Quadrant II – Transcript and Related Materials

Programme : **Bachelor of Science (Second Year)**

Subject : **Geology**

Paper Code : **GEC-104**

Paper Title : **Principles of Stratigraphy and Paleontology**

Unit : **II**

Module Name : **Conditions for fossilization**

Module No : **12**

Name of the Presenter : **Dinanath Parab**

CONDITIONS FOR FOSSILIZATION

Protection, preservation and conversion of dead bodies, their parts or traces into fossil form by natural processes is known as fossilization.

Fossilization is a continuous process and is still going on. In oceanic and lake environment, a variety of organisms are surviving at various depth. After death their bodies sink and came to rest on the layers of sediments which are laid at the same time.

Fossilization includes all physical, biological and chemical processes that bring about the preservation of organisms inside the rock.

There are number of controls on the process of fossilization. They are

1. Possessing hard parts

2. Rapid burial or entombment

3. Structure, strength and composition of hard parts

POSSESSING HARD PARTS

Dead organisms are exposed to atmosphere and may be destroyed by scavengers or due to the erosive action of exogenous natural agencies, where as soft parts undergo rapid decomposition, the hard parts, if any are dispersed. Animals like jelly fish,

insects and worms do not possess bony skeleton and for these reasons they are not preserved in the form of fossils. Similarly the leaves, buds, fruits and flowers of plants are not commonly found to occur as fossils. Such animals or plants, thus, leave no record of their existence except occasionally, in the form of merely imprints. On the other hand, animals with hard and rigid skeleton stand a much better chance of being converted into fossils. In a similar manner, the massive trunks of trees are preserved conveniently within the rocks.

RAPID BURIAL OR ENTOMBMENT

Although the hard parts of organisms are strong enough to resist wear and tear for some length of time, their prolonged exposure upon the earth's surface is scheduled to lead ultimately to their complete destruction. If however the remains of plants and animals be entombed (buried) quickly under thick cover of sediments, its chances of preservation as fossil are high. It means that dead bodies must be quickly covered by layers of sediments which provide protection against disintegration and dispersal of hard parts.

These conditions viz. quick burial and possession of hard parts are easily fulfilled in case of marine organisms. But in case of terrestrial organisms it has to undergo long transport before its deposition and burial i.e. it has to survive prolonged wear and tear. Therefore land organisms have very little chance if being preserved as fossils.

STRUCTURE, STRENGTH AND COMPOSITION OF HARD PARTS

The hard parts of organism may take form of rigid structure within a body (endoskeleton) or enclosing it (exoskeleton) or of separate units which fall apart when the soft tissues decay after death (disarticulation)

A chance of preservation of an organism is also controlled by composition of hard parts. If the skeleton consists of thin, fragile pieces, they are easily broken and scattered and chances of fossilization of entire organism are reduced. Composition of skeleton or hard parts also plays an important role in preservation.

COMPOSITION AND RELATIVE SOLUBILITY OF HARD PARTS

Animals/ Plants	Composition	Relative solubility in chemically active groundwater/ possible change
Insects or hydroids (trilobites & graptolites)	Chitin i.e. carbohydrates e.g. finger nail	Dissolved with difficulty but undergoes carbonisation
Bones and teeth	CO_3 & PO_4 of lime	Not easily soluble but become more resistant & dense by mineralization & per- mineralization
Micro skeleton of diatoms, radiolarians & sponges	Silica (isotropic & glassy)	Easily soluble in slightly alkaline solutions unlike inorganic silica
Shells of Invertebrates	Aragonite	Loose faster in acidic water
	$CaCO_3$	Relatively less easily soluble

PRESERVABILITY OF ORGANIC REMAINS

To be a fossil, all or part of an organism or some trace of its activity must be preserved in the rock. The following natural processes operate as destructive processes.

BIOLOGIC DESTRUCTION

Biologic agents of destruction are present in nearly all environments. Predators and scavengers are ubiquitous in the biologic world. Some are larger than the organisms they feed on, some are much smaller 9micro organisms). All organisms attacked by scavengers or other biologic agents or destruction while living or after death. For example, the shell of an oyster is quite sturdy and made up of calcium carbonate and hence most likely to become fossil. As soon as oyster die its shell is subjected to deterioration due to attack by boring organisms such as worms, sponges, algae and other molluscs. For this reason few shelled organisms on sea bottom have intact empty shells. If an organism is buried by sedimentation shortly after its death then it is protected from destructive processes.

MECHANICAL DESTRUCTION

It is an observed fact that organisms which die in high energy environments may be abraded beyond recognition or completely destroyed by the action of wind, waves and currents. Some kinds of skeleton are more susceptible to mechanical destruction then others.

In one laboratory experiment particle against particle abrasion was tested by placing shells and other skeletal parts of various marine organisms with chert pebbles in tumbling barrels. The time required for various degree of destruction by abrasion was carefully noted. This experiment was carried out on the skeletons of gastropods, corals, echinoids and bryozoans. The result showed more durability of gastropod shells and faster destruction of bryozoans and calcareous algae. This result agree with the observation of fossil records i.e. bryozoans make up relatively small fraction of fossil record and gastropods are relatively large fraction.

CHEMICAL DESTRUCTION

The skeleton of animal may withstand biologic and mechanical destructive process yet may fail to form fossil. Simple chemical solution is one of the most important reasons why we do not more identifiable fossils.

Chemical solution can take place at any time after the death of an animal, even after its skeleton has been fossil for a long time. Fossil may be also dissolved away by groundwater millions of years after its burial. Ability of fossil to survive solution depends on its chemical composition and physical characteristics of water to which it is exposed. If a shell is disintegrated by chemical solution after being embedded in rock, it may leave just a cavity of a fossil record.