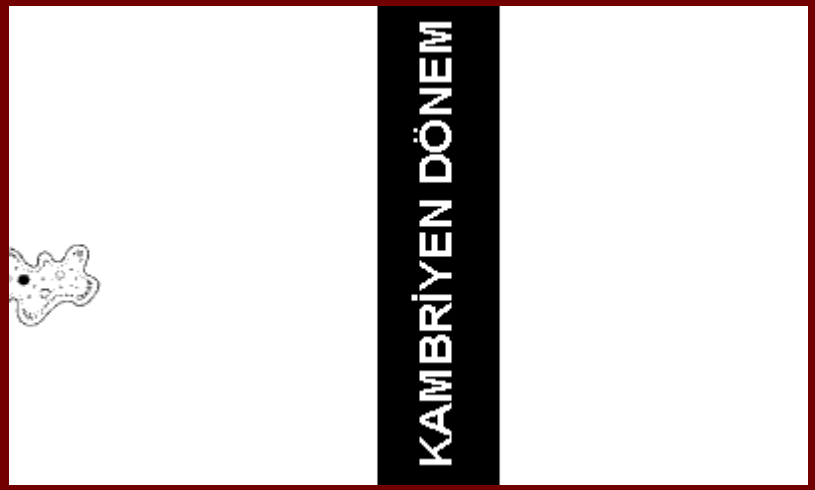
Planta

Mesozoic

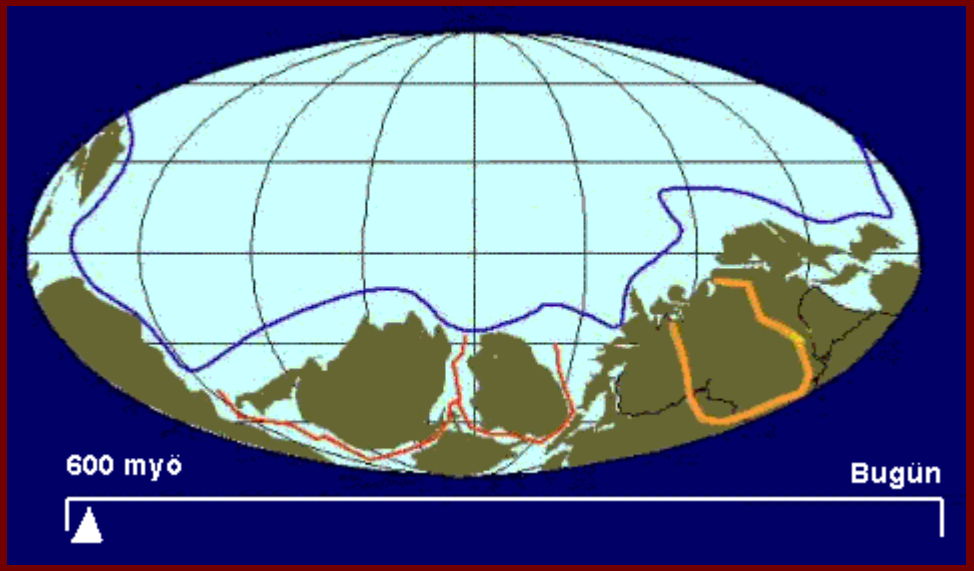
TERSİYER YAŞLI KÖMÜRLERİN OLUŞUMDA ROL OYNAYAN BİTKİLER

Tersiyer yaşlı kömürlerin oluşumunda rol oynayan flora aktüel floraya her bakımdan benzemektedir. Eosenden Pliyosene kadar floranın iklim şartlarına bağlı olarak geliştiği izlenmektedir. Aktüel ve fosil spor ve polenlerin birbirleriyle rasyonel bir şekilde mukayese olanağı vermesi Tersiyer florasının saptanması için yapılan çalışmalarda palinolojik incelemelerin önemini arttırmıştır. Genellikle Angiosperma'lar Mesozoyik'ten itibaren büyük bir gelişme içindedir. Coniferales türleri de bol bulunmaktadır. Eosen'deki bitki örtüsünü esas olarak Sorgun (Yozgat) kömürlerinde görüldüğü gibi Polypodiaceae, Sphagnaceae ve Lauraceae, Nyssaceae ailelerine ait bireyler oluşturur.Oligosende ise bunların yanında Pinaceae, Palmaceae, Lauraceae, Ginkoinae, Taxodiaceae grupları görülür.Miyosen kömürlerinde ise Taxodiaceae, Salicacae, Aceraceae türleri de izlenmiştir. Ağaçlı (İstanbul) kömürlerinde Miyosen bitki kömürlerinde görülmeyen Palmiyeler ortaya çıkar. Üst Miyosen florasının bir örneği Seyitömer linyitlerinde görülmektedir.Bütün saydığımız guruplara ait türler Üst Pliyosen'de Halifan florasında izlenmiştir

time



http://www.biltek.tubitak.gov.tr/bilgipaket/jeolojik/Fanerozoik/Paleozoik/Kambriyen/index.htm



WWW……

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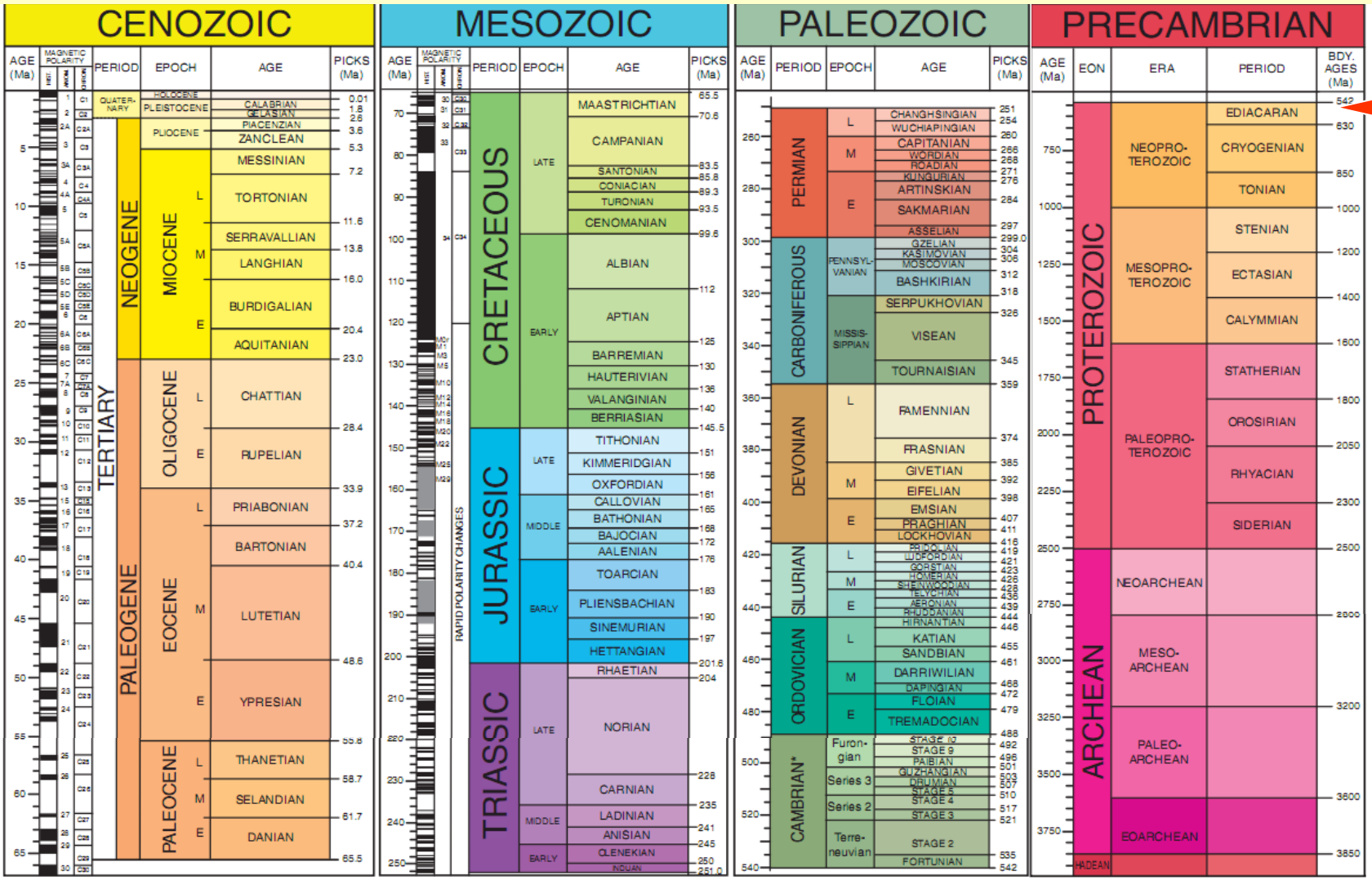
EDIACARAN OR VENDIAN FOSSILS



*International ages have not been fully established. These are current names as reported by the International Commissionon Stratigraphy.

Walker, J.D., and Geissman, J.W., compilers, 2009, Geologic Time Scale: Geological Society of America, doi: 10.1130/2009.CTS004R2C. ©2009 The Geological Society of America.

Sources for nomenclature and ages are primarily from Gradstein, F., Ogg, J., Smith, A., et al., 2004, A Geologic Time Scale 2004: Cambridge University Press, 589 p. Modifications to the Triassic after: Furin, S., Preto, N., Rigo, M., Roghi, G., Gianolla, P., Crowley, J.L., and Bowring, S.A., 2006, High-precison U-Pb zircon age from the Triassic of Italy: Implications for the Triassic time scale and the Carnian origin of calcareous nannoplankton and dinosaurs: Geology, v. 34, p. 1009–1012, doi: 10.1130/G22967A.1; and Kent, D.V., and Olsen, P.E., 2008, Early Jurassic magnetostratigraphy and paleolatitudes from the Hartford continental rift basin (eastern North America): Testing for polarity bias and abrupt polar wander in association with the central Atlantic magmatic province: Journal of Geophysical Research, v. 113, B06105, doi: 10.1029/2007JB005407.

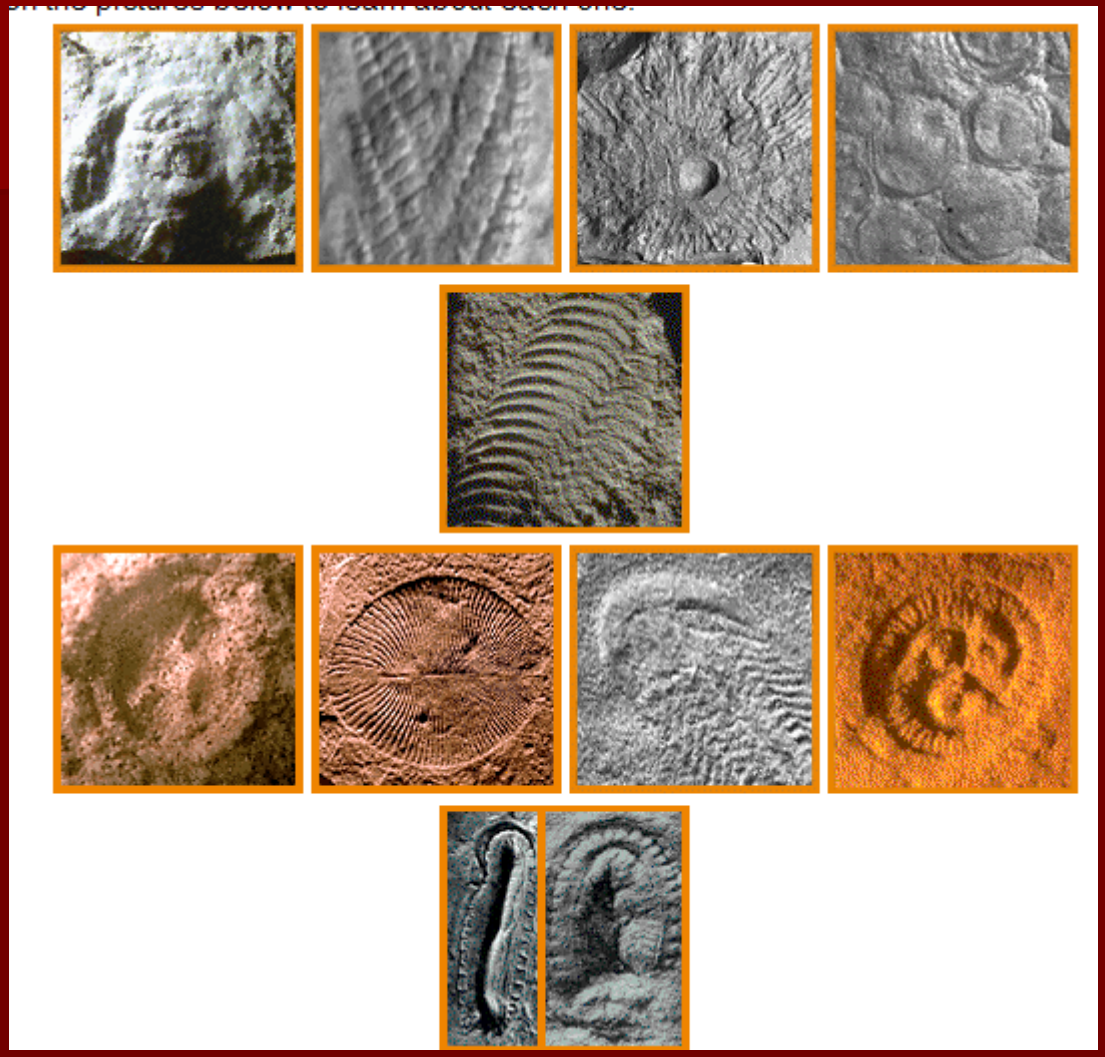
THE GEOLOGICAL SOCIETY OF AMERICA®

Localities of the Vendian:

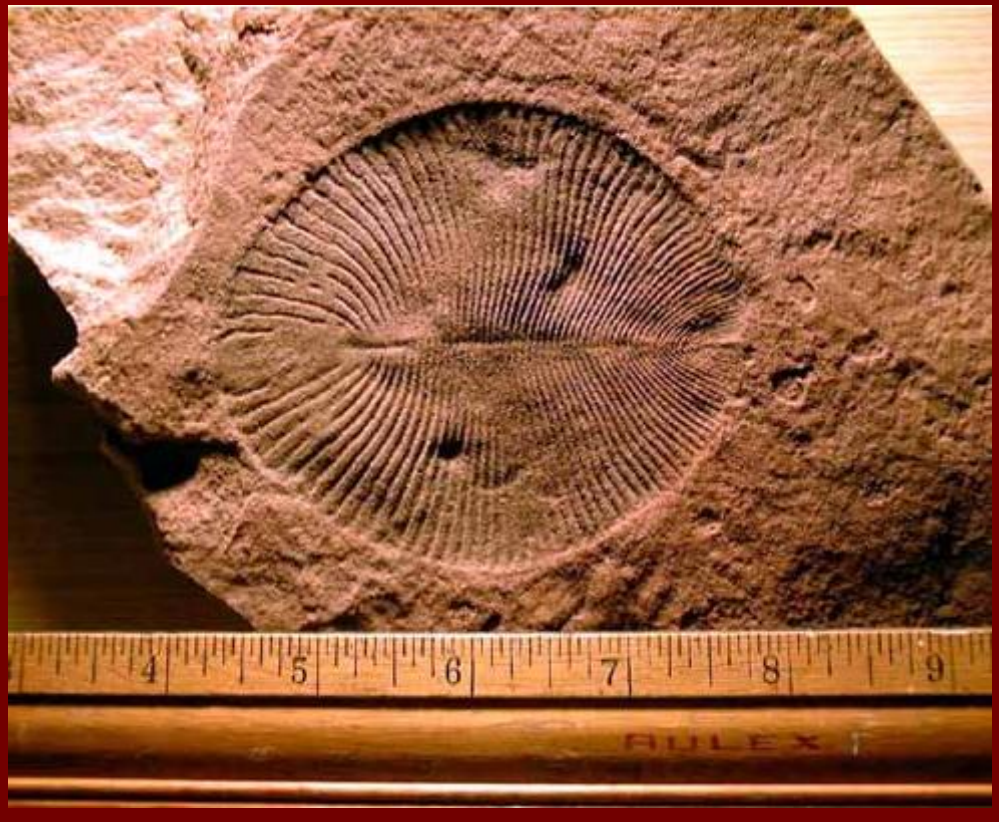
Ediacara Hills, Australia

In 1946, an Australian mining geologist named Reginald C. Sprigg was exploring a range of mountains north of the city of Adelaide, Australia, known as the Ediacara Hills. Serendipitously, he found fossilized imprints of what were apparently soft-bodied organisms, preserved mostly on the undersides of slabs of quartzite and sandstone. Most were round, disc-shaped forms that Sprigg dubbed "medusoids" from their seeming similarity to jellyfish. Others, however, resembled worms, arthropods, or even stranger things.

VENDIAN FOSSILS (between 650-543 MILLIONS YEARS)



http://www.ucmp.berkeley.edu/vendian/vendian.html



Dickinsonia is known from Vendian rocks of south Australia and north Russia. It is often considered to be an annelid worm because of its apparent similarity to one genus of extant polychaete, *Spinther*. However, in the opinion of some, it may in fact be a cnidarian polyp, like a soft-bodied version of the "banana coral," *Fungia*.

The specimen pictured above is an adult one from the Ediacara Hills of southern Australia. We also have a picture of a young *Dickinsonia costata* from the Winter Coast of the White Sea, in the collections of the Paleontological Institute of the Russian Academy of Sciences in Moscow.

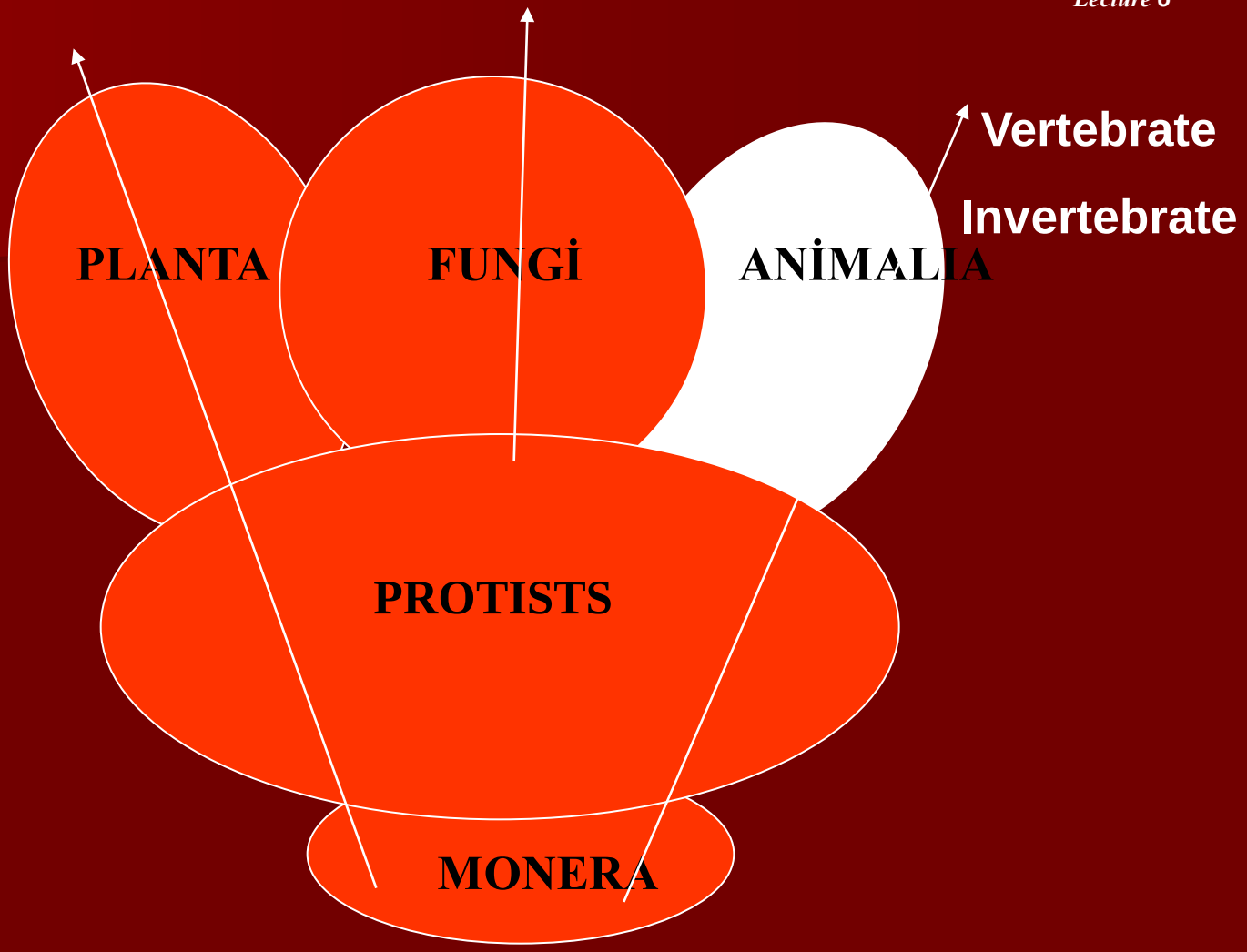
http://www.ucmp.berkeley.edu/vendian/vendian.html

EUCARYOTIC

MULTICELLUAR

UNICELLUAR

PROK.



Trace fossils

INVERTEBRATE PHYLUMS

Archaeocyatha

Stramatoporoid

Annelid

Porifera

Cnidaria

Bryozoa

Brachiopoda

Mollusca – Pelecypoda, Gastropoda, Sefelopoda

Arthropoda - Trilobita

Echinodermata – Echinid, Crinoid

Hemicordata (Graptoliths)

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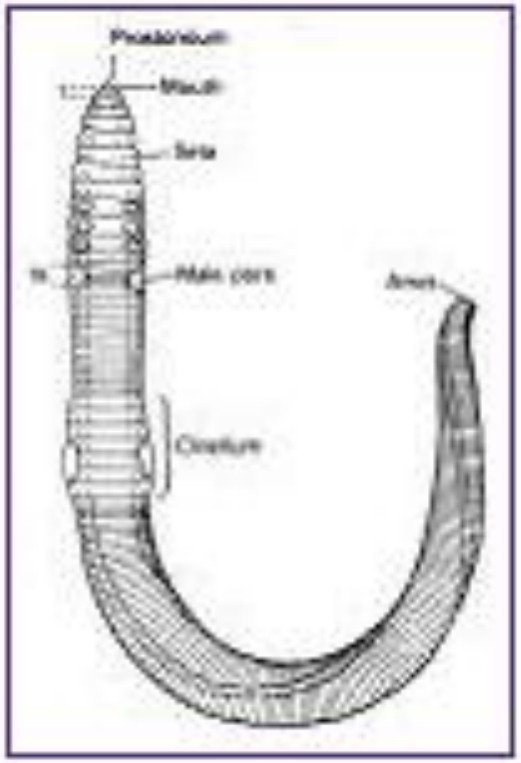
Annelida

ANNELIDA



ANNELIDA

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Phylum Annelida

Domain Eukarya
Kingdom Animalia
Phylum Annelida

Image courtesy of The University of Arizona

The phylum Annelida is made up of segmented worms, numbering about 15,000 species. Body segmentation, a hallmark of annelids, was a major step in the evolution of animals. Annelids are protosomes, meaning they have a coelom made from cell masses. This coelom is divided into a series of repeated parts. This repetition is called metamerism, and each segment is called a metamere. There are a cluster of nerve cells and excretory organs in each metamere, but the ventral nerve cords, a dorsal and ventral blood vessel, and the digestive tract pass through the walls of segmentation and are therefore unsegmented. These walls, or septum, are thin sheets of mesodermic tissue, isolating the coelom. Except for the head and tail region, each with an opening of the digestive tract, making it a complete tract, each segment in an annelid is ringlike and very similar.

Segmentation allows for flexibility and mobility because annelids can bend at segmented parts. Therefore, because a segmented body is advantageous, it evolved twice, with the protosomes, as shown by phyla Annelida and Arthropoda, and again in the deuterosomes, as shown by phylum Chordata. Other hallmarks of the annelids are soft bodies that are round in cross section, repetition of organs in the segemented parts, and a body that is much longer than it is wide. There are three main classes in the phylum Annelida.

Below is a list of the phylum Annelida, with each class and the orders of each class (some of these classes, making up a very minor portion of the phylum, have not been described):

- Class Polychaeta -Polychaetes
- Class Oligochaeta - Oligochaetes
- Class Hirudinea - Leeches

http://www.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Eukarya/Animalia/Annelida/

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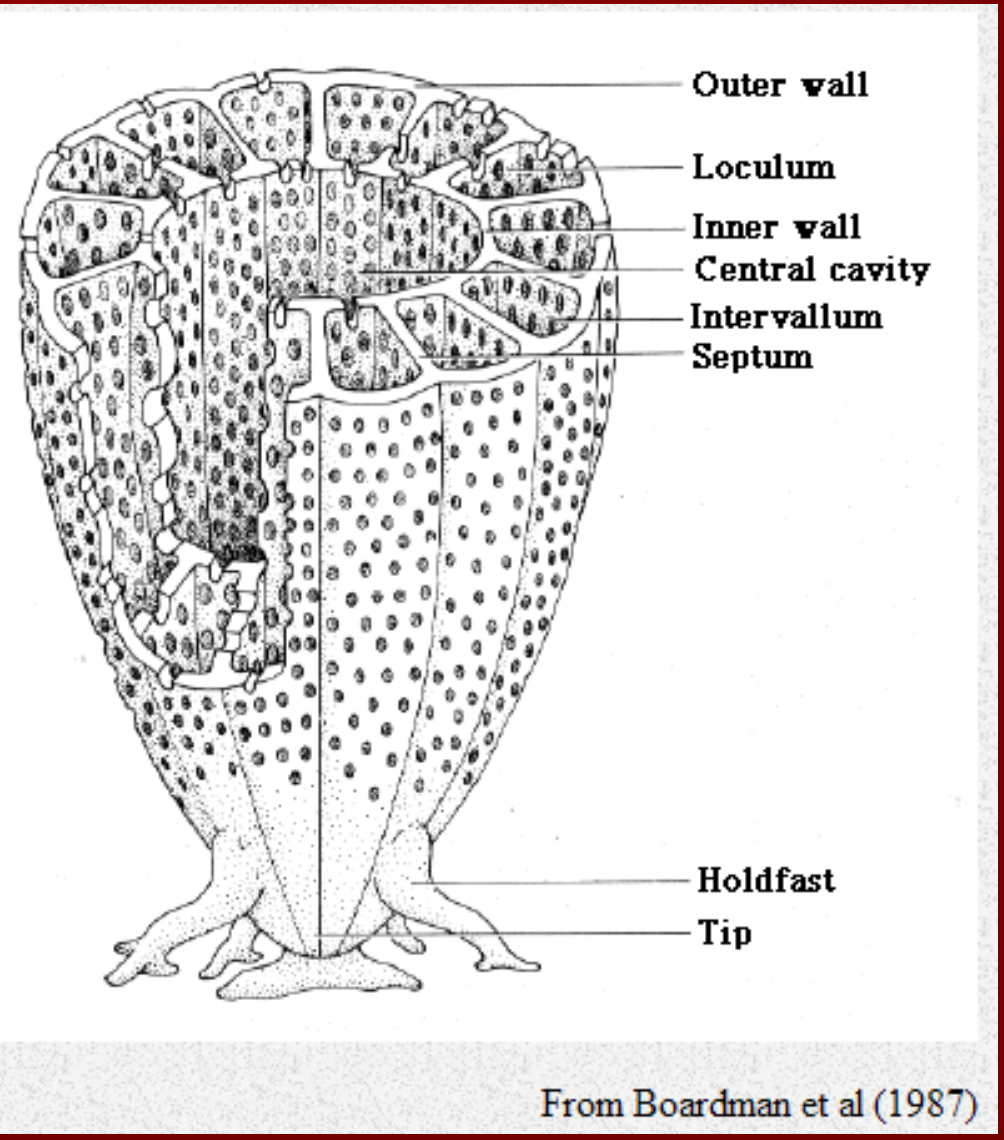
Archaeocyathida

ARCHAEOCYATHIDA



From Boardman et al (1987)

Shape: looks like beet, diameter 10-25 mm, length 50 mm

Shell: Carbonate

Stratigraphical range: Early to middle Cambrian

Environment: Very shallow (20-30 m in dpeth, smaller in deeper up to 100 meteres, tropical, benthic, live individually, reef framework organism, together with algea, trilobita & brachiopoda, rarely with spongia.

Occurrences: Russia, southern Australia, norther America, not reported in northern Europa and Türkiye.

http://paleo.cortland.edu/tutorial/Protista/porifera.htm

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Stromatoporoidea

STRAMATOPOROIDEA

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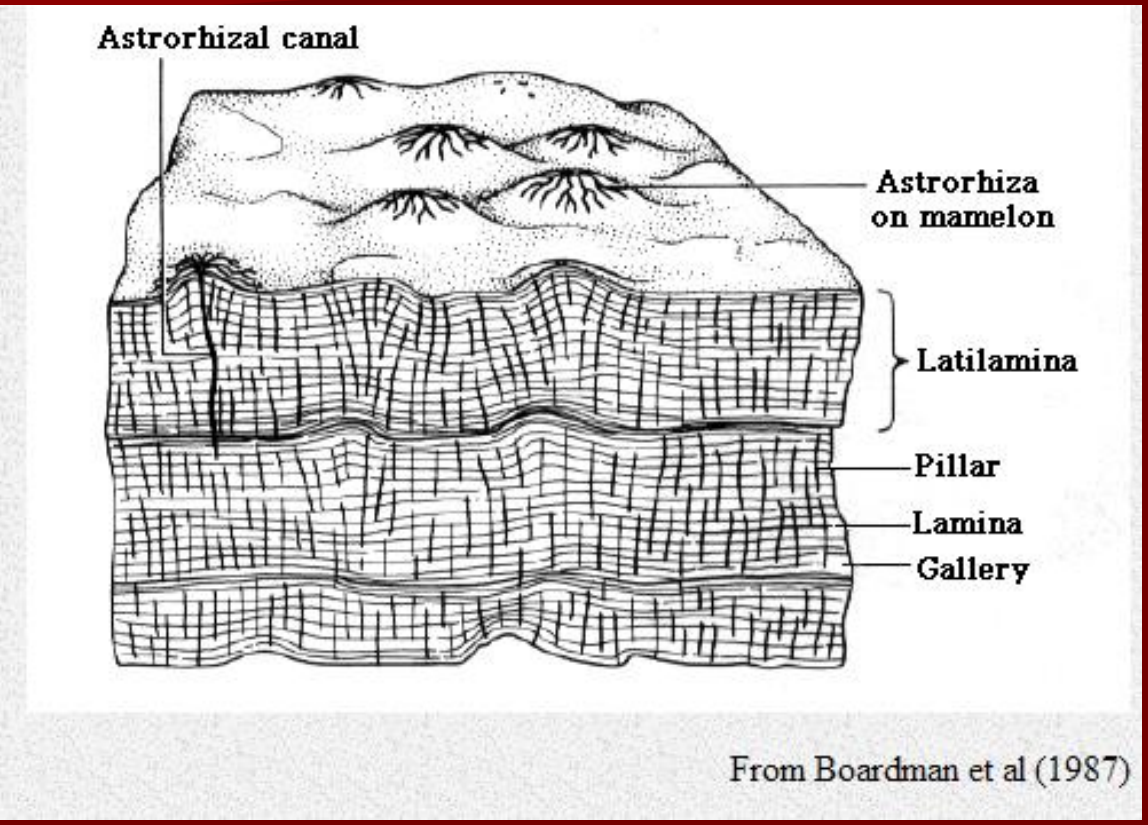

From Boardman et al (1987)

Geometry: laminated, irregular with namelons, flattaned up to 2 meters in thickness.

Shell: Carbonate

Stratigraphical range: Cambrian to Cretaceous, rich in the Silurian to Devonian reefs, together with corals

Environment: Reef framework organism.

http://paleo.cortland.edu/tutorial/Protista/porifera.htm

Homework 6

Search the coal localities in Turkey, draw or get a Turkiye map including coal localities with their ages.