Paleobotany
Dr.M.Gopi

QUESTION CORNER

Determining fossil's age

QUESTION: How is the age of fossils determined?

G.R. Seshadri, Ariyalur, T.N.

ANSWER : Dating of fossils is known as finding out of the age of fossils. The age of fossils indicates the age of the strata and the rock from which it is collected by using radioactive isotopes. This is called Radiometry or Radioactive clockmethod. The main principle underlying this method is that many rocks have natural clocks in the form of radioactive isotopes and these radioactive isotopes changes into stable elements slowly, and at a steady rate. Eg. one gram of radio active element changes into half gram in a particular duration of time. This duration is called half life of the element.

Half life is the time taken for the activity of the radioactive element to decay to one half of its original value. This duration of half life varies from element to element. The most common radioactive elements used for dating the fossils are Uranium, Carbon14, Pottassium, Rubidium.

In Lead method Uranium238, slowly disintegrates in to Lead206 and Helium. Here 1 gram of Uranium disintegrates into half gram of Uranium and another half gram of Lead206 and Helium. Here the half life period of Uranium is 4.51 billion years. The age of rock or fossil is determined by estimating the ratio of Uranium and Lead. This has three limitations.

— Uranium is not a common element.
— it can be used only for old rocks.
— it is not known that the Lead produced is lost or retained in the aquatic rocks.

Carbon method

The living organism contain a definite amount of carbon in bones and tissues as C14. When the animal dies the C14 disintegrates into C12 at a constant rate. The dating method cannot be used for the fossils which are more than 70,000 years old. Hence the age of recent fossils can be calculated accurately and sensitively with 30 years plus or minus by this method. Another limitaiton in this method is the fossil should contain at least some of the organic materials.

Fission track method:

This method is used when rocks contains glass or crystal. When Uranium 238 is present in the rock, it undergoes spontanious fission. This radiation causes the appearence of tracks on the rocks. When such a rock is etched with Hydrofluoric acid, the tracks are revealed and the tracks can also be seen with a microscope and counted. From the count the age of the glass or rock can be computed. This method may be used for glass as young as 2000 years.

Sangeetha Manoj, *Thiruvananthapuram*

This Week's Questions

Why do newspapers turn yellow in colour when exposed to sunlight in course of time?

A.R.K.Deepthi, *Hyderabad*

How do chameleons change their body colour?

Prakash Kumar, *Karnataka*

TABLE 1.1 Geological Time Scale

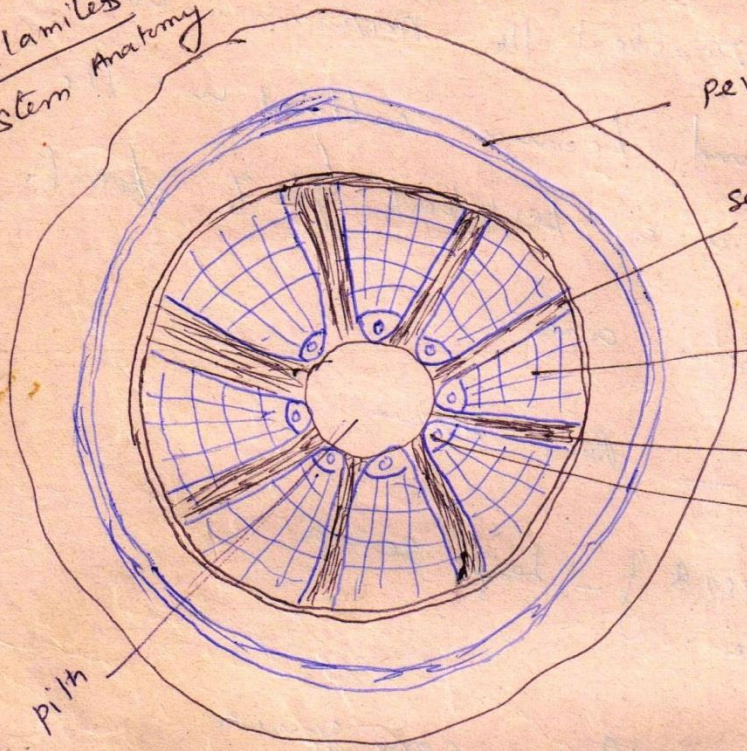
S. No.	*Era with duration in years*	*Major divisions*	*Period and number of years from the present time*	*Epoch*	*Important events in plant life*	*Dominant organisms of the era*
1	CENOZOIC (60,000,000 years)	Quaternary	2,000,000 years	Recent	Dominance of herbaceous plants	Age of herbs and man
				Pleistocene	Speciation of herbaceous plants	
		Tertiary	Late Tertiary	Pliocene	Spreading of herbaceous dicots	Angiosperms, birds mammals.
				Miocene	Restriction in plant distribution, Reduction in forests; rise of herbaceous angiosperms	
			Early Tertiary (60,000,000 years from the present)	Oligocene	Dispersal of woody angiosperms	
				Eocene	Development of flowering plants; extensive forests	
				Paleocene	Modernization of angiosperm families	
2	MESOZOIC (125,000,000 years)	Late Mesozoic	Upper Cretaceous		Dominance of angiosperms dwindling of gymnosperms	Higher Gymnosperms and reptiles.
			Middle Cretaceous		Rapid development of angiosperms. Many genera are present even today.	
			Lower Cretaceous		Rise and development of Cycads, Conifers and angiosperms	
		Early Mesozoic	Jurassic		Origin of angiosperms, Dominance of Cycadales and Coniferales, Definite evidence of diatoms	
			Triassic (185,000,000 years from the present)		Conifers and Ginkgoales increased. Disappearance of seed ferns; Rise of Cycads.	

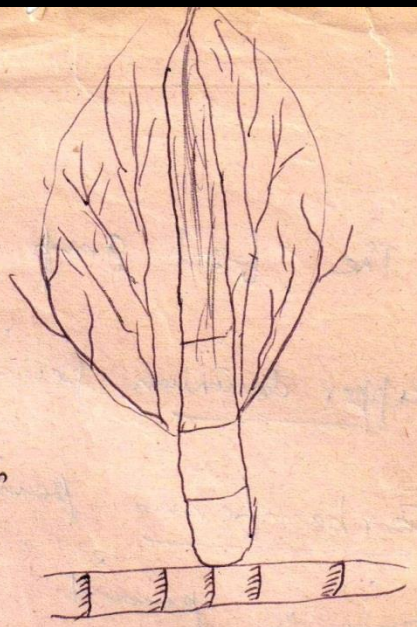
(contd.)

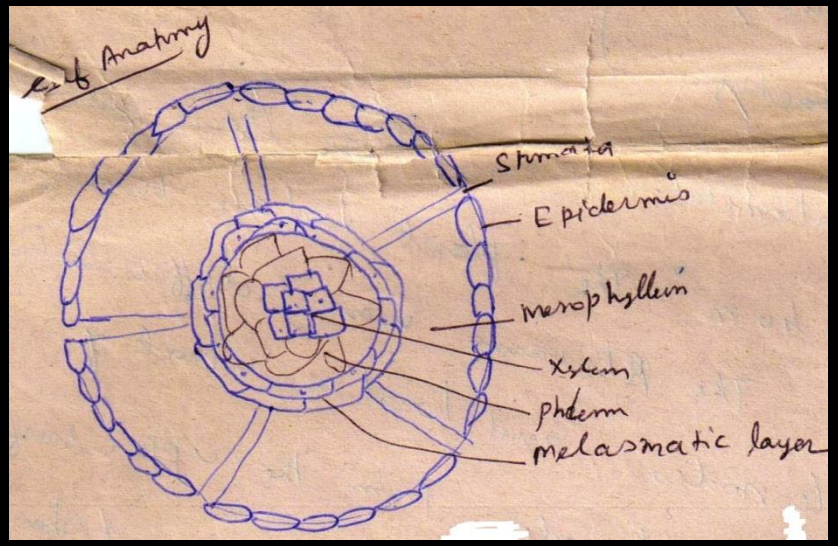
3	PALEOZOIC (368,000,000 years)	Late Paleozoic	Permian (223,000,000 years from present)	Rise of Conifers. Extinction of coal swamp flora	Lycopods, seed ferns and amphibians.
			Upper Carboniferous (271,000,000 years from present)	Dominance of ferns, Calamitales, Lepidodendrales, Cordaitales (Gymnosperms). Extensive coal formation.	
			Lower Carboniferous (309,000,000 years from the present)	Development of Lycopsida, Calamitales, seed ferns. Early coal deposits.	
		Middle Paleozoic	Devonian (354,000,000 years from present)	Flourishing Psilopsida, Lycopsida, Sphenopsida, ferns, Bryophytes, some algae.	Fishes and Early land plants.
			Silurian (381,000,000 years from the present)	First known land plants; dominance of algae; *Cooksonia*, the oldent known vascular plant.	Algae, Higher invertebrates
		Early Paleozoic	Ordovician (448,000,000 years from the present)	Marine red and green algae. Perhaps the time of rise of land plants.	
			Cambrian (553,000,000 years from the present)	Evidence of algal origin.	
4	PROTEROZOIC (900,000,000 years)		1,500,000,000 years from the present	Algae and bacteria	Marine invertebrates
5	ARCHEOZOIC (550,000,000 years +)		2,000,000,000 years from the present	Probably very simple, unicellular organisms. Origin of prokaryotic cell? Origin of earth.	Unicellular life(?)

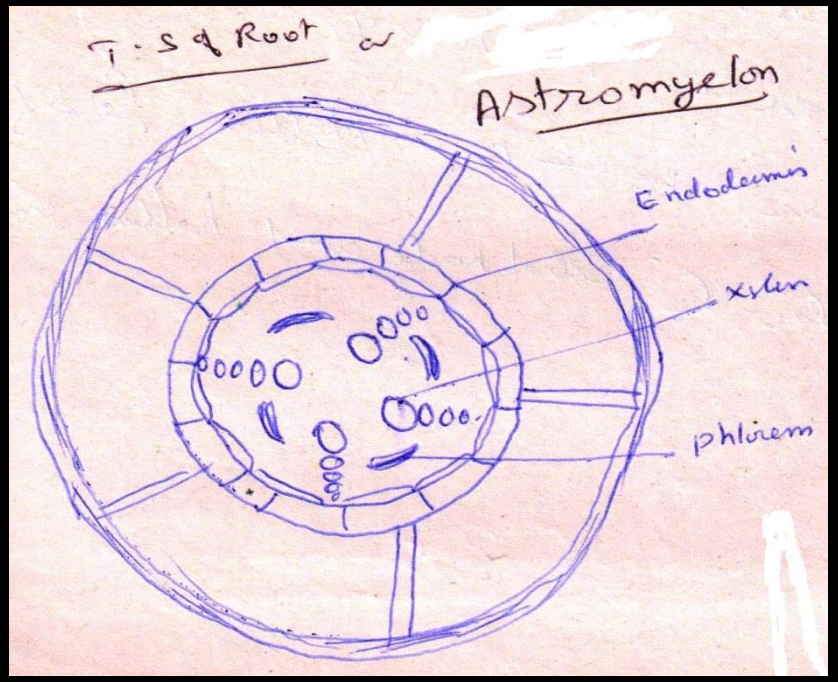
Sphenopsida
Calamatales
Calamitaceae
Calamites

Calamites
stem Anatomy

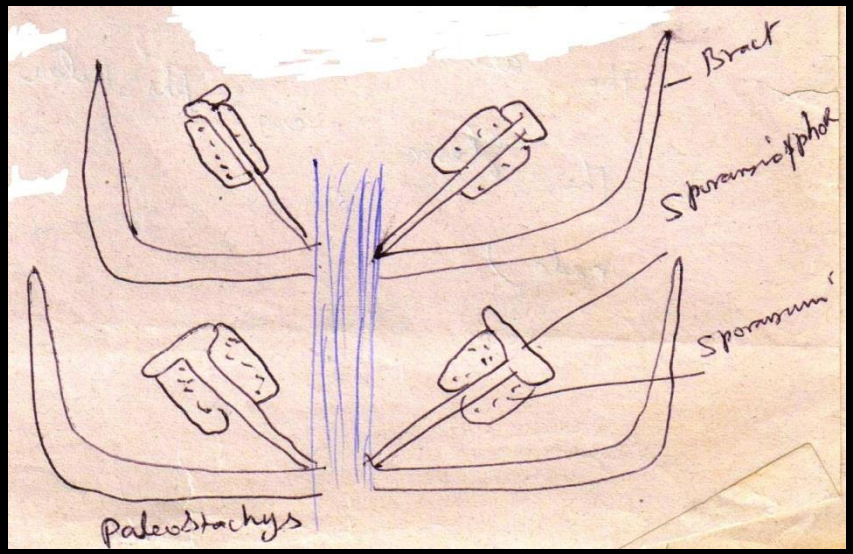


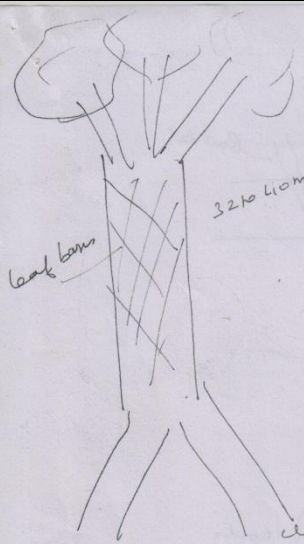


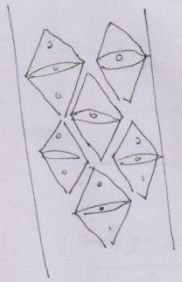

Stomata
Epidermis
Mesophyllem
Xylem
phloem
melasmatic layer

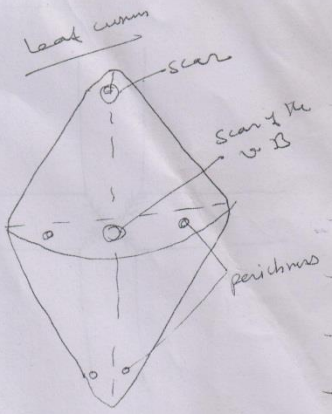

T.S of Root
Astromyelon
Endodermis
xylem
phloem


Calamites
Leaves of Annularia
Strobili
Calamostachys


Bract
Sporangiophore
Sporangium
Paleostachys







class – Lycopsida

order – Lepidodendrales

Ex Lepidodendron — Stem

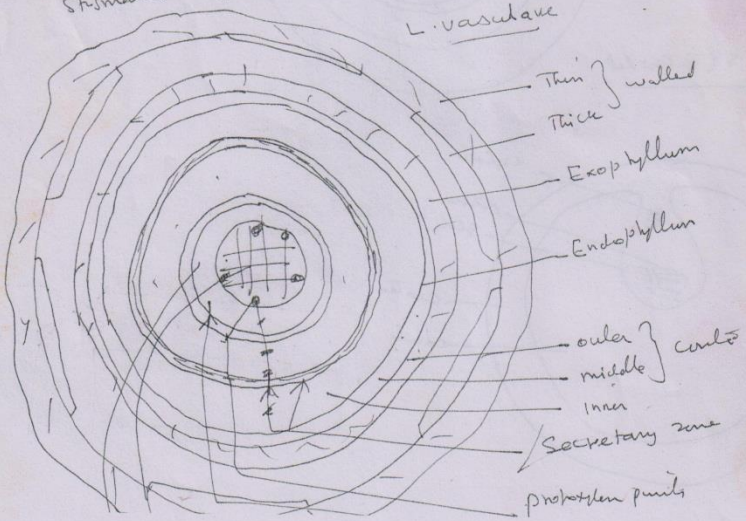
Lepidophyllum — Leaf

Lepidostrobus — Cone

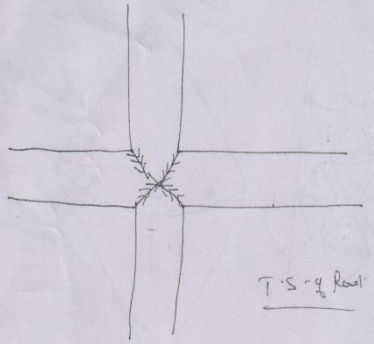
Lepidocarpon — Seed

Stigmaria — Root

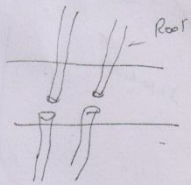
L.S. vasculare

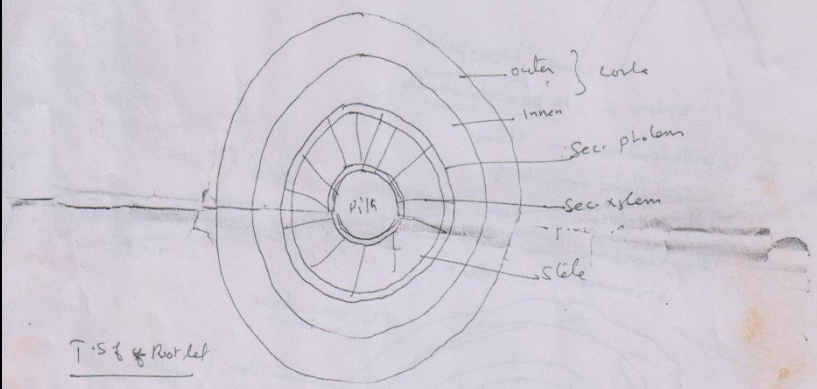


Stigmaria branches (2)

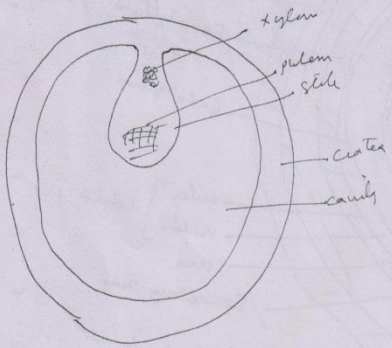


T.S of Root

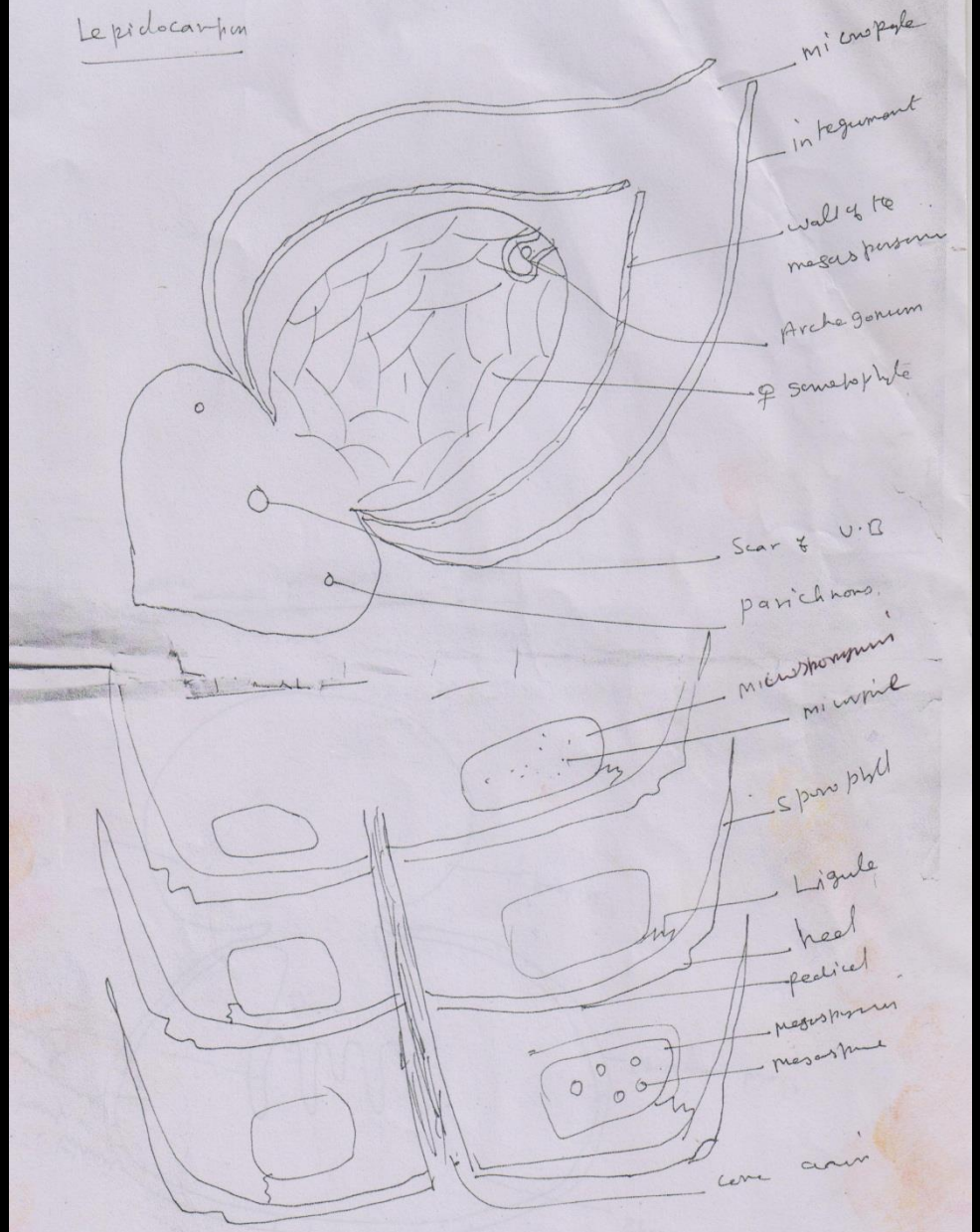




T.S of Root let



Lepidocarpon



T.S of Sporophyll and Sporangium of Lepidostrobus