UNIT 2

STRATIGRAPHIC CLASSIFICATION

Structure

2.1 INTRODUCTION

You are by now familiar with the general principles of stratigraphy and how stratigraphic studies are undertaken. It was also discussed in Unit 1 that what you have to observe in the rocks and some information was also given on how to collect and present the stratigraphic data that form the base of stratigraphic classification. In this unit, you will be introduced how rock sequences are classified so that you arrive at conclusions about their mode and time of deposition. For the study of any rock sequence, it is necessary to classify it so that it can be studied in parts with respect to its thickness and time of deposition that it indicates. The factors that need to be considered for stratigraphic classification are the rock type, its physical and chemical characters, nature of bedding and fossils it contains. From all these, the type of the basin and the time of deposition can be interpreted.

In this unit, we will discuss three basic classifications of stratigraphy, namely, lithostratigraphy, biostratigraphy and chronostratigraphy. You will also learn about the various units of classification and how we name these different units. It is important to note that for classifying the rock sequences, you should be able to identify the rock types. The most common types of sedimentary rocks are sandstone, limestone, shale and conglomerate. In addition, you should also be able to identify the breaks or unconformities in the rock sequence. The fossils present in the sequence also need to be identified. In addition, we will also discuss the methods and importance of stratigraphic correlation in this unit.

Expected Learning Outcomes

After studying this unit, you should be able to:

- ❖ define stratigraphic classification;
- ❖ describe lithostratigraphy, biostratigraphy and chronostratigraphy;
- ❖ discuss basic units of different types of stratigraphic classification;
- ❖ differentiate different types of stratigraphic classification;
- ❖ elaborate the concept and principles of stratigraphic correlation; and
- ❖ explain methods and importance of stratigraphic correlation.

2.2 PRINCIPLES AND TYPES OF STRATIGRAPHIC CLASSIFICATION

Stratigraphy involves the definition and description of rock successions from a historical point of view. It includes determination of the sequence of rocks locally and relating the same to the regional or global framework of the geological time scale. You may have become familiar with the geological time scale while studying the section 1.7 of Unit 1. You may also be familiar with the fundamental unit of stratigraphy namely the stratum (plural strata) that has given name to this branch of Earth science. To remind you the **stratum** denotes a layer of rock and such layers in a sequence are referred to as **strata**. Each stratum indicates deposition of sediment at a particular point of time. Therefore, stratigraphy has a time significance and the rock sequence constituting the strata indicates the time of deposition.

It is necessary to classify the strata into various divisions to determine the nature and time of deposition and to relate it to the geologic time scale. Therefore, stratigraphic classification includes all rocks of the Earth's crust. Each classification is based on certain stratigraphic units, in which each unit represents a single property or a set of rock properties. Since rocks have many distinctive and measurable properties, therefore, rocks may be classified according to any property. It is important to note that the stratigraphic position on change of any property does not necessarily coincide with that for any other property. As a result, the stratigraphic units based on one property generally do not match with those units which are based on a different property. Normally, it is not possible to show the distribution of all properties in the rocks by using a single set of stratigraphic units. Hence, different sets of stratigraphic units are required in order to classify the rock sequence. Thus, there are three main types of stratigraphic classification namely:

- **Lithostratigraphic**;
- **Biostratigraphic**; and
- **Chronostratigraphic** classifications.

These are based on lithology, fossil content and time of deposition, respectively. In a broad sense, all these classifications are closely related to each other because each classification represents a different property of the same rock sequence. The main aim of all stratigraphic classifications is to enhance our knowledge and understanding of rock sequences of the Earth and their history.

It is important to know that for either of these classifications, it is necessary to follow the prescribed rules and regulations as specified in the **Code of Stratigraphic Nomenclature**. When we follow all these rules and classify the sequence it becomes a formal classification. If we do not strictly follow the code then it is only an informal classification. For each unit of classification in lithostratigraphy and chronostratigraphy, we need to identify a type area and the sequence in the type area, which is known as **stratotype**. The type area is a geographic area or region where the stratotype of a stratigraphic unit is first identified. Let us discuss each classification one by one.

- **Code of Stratigraphic Nomenclature** was developed by the International Subcommission on Stratigraphic Classification (ISSC) of the International Commission on Stratigraphy (ICS) created by International Union of Geological Sciences (IUGS). It has since been accepted by most countries of the world, including India. All stratigraphic classifications follow this code to evolve a uniform and formal division of rock sequences.
- **Stratotype** is regarded as a typical of a stratigraphic unit that it defines. It is a particular section that shows all the characteristics of the stratigraphic unit. Identification of stratotypes is mandatory for all lithostratigraphic units and desirable for chronostratigraphic units but are not used for biostratigraphy.

Let us discuss the three main types of stratigraphic classification in the following subsections.

2.2.1 Lithostratigraphy

In simple words, lithostratigraphy (**litho** means rock type and **stratum+ graphia** means description of all rock bodies) may be defined as an element of stratigraphy that deals with the description, definition and naming of the rocks of the Earth based on their lithology and their stratigraphic relations. Hence, the lithostratigraphic classification is primarily based on the rock types (i.e. lithologic properties) present in a rock sequence. That is why it is also called **rock-stratigraphic classification**. Lithostratigraphic classification, basically, is the organisation of rock sequences into different units on the basis of their lithological properties and their stratigraphic relations to other rocks. It is more accurate stratigraphic classification and is fundamental to all branches of stratigraphy. In addition, lithostratigraphic units are basic units of geological mapping. In this classification, the sequence is divided on the basis of lithology whereby each rock type or a group of rock types constitutes a unit. These units are further divided or grouped together as follows:

- **Lithostratigraphic Units**

The basic hierarchy of lithostratigraphic units is given in Table 2.1.

Table 2.1: Lithostratigraphic units.

Supergroup – a combination of several associated groups
Group – a combination of two or more formations
Formation – basic unit of lithostratigraphy
Member – named lithologic subdivision of a formation
Bed – named distinctive layer in a member or formation

The arrangement of units in lithostratigraphic classification in descending order of thickness is Supergroup, Group, Formation, Member and/or Beds. However, the primary and mandatory unit of this classification is only the Formation.

- **Formation**: In lithostratigraphy, we start the classification from formation. Formation is the basic formal unit of this classification. A Formation is a homogeneous set of strata consisting of a distinct rock type or a set of rock types. It is laterally continuous and of a sufficient thickness so that it becomes a mappable unit. In Unit 1 you have already been introduced to mappable unit. Let us recapitulate, a **mappable unit** of rock sequence constitutes a rock type or a set of rock types that is sufficiently thick and continuous so that it can be recorded in a map to a scale. The homogeneity may be by way of lithological or other distinctive characters like colour or weathering characteristics or a combination of these. Talchir Formation of Damuda Group, Gondwana Supergroup is an example of Formation.
- **Member**: Each Formation may be further classified into **Members**. Hence, member constitutes a formal unit of lithostratigraphy next in rank below a formation. It possesses certain lithologic properties which distinguishes it from adjacent parts of formation. Several members may be present within a formation and each member is characterised by distinctive lithology. It is not always necessary to divide the formation into members. Depending on the purpose, some formations may be divided into members while others are not divided into members or its certain parts may be designated as members.
- **Bed**: It is the smallest formal unit of lithostratigraphy. In sedimentary sequences, there are certain distinctive layers such as key beds, marker beds, etc. of stratigraphic importance. These beds deserve their proper names and hence, they are considered as formal lithostratigraphic units. For example, the Boulder bed of the Talchir Formation is a classic example of bed.
- **Group**: A group is a combination of two or more formations, in which each Formation has common significant and diagnostic lithological properties. Damuda Group consisting of four formations (Karharbari, Barakar, Barren measures and Raniganj), belongs to the Gondwana Supergroup is an example of a Group.
- **Supergroup**: It is a combination of several associated groups or associated groups and formations, in which significant lithological properties are common. The Gondwana Supergroup is an example of a Supergroup.

The lithostratigraphic units are named on the basis of locality or geographical features such as a river or a mountain peak where a type section is exposed.

For example, Raniganj Formation named after the town Raniganj (Bardhaman District, West Bengal), where this formation is exposed, constitutes its type section. A type section and stratotype, as mentioned above, are necessary to be identified for a formation as per the Code of Stratigraphic Nomenclature. A stratotype should include the full complement of the formation. The locality or geographical feature that gives name to the formation is suffixed by unit name. For example, we can say Raniganj Formation for a rock formation consisting of a set of rock types for which Raniganj area in West Bengal is the type area. When the formation consists of a distinct rock type, we may also use the rock name as a suffix instead of the Formation like Muth Quartzite and Rohtas Limestone. For other lithostratigraphic units like Supergroup, Group and Member also the same procedure is used. The first letter of all formal stratigraphic units is capitalised.

Learners, you have learnt the principles and types of stratigraphic classification. In the above section we have discussed about lithostratigraphic classification. Before discussing about biostratigraphic and chronostratigraphic classifications, spend few minutes to perform an exercise to check your progress.

SAQ 1

a) Complete the following sentences:
   i. The factors that need to be considered for stratigraphic classification are……………………………………………………………………….
   ii. For each unit of classification, we need to identify a type area and the sequence in the type area is known as……………………………….
   iii. A formation is a homogeneous set of strata consisting of a distinct rock type or a set of rock types that is laterally continuous and of a sufficient thickness so that it becomes……………
b) Arrange the different units of lithostratigraphic classification in descending order of thickness.

2.2.2 Biostratigraphy

Biostratigraphy (**bio** means life and **stratum+ graphia** means description of all rock bodies) may be defined as an element of stratigraphy that deals with the distribution of fossils in a rock sequence and organisation of strata into distinctive units based on the fossils present in it. Biostratigraphic classification is the systematic subdivision and organization of a rock sequence into named units on the basis of fossils contained in the rocks. The basic principle of biostratigraphy is that the evolutionary changes in organisms are non-reversible and, therefore, the fossils present during a time span are characteristic only of that particular time interval and cannot repeat or replicate at any other time. Accordingly, based on the presence of characteristic fossils, the strata are divided into different **biostratigraphic zones** or **biozones.** It is important to note that biozones constitute the primary units of biostratigraphic classification.

- **Biostratigraphic Units or Biozones**

Biozones are of various types depending on the nature and distribution of fossils contained therein. However, there are four most commonly used biozones (Table 2.2).

Table 2.2: Biostratigraphic units.

1.	Range zone (also called Acrozone)
2.	Interval zone
3.	Assemblage zone (also called Cenozone)
4.	Abundance zone (also called Acme zone)

Let us discuss each biozone in brief in the same order as given above.

1. **Range Zone**: A range zone is based on the total range of a fossil form that is, the span between its first appearance and final disappearance. In a sequence, when a particular fossil appears for the first time, that level marks the beginning of this zone. The zone ends at the level of its last presence (Fig. 2.1). For fixing a range zone, only those fossils can be utilised which have a short time range and as far as possible wide geographical distribution. Such fossils are known as **index fossils**. On the basis of total ranges of such fossils, the biozones are fixed. There are two types of range zone namely – partial range zone and concurrent-range zone.

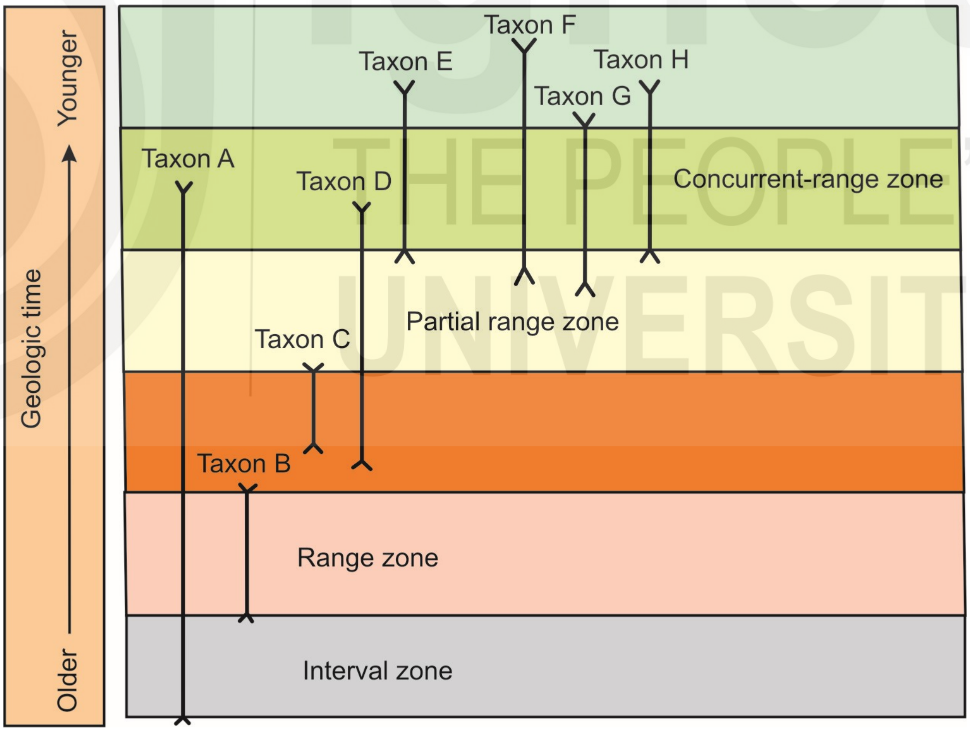

Fig. 2.1: Types of biostratigraphic zones; interval zone marked by the first appearance of taxon A and B, range zone defined by first and last appearance of taxon B, partial range zone is that part of the stratigraphic range of taxon D which starts from the end of taxon C and beginning of taxon E and concurrent-range zone defined by overlap of taxa F, G and H. Taxon is singular and taxa is plural.

A partial range zone is made within a stratigraphical range of a taxon or form in which part of its stratigraphic range lying above the range of another taxon and part of its range lying below the range of another taxon (Fig. 2.1). Concurrent-range zone includes abody of rock sequence corresponding to the overlapping stratigraphic range of two or more specified fossil taxa as shown in Figure 2.1.

2. **Interval Zone**: It contains a body of rock sequence corresponding to the interval between any two specified biological events (Fig. 2.1). For example, an interval between two extinction events and an interval between two origination events or an interval between an origination event and an extinction event.

3. **Assemblage Zone**: An assemblage zone is defined as a biozone characterised by the association of many fossil forms (usually three or more) as shown in Fig.2.2. Only on the basis of the combined association of these forms the zone can be identified and not on the presence of any single form as in the case of range zone. It is necessary for all the identified forms to be present in the strata in order to qualify for the recognition of an assemblage zone.

4. **Abundance Zone**: An abundance zone is defined as a body of strata that contains a maximum population of one or more species of fossils (Fig. 2.2). In other words, these species were at their acme or climax during that period. Abundance zones are used only for local classification and do not have widespread application. This type of classification is commonly used in oil industry for classifying local stratigraphic sections in an oil field.

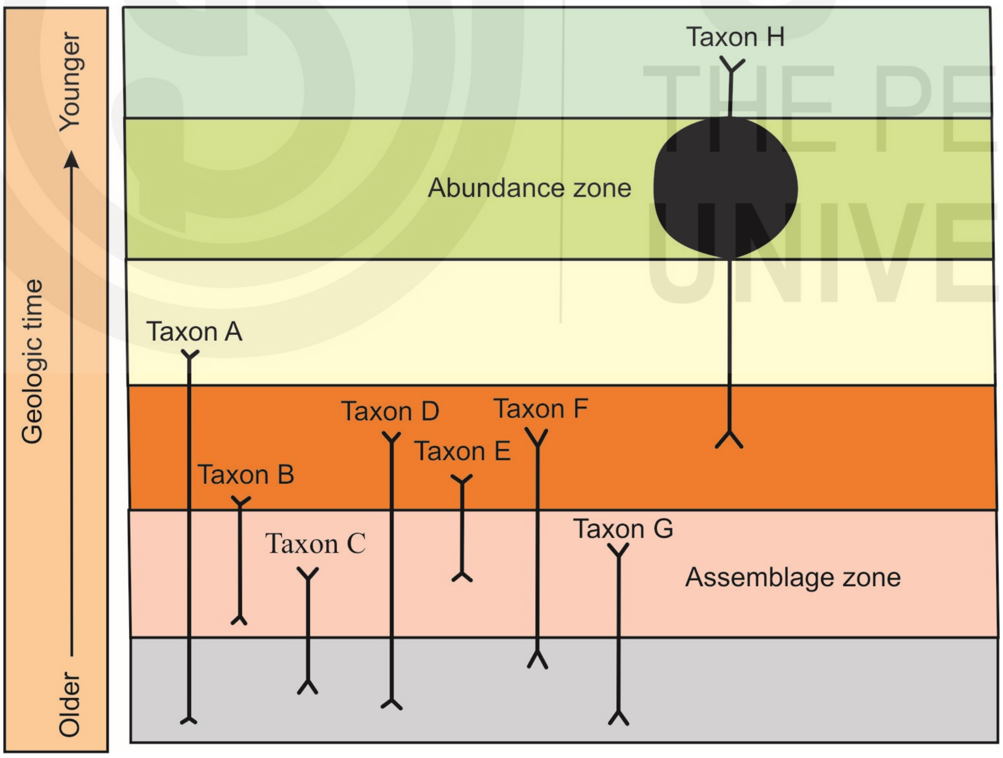

Fig. 2.2: Types of biostratigraphic zones; assemblage zone defined by presence of taxa A to G and abundance zone marked by the extraordinary population of taxon H.

It is interesting to note that sometimes in a fossiliferous sequence we have a bunch of strata that do not contain any fossils. The term **Barren Zone** is used for that unfossiliferous part of the sequence.

Note that for biostratigraphic classification, there are usually no stratotypes, but reference localities can be named. A **range zone** or **abundance zone** is named on the generic or trivial name of the index or acme species, respectively. In the case of an assemblage zone, the name can be based on the two of the assemblage forms. The examples can be *Ophiceras* Zone for a range zone, *Spiriferella raja* Zone for an abundance zone and *Tonkinella-Bailliella* Zone for an assemblage zone. The zones may be further divided into **subzones** or further into **Zonules**, the latter being the smallest biostratigraphic sub-division.

2.2.3 Chronostratigraphy

You have read that lithostratigraphy and biostratigraphy are based on the content of the strata namely lithology and fossils, respectively. The chronostratigraphy (**chrono** means time and **stratum+ graphia** means description of all rock bodies) is defined as an element of stratigraphy that deals with the relative time relations and age of rock bodies. It may be noted that chronostratigraphy is an abstract concept and is based on relative time as interpreted from biostratigraphy to a large extent. The time is not something that can be seen within the rocks, but it has to be determined from the fossil content as indicated by the biostratigraphic classification. The main aim of the chronostratigraphy is to organise the rock sequence on a global scale into chronostratigraphic units, so that all local, regional as well as global events can be related to a single standard geological scale. Thus, chronostratigraphy is mainly concerned with the age of rock sequence and their time relations. Hence, chronostratigraphic classification is considered as the organisation of rocks into units on the basis of their age or time of origin.

- **Chronostratigraphic Units**

A chronostratigraphic unit may be defined as a body of rocks that includes all rocks formed during a specific interval of geologic time and it also includes those rocks formed during that time span (Murphy and Salvador, 1999). In chronostratigraphy, the time encompassed by a biozone is termed as a **biochron** and on the basis of biochrons, the various chronostratigraphic units can be identified. Chronostratigraphic units are the fundamental working units of the geological time scale. The hierarchy of chronostratigraphic units is given in Table 2.3.

Table 2.3: Chronostratigraphicunits.

Eonothem				
	Erathem			
		System		
			Series	
				Stage

On the basis of a biochron, we determine and identify **stage** that constitutes the lowest unit of chronostratigraphy. The other units in ascending order are **series**, **system**, **erathem** and **eonothem**. These are all identified on the basis of fossil content and are of a relative nature. The order of superposition determines the sequence of the sediments and characteristic fossils of different beds that determine their relative ages.

In section 1.7 of Unit 1, you have already learnt how the geological time scale was prepared on the basis of time. You have also learnt that the time is relative time and is not measured in absolute years. Therefore, for the better understanding of chronostratigraphy, a proper knowledge of geochronology is essential. **Geochronology** is a branch of geology that deals with the dating of rock formations and geological events in years by using radioactive dating methods. Thus, geochronologic units are the subdivisions of geologic time. These are abstract units and only defined after the chronostratigraphic units. The hierarchy of geochronologic units is given in Table 2.4.

Table 2.4: Geochronologic units.

Eon
Era
Period
Epoch
Age

You have already studied in Unit1, the age in absolute years as determined by radiometric methods may be assigned to these units but that is not the basis of the classification.

It should be noted that the basic aim of chronostratigraphic and geochronologic classifications is to arrange systematically rock strata of Earth into named units (chronostratigraphic units) and corresponding to intervals of geologic time (geochronologic units). Such arrangement facilitates time correlation and age determination of rock strata and further, serves as a reference system for recording events of geologic history. In this arrangement, each chronostratigraphic unit has its corresponding geochronologic unit as shown in Table 2.5.

Table 2.5: Hierarchy of chronostratigraphic and corresponding geochronologic units.

Chronostratigraphic (time-rock) units	Example	Geochronologic (time) units	Example
Eonothem	Phanerozoic	Eon	Phanerozoic
Earthem	Mesozoic	Era	Mesozoic
System	Triassic	Period	Triassic
Series	Upper Triassic	Epoch	Late Triassic
Stage	Norian	Age	Norian

Now, let us discuss the chronostratigraphic units and their corresponding geochronologic equivalents in brief.

- **Stage**: It is a basic and lowest ranking unit of chronostratigraphy. It includes all rocks formed during a particular age. Stage can be recognised worldwide. It represents a subdivision of a series. Its corresponding geochronologic equivalent is age.
- **Series**: It is a chronostratigraphic unit ranking above a stage and below a system. An epoch is its geochronologic equivalent unit.

- **System**: It is a major rank chronostratigraphic unit. It lies above the series and below erathem, e.g. Triassic System. Period is its geochronologic equivalent unit, e.g. Triassic Period. Here the relation between these two units such as Triassic System and Triassic Period is that the rocks of the Triassic System were all deposited during the Triassic Period.
- **Erathem**: It consists of a group of systems. For example, Mesozoic erathem consists of Jurassic System, Triassic System and Cretaceous System. The geochronologic equivalent of erathem is an era. The Mesozoic era which consists of Jurassic Period, Triassic Period and Cretaceous Period, is an example of era.
- **Eonothem**: It consists of a group of erathem. It is higher in rank than an erathem. Its geochronologic equivalent is an eon. It may be noted that there are three eonothems namely Archean, Proterozoic and Phanerozoic.
- The time-rock and time divisions in the geological time scale are denoted by the same terms but the suffix indicates if it is a time-rock unit or a time unit. For example, Cambrian System denotes a time-rock division while Cambrian Period denotes time division during which those rocks were deposited.

It may be noted that age in absolute years or what is known as **geochronology**, when determined by various methods includes radioactive dating or magneto-stratigraphy. It is superimposed on the time units but their variation does not change the scale since it is not based on absolute years.

Learners, you have learnt about biostratigraphic and chronostratigraphic classifications. Before discussing about stratigraphic correlation, spend few minutes to perform an exercise to check your progress.

SAQ 2

a) Fill in the blanks:

(i) On the presence of characteristic fossils, the strata are divided into …………… that constitute the primary units of biostratigraphic classification.

(ii) The span between the first appearance of a fossil form and its final disappearance is known as…………………

(iii) A biozone is characterised by the combined association of more than one fossil form is known as …………………..

(iv) The time-rock equivalent of the time unit Epoch is…………………

(v) The time encompassed by a biozone is called a…………………………

2.3 STRATIGRAPHIC CORRELATION

You have learnt in Section 1.5 of Unit 1, how to collect the stratigraphic data and how to construct stratigraphic columns. Once you have constructed stratigraphic columns of different sites of a wide area, then next step will be to correlate these columns. As you know the principle of lateral continuity states that rock beds can be traced across a wide area. Therefore, stratigraphic correlation i.e. connecting similar rock beds is a best means to reconstruct the geological history of an area. Let us discuss stratigraphic correlation in detail.

2.3.1 Definition and Introduction

Correlation is a procedure to indicate correspondence between geographically separated geologic units of rocks. The correspondence can be in the character and stratigraphic position of the rocks. It can be of various types like correspondence in lithology, fossil content and time of deposition. Thus, correlation is dependent on what kind of equivalence can be established according to the character of the rocks to be equated. The scope of correlation is different in different sequences and the interpretation depends on the type of correlation undertaken.

When we are looking for correspondence in lithology or lithological correlation we make use of **key beds**. Key beds are the marker beds with a characteristic lithology that may extend for considerable distances and may help in marking a stratigraphic position. Likewise an unconformity may also be used as a marker horizon like a key bed and can be of importance in lithological correlation. Biostratigraphic correlation or correlation by fossil content may be made by index fossils or a fossil assemblage as indicated in section 2.2.2 above.

2.3.2 Methods

Rock sequences can be correlated in many ways, but there are three simple and important methods, viz., lithostratigraphic, biostratigraphic and temporal correlation. Let us discuss each method of correlation in detail.

i. **Lithostratigraphic Correlation**: The methods to be applied for correlation depend on what type of correlation is needed or possible in various stratigraphic sequences. The easiest correlation is the lithostratigraphic correlation whereby similar rock units or key beds are used to determine the correspondence between two separated sequences.

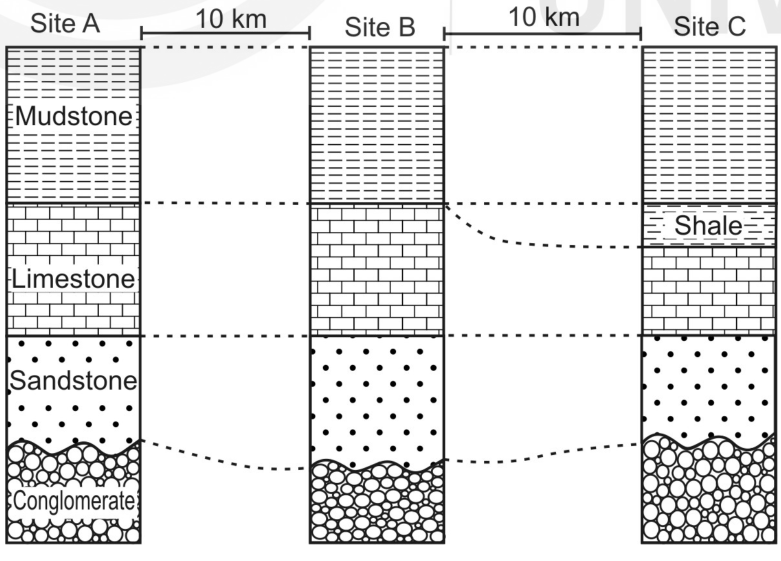

Fig. 2.3: Lithostratigraphic correlation of three sites namely A, B and C. Dotted lines indicate correlation. Note that shale bed is absent at sites A and B, but it is present at site C. Unconformity above the conglomerate bed is marked by the wavy line. The distance between site A, B and C is 10 kms.

In lithostratigraphic correlation, it is the usual practice to classify one sequence on the basis of lithology into formations and even members if possible, and to identify the key beds or marker beds and unconformities, if any. Then these marker horizons are located in the other sequences and accordingly, the correspondence between the first sequence and the second sequence is established. The correspondence may not be necessarily identical because lithological units are known to thicken or thin out or sometimes even vanish as we follow them laterally. But a general correlation is possible while registering the lateral changes.

While lithological correlation is relatively easy, it has to be understood that this correlation is only of a local nature and may not be applicable or useful for long distances. The lithological similarity can be only if the deposition has taken place in a single basin. If the basins of deposition are different then the lithological similarity may not be there nor can the same key beds exist in different basins.

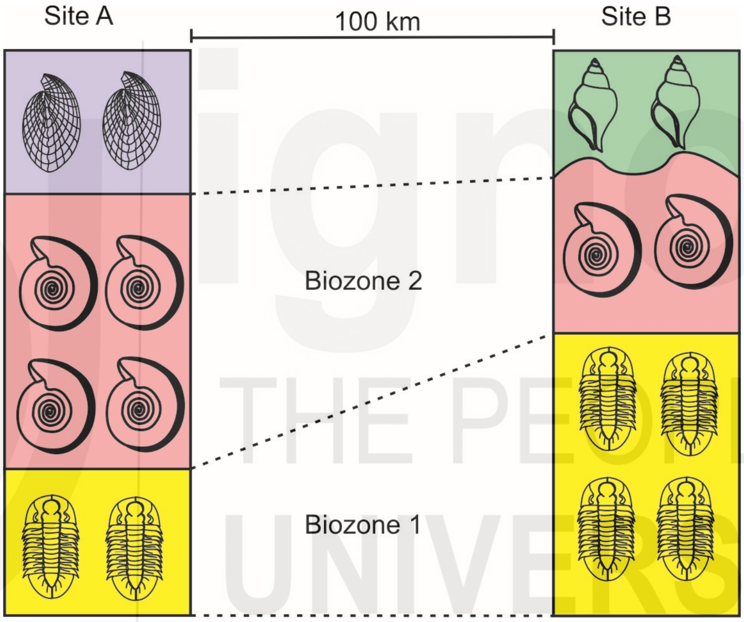

Fig. 2.4: Biostratigraphic correlation between two sites, namely, A and B. Here the beds are correlated on the basis of similar fossils. Dotted lines indicate correlation. For example in this figure, biozone 1 is characterised by the occurrence of trilobites and biozone 2 by ammonoids. Note that top of both sites has different fossils content hence they cannot be correlated and wavy line in site B indicates a depositional break (unconformity).

ii. **Biostratigraphic Correlation**: Biostratigraphic correlation is based on the fossil content of the rocks. It is more precise and accurate correlation that can be applied for long distances or even widely separated sequences that may have been deposited in different basins. In biostratigraphic correlation, index fossils or an assemblage of fossils is used. In the case of lithostratigraphy, in practice we choose a sequence and classify it on the basis of fossil content. You have already learnt how we classify a sequence on the basis of fossil content in Section 2.2.2 above. To remind you again we divide the sequence into biozones that may be either range zones, assemblage zones or abundance zones. Once such a classification is made we identify these zones in other sequences that may be widely separated. In this regard, the range zones based on index fossils are usually the best tools for biostratigraphic correlation. Index fossils may be useful within a region or may also be applicable for long distance correlation or intercontinental correlation.

Biostratigraphic correlation is also directly related to chronostratigraphic or time correlation because as biochrons are based on biozones as they indicate the relative time. However, one precaution is necessary in this correlation. The similarity of fossils or **homotaxis** in two widely separated localities does not necessarily indicate same time of deposition or **contemporaneity**. This is because the organisms that may have evolved at one place may take a long time to reach another locality and there may be some time lag of dispersal. However, since we are only dealing with relative time and not absolute time, the homotaxis need not indicate contemporaneity as the sequence will remain the same.

iii.**Temporal Correlation**: Sometimes when fossil content may be scanty and lithological similarity may not be there we choose only a key bed that may be based on some kind of a time similarity like an unconformity or some fossil horizon. From that bed upwards and downwards we build a stratigraphic column based on superposition and correlate it with the corresponding known units from an established stratigraphic sequence. This is based on the principle that overlying beds are younger and underlying beds are older and they should correspond with the beds of the known sequence.This is the temporal correlation and it may not be very accurate since it is only an approximation.

2.3.3 Need for Correlation

The concept of correlation is fundamental to stratigraphy because without correlation there can be no synthesis of geographically separated rock units. Moreover, without correlation we will have innumerable rock sections from different parts of the globe without any relationship or linkage to one another.

The scope of correlation is twofold. The main purpose of correlation is to determine the equivalence in the time of deposition so that we can establish a standard time sequence of rocks across the globe. It is only through correlation that we have been able to establish a geological time scale and we are able to place the different rock units across the globe at their proper stratigraphic positions. It is through correlation that we obtain a neat gradation of rock sequences from old to young. The distribution of fossil types around the globe has to make sense in terms of the history of the continents and a coherent pattern usually emerges through correlation. The other scope of correlation may not be related to time but may deal with geometrical relationships of rocks. In other words, this correlation is primarily based on lithology and how rock units change vertically and laterally and the relation between the two. While such a correlation has only a local value, it has significant application in oil industry where local correlation is of considerable importance.

Learners, you have learnt about stratigraphic correlation in the above section. Now, spend few minutes to perform an exercise to check your progress.

SAQ 3

a) What is correlation?

b) What are the main methods of correlation?

c) Fossil similarity is indicative of (a) homotaxis (b) contemporaneity.

d) Lithostratigraphic correlation is (a) intercontinental (b) regional (c) local.

e) The main purpose of correlation is to determine_______________.

2.4 ACTIVITY

1. Write down the lithostratigraphic divisions in descending order from the largest unit to the smallest unit.
2. List the various biozones and indicate the two most preferred biozones that help in regional correlation.
3. In the two stratigraphic columns given in Figure 2.5 below, connect the litho-units to indicate the lithostratigraphic correlation.

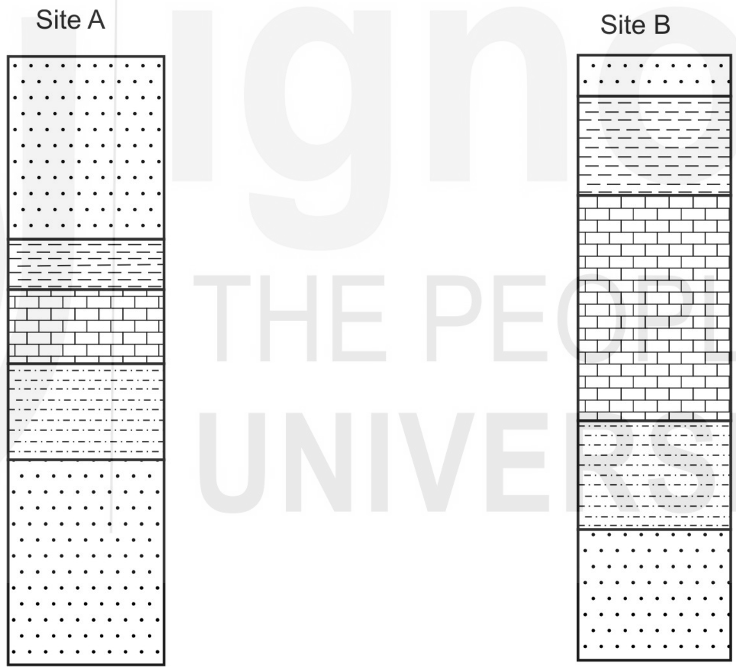

Fig. 2.5: Lithostratigraphic columns of two sites, site A and site B.

2.5 SUMMARY

In this unit, we have discussed the principles and methods of stratigraphic classification and correlation. Let us now summarise what we have learnt:

- The factors that need to be considered for stratigraphic classification are the rock type (lithology), its physical and chemical characters, nature of bedding and fossil content.
- The stratigraphic classification can be of various types depending on the nature of lithology, fossils present in the rocks and the time of deposition as interpreted from fossils.
- There are three main types of classification, namely, lithostratigraphic, biostratigraphic and chronostratigraphic classifications.

- The basic unit of lithostratigraphic classification is a Formation which is a homogeneous set of strata consisting of a distinct rock type or a set of rock types that is laterally continuous and of a sufficient thickness so that it becomes a mappable unit. Formations can be further classified into Members. Formations can also be combined into Groups and Groups into Supergroups.
- The basic unit of biostratigraphy is a Biozone. There are four primary types of biozones namely, Range zone, Interval zone, Assemblage zone and Abundance zone.
- Chronostratigraphic classification is an abstract classification based on relative time as interpreted from biostratigraphy. The basic chronostratigraphic unit is a Biochron that is based on a biozone. On the basis of chronostratigraphy the sequences can be divided into time-rock divisions and time (geochronologic) divisions. The main chronostratigrapic (time-rock) units are Eonothem, Erathem, System, Series and Stage. The main geochronologic (time) units are Eon, Era, Period, Epoch and Age.
- Correlation is a procedure to indicate correspondence between geographically separated units of rocks. It can be undertaken by lithology or fossil content. Lithological correlation is local while correlation by fossils can be regional or intercontinental. It is through correlation that a coherent pattern emerges in stratigraphy throughout the globe.

2.6 TERMINAL QUESTIONS

1. What are the main types of stratigraphic classification?
2. What are the essential requirements for defining a Formation?
3. What is a stratotype? In which classification is it mandatory?
4. What are the main types of biozones?
5. What are index fossils? What are their applications?
6. What is the relation between biostratigraphic and chronostratigraphic units?
7. List the main time units and their equivalent time-rock units.
8. What is the purpose of stratigraphic correlation?

2.7 REFERENCES

- Murphy, M.A. and Salvador, A. (1999) International Stratigraphic Guide – An abridged version. Episodes, Vol. 22, No. 4, pp. 255-271.

2.8 FURTHER/ SUGGESTED READINGS

- Boggs, S. (2012) Principles of Sedimentology and Stratigraphy, Pearson Education, Inc., New Jersey, USA.
- Schoch, R.M. (1989) Stratigraphy, Principles and Methods, Van Nostrand Reinhold, New York.
- http://www.stratigraphy.org/index.php/ics-stratigraphicguide.

2.9 ANSWERS

Self Assessment Questions

1. a) i) The rock type, its physical and chemical characters, nature of bedding and Fossil content
   ii) Stratotype.
   iii) Amappable unit.
   b) Supergroup, Group, Formation, Member.

2. a) (i) Biozones.(ii) Range Zone.(iii) Assemblage Zone.(iv) Series. (v) Biochron.

3. a) Correlation is a procedure to indicate correspondence between geographically separated geologic units of rocks.
   b) Main methods of correlation are Lithostratigraphic and Biostratigraphic correlation.
   c) Homotaxis.
   d) Local.
   e) The main purpose of correlation is to determine the equivalence in the time of deposition so that we can establish a standard time sequence of rocks across the globe.

Terminal Questions

1. Refer to section 2.2.
2. Refer to sub-section 2.2.1.
3. Refer to section 2.2.
4. Refer to sub-section 2.2.2.
5. Refer to sub-section 2.2.2.
6. Refer to sub-section 2.2.3.
7. Refer to sub-section 2.2.3.
8. Refer to sub-section 2.3.3.