Hello students.

This is Bachelor of Science,

second year, semester 4.

Course code is GEC104.

Principles of stratigraphy and paleontology.

This module is within the unit 1

standard stratigraphic timescale.

Outline of the subject lecture.

Geological time scale,

its subdivisions and characteristics.

Learning outcomes students

will be able to understand the

concept of time in geology.

Understand the nature of

the stratigraphic timescale,

understand the contents of the time scale.

Let us start with geological time scale

An appreciation of the immensity of

geological time is central to understanding

the evolution of the Earth and its biota.

Indeed, time is one of the main

aspects that sets geology apart from

other Sciences except astronomy.

Most people have difficulty comprehending

geologic time because they tend to

think in terms of human perspective,

seconds, hours, days, and years.

Ancient history is what occurred

hundreds or even thousands of years ago,

when geologists talk about

ancient geologic history.

However, they are referring to events

that happened hundreds of millions

or even billions of years ago.

To a geologist recent geologic events are those that

occur within the last million years or so.

It is also important to remember

that Earth goes through cycles

of much longer duration than

the human perspective of time,

Although they may have disastrous

effects on the human species Global warming and cooling are a part

of a larger cycle that has resulted in

numerous glacial advances and retreats

during the past 1.8 million years.

The geologic time scale subdivides

geologic time into a hierarchy of

increasingly shorter time intervals.

Each time subdivision has a specific name.

One of the cornerstones of geology is

the principle of uniformitarianism,

which is based on the premise

that present day processes have

operated throughout geologic time.

Therefore,

in order to understand and interpret geologic

events from evidence preserved in rocks,

we must first understand present

day processes and their results.

In fact,

uniformitarianism fits in completely

with the system approach we are

following for the study of Earth.

What uniformitarianism means is

that even though the rates and

intensities of geologic processes

have varied through during the past,

the physical and chemical laws of

nature have remained the same,

although Earth is in a dynamic

state of change and has been ever

since it formed the processes that

shaped it during the past are the

same ones operating today.

The geological time encompassing a total

span of over 4.6 billion years since

the Earth was born is represented by

past geological events and phenomena.

The rock sequences which were deposited

during a certain duration of geological time

and which contain characteristic fossils,

constitute chrono stratigraphic units.

Thus, each of these represents a

certain course in the geological in

the Earth's history and for each

Chronostratigraphic unit there

is a corresponding time unit.

These units have separate sets

of terminology.

An Erathem that is chronostratigraphic,

and it is divided into systems.

Then the system is divided into series

or series is divided into stages

and stages are divided into zones.

Likewise, an Era which is a time

the unit is divided into periods.

Periods are divided into epochs.

Epochs are divided into ages,

and ages are divided into phases.

Hence we have a table here that lists

chronostratigraphic units and time

units for Chrono stratigraphic unit

we have Erathem, then system, series,

stage and zone correspondingly

For system we have tertiary system for

series we have Miocene series, stage

We have Pannonian stage and for zone

We have globorotalia tumuda,

flexuosa zone.

Similarly,

for era we have Cenozoic era four

period we have tertiary period, epoch.

We have Miocene epoch, Age which is

Pannonian age and phase is Globorotalia tumuda flexuosa phase. Successive

arrangements of stratigraphic and

time units as standard reference

for worldwide correlation are

known as Standard stratigraphic

scale or geological time scale.

Here we have eons.

Eons are the largest and

most general divisions of time.

There are two biggest Eons.

One is the pre Cambrian Eon and

the other one is Phanerozoic Eon.

Both of them consist of

three Era’s as shown.

Precambrian consists of Hadean,

Archean and Proterozoic Era,

whereas Phanerozoic,

which contains Paleozoic, Mesozoic and Cenozoic eras.

Hadean is the informal name

for the span that begins at the

Earth's formation and ends with

Earth's earliest known rocks.

Eras

Each Eon is broken up into eras.

Hadean there is no er.

In Archean there are four Eras.

One is Eoarchean that spans

from 4000 to 3600 million years.

Ma refers to million years

#2 Paleoarchean spans from 3600

to 3200 million years.

#3 meso Archean spans from

3200 to 2800 million years.

#4 Neoarchean spans from

2800 to 2500 million years.

In Proterozoic we have three Eras.

Well first one Paleoproterozoic spans

from 2500 to 1600 million years.

Second one Mesoproterozoic spans from

1600 to 1000 million years.

Third one, Neoproterozoic from 1000,

to 541 million years.

In Phanerozoic, we have three Eras.

Paleozoic spans from 541

to 251.9 million years.

Mesozoic 251.9266 million years and

Cenozoic 66 million years to present.

Then we have periods.

Each era is divided into even

more specific blocks of time,

called periods.

Various geologic events are

associated with each period.

Each period is again classified

into different epoch.

Hence in this image

We can see various periods they are

named is Siderian, Rhyacian, Orosirian, sthaterian, Calymmiam, Ecstacian, Stenian, Tonian, Crogenian, Ediacaran.

They only belong to Precambrian.

Then we have some more from the

Phanerozoic. We have series.

Which is Paleocene, Eocene,

Oligocene Miocene Pliocene,

Pleistocene and Holocene

all belong to Phanerozoic.

Cenozoic is the Era.

Phanerozoic is the Eon.

Cenozoic is the era.

In this there are stages or age

right from Danian, Selandian, Thanesian, Ypresian, Lutetian, Chattian, Langhian and Calabrian and so on With their ages are given on

the right hand side from 61.6

million years going through 37.71

million years to 7.246 million

years to 0.0117 million years.

Archean Eon

Archean Eon was span

between 4 to 2.5 giga years that

is 4000 to 2500 million years.

Earth was in a great turmoil and

subjected to extensive volcanism

and intense meteorite bombardment.

It is known as age of algae.

Life consisted mostly of bacteria,

unicellular algae and clusters

of algae called stromatolites.

The one you can see in the attached picture.

This is a stromatolite.

These are layered structures formed

by accretion of fine sediment

grains by matted colonies of

cyanobacteria or primitive blue

green algae living in shallow seas.

So basically this blue green algae

used to build mats which used to

be sticky where sand particles used

to get stuck and layer after layer the cyanobacteria used to build

the mat and the sand used to get

stuck in these layers and hence

we have this type of expression.

This particular photograph is

a picture of stromatolite from

Chitrabhanukot Dolomite member, Petlur carbonate formation

Lokapur Subgroup, Bagalkot Group, Kaladgi Supergroup.

This is from personal collection.

During Archean Eon,

even prokaryotes did exist.

Proterozoic Eon spans from from 2.5 to 0.541 giga years

i.e. 2500 to 541 million years.

This is the age of complex life forms.

Earth was not tumultus,

but had become stable.

Emergence of Ediacaran biota

marked this Proterozoic Eon.

Evidence of oxygen producing bacteria

began to change the atmosphere.

Life turned from an Anaerobic to aerobic.

Bedded or stratified banded iron

formations formed across the world.

Hence as oxygen started getting

built up in the atmosphere,

the iron that was dissolved in

the waters was oxidized to iron

oxide forming haematite and

magnetite deposits of the world transforming them into banded

iron formations.

Massive iron formations throughout the world.

Then we have Cambrian which lasted from 541 to 485.4 million years.

This is known as age of Shelly faunas When the faunas got complex and they

developed shells

Then Ordovician

485.4 two 443.8 million years.

This is known as age of spinal lifeforms.

That is when life forms

developed spinal cords.

Silurian 443.8 to 419.2 million years.

This is known as the age

of terrestrial Floras i.e. flowering plants

Devonian

419.2 to 358.9 million years.

This is known as the age of marine

animals or the age of fishes.

Carboniferous 358.9 to 298.9

million years the age of forests

resulting in present coal deposits i.e. these forests were later buried under

thick sediment which transformed

them into coal which we mine today.

Permian 298.9 to 251.9 million years.

This is known as the age of reptiles.

Triassic 251.9 to 201.3 Million years

This is known as the age of dinosaurs.

Jurassic 201.3 to 145 million years.

This is known as the age of flying reptiles.

Cretaceous, 145 to 66 million years.

This is known as the age of tropical biota.

Ammonites in the waters were also present.

Tertiary 66 to 2.58 million years.

This is known as the age of advanced

species and the last is Quarternary

2.58 million years to the present age.

This is known as the age of modern life,

that is, humans.

For this presentation I used

the following references.

Thank you.