

# Jiwaji University

# SOS in Earth Science

For M.sc GEOLOGY IIInd Semester

Paper GT203 Indian Stratigraphy UNIT IV(4.3)

Paleozoic of India

By- Varnica Mishra

# Paleozoic rocks-543-248 million years ago

- The Paleozoic era has been subdivided into six periods. 1) Cambrian 2) Ordovician 3) Silurian 4) Devonian 5) Carboniferous 6) Permian.
- The Paleozoic rock of marine origin are found only in Spiti and Kashmir areas of western Himalayas and in salt range.
- THE SALT RANGE- it is situated at the southern side of polwar plateau of Pakistan. Here Cambrian and Permocarboniferous are well exposed.

# Cambrian rocks of Salt Range

- In the Cambrian succession of Salt range “ the saline series” is at the base.

## FORMATION

Salt Pseudomorph beds(105m)

Magnesian sandstone(75m)

Neobulus shales(45m)

Purple sandstone(75-140m)

Saline series(450m)

## LITHOLOGY

shales with salt crystals

dolomitic sandstone

fossiliferous grey shales

fine grained purple sst

gypsum-dolomite

# Permo carboniferous rocks-

- In salt range, the rocks belonging to the Ordovician, Silurian, Devonian, and Lower Carboniferous periods are missing and the permo carboniferous rocks are present. They rest directly over the salt pseudomorph beds of Cambrian succession.

## FORMATION

PERMIAN

UPPER CARBONIFEROUS

## LITHOLOGY

Productus limestone(230m)

SPECKLED SANDSTONE(100m)

OLIVE FORMATION(100m)

GLACIAL BOULDER BED(3-65m)

**Glacial Boulder Bed-** This bed rests unconformably over the Cambrian succession. It is composed of glacial boulders of different sizes. The Upper part of this formation contains plant fossils of Upper Carboniferous(Lower Gondwana ) age.

**Olive Formation-** This formation is composed of olive shales and sandstones. This formation is also called as “Conularia beds” Because it contains remains of Gaestropods(Conularia) in abundance. The other fossils of this formation are Lamellibranchia of Lower Permian age and plant fossils of Gangamopteris and Glossopteris.

**Speckled Sandstone-** This formation is composed mainly of speckled sandstone of light red colour. In the upper part of the Succession shales predominate. The rock beds exhibit current bedding and ripple marks which indicates they are shallow water Deposit.

**Productus limestone-** The productus limestone of salt range is regarded as one of the best developed Permian formation in the world. It is characterized by rich marine fossil. This formation is subdivided into three parts lower Productus limestone, middle Productus limestone, upper Productus limestone.

# Kashmir

- **Cambrian rocks-** The Cambrian rocks of Kashmir rest conformably over the fossiliferous “Dogra slates” of Precambrian age. The succession is composed of clays, impure sandstone and greywacks with a few lenticular bands of limestone.
- **Ordovician and Silurian rocks-** the Ordovician rocks of Kashmir and adjacent areas are composed of shales, silt and limestone. The shales have yielded well preserved fossil of bryozoan, brachiopods and cystoids.
- **Devonian rocks-MUTH QUARTZITE-** In the northern parts of Kashmir, muth quartzite of Devonian age are exposed. They constitute a thickness of 650m.

# Permocarboniferous rocks of Kashmir

- The Permocarboniferous succession of the Kashmir area has been divided into six formations :1) Syringothyris limestone.2) Fenestella shales, 3)Agglomeratic slates, 4)Panjal traps, 5)Gangamopteris beds and 6)Zewan formation

PERIOD	FORMATION	LITHOLOGY
PERMIAN	ZEWAN FORMATION	shales, limestones
	GANGAMOPTERIS BEDS	shales and pyroclastic beds

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Upper	Panjal traps	Basaltic lavaflows
Carboniferous	Agglomeratic slates	Slates and greywacks
	Fenestella shales	shales and quartzite
	Syringothyris limestone	Limestone

**SYRINGOTHYRIS LIMESTONE-** The Muth Quartzite are conformably overlain by the “Syringothyris limestone”. This formation is

composed of thin beds of grey and dark blue limestones with a few beds of shales, quartzite and traps. The limestone is characterised by the presence of the brachiopods “SYRINGOTHYRIS” of Lower Carboniferous age.

**FENESTELLA SHALES-** The fenestella shales is composed of a 600m thick succession of shales and quartzite with a few beds

of conglomerate. The shale beds are fossiliferous and contain abundant remains of polyzoa, called “FENESTELLA”.

**AGGLOMERATIC SLATES-** This formation consists of a succession of slates, sandstone, quartzite and conglomerates. These rocks

beds are considered to be of volcanic origin. The fossils are absent.

**PANJAL TRAPS-** The Agglomeratic slates is overlain by a thick succession of lavaflores of basaltic composition, known as “Panjal Traps”. The lavaflores are intercalated with pyroclastic material and intertrappean beds.

**GANGAMOPTERIS BEDS-** In some parts of Kashmir, the Panjal traps are overlain by beds of slaty and pyroclastic rocks. These beds have yielded plant fossil of Lower Gondwana age.

**ZEWAN BEDS-** The Gangamopteris beds are overlain by 240 m thick succession of limestone and shales. These beds are rich in

Marine fossil of middle and upper Permian age. The chief fossils are brachiopods, bryozoan.

# SPITI

## • PERIODS

PERMIAN

CARBONIFEROUS

DEVONIAN

SILURIAN AND  
ORDOVICIAN

CAMBRIAN

## GROUPS

Kuling group

Kanawar group

Haimanta group

## FORMATION

Productus shales

Calcareous sandstone

Conglomerates and spiti

Po formation

Lipak formation

Muth quartzite

Limestones and sandstones  
quartzite and shales

quartzite, shales and slates

# Cambrian rocks

- **Haimanta group**- The Haimanta group rests over the rocks of Vaikrita group of Precambrian age. The Haimanta group 1500m thick succession of quartzite, shales and slates. The lower 600m thick rock beds are unfossiliferous while the rocks of the upper part of the succession contain a rich collection of trilobites and brachiopods.
- **Ordovician and Silurian rocks**- The rocks of the Haimanta group are conformably overlain by a succession of coarse red sandstone, gritty quartzite, sandstone, shales, limestones and dolomites. It is 750m thick succession.
- **Muth quartzite**- this formation of the Spiti area consists of about 100m thick succession of white and green quartzite. It is of Devonian age.

# Permocarboniferous rocks of Spiti

- The Permocarboniferous succession of the Spiti has been divided into two groups: (1) the Kanawar group. (2) the Kuling group. The two groups are separated by an unconformity which is represented by a conglomerate

## GROUP

## FORMATION

## LITHOLOGY

Kuling group

Productus shales  
Calcareous sandstone

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## UNCONFORMITY

Kanawar group

Po formation  
Lipak formation

shales and quartzite  
shales and limestone

**Kanawar group- LIPAK FORMATION** - the Lipak formation consists of a succession of limestones and shales. This formation yielded a fossil of Lower Carboniferous age. The chief fossils are trilobites, brachiopods and coral

**Po formation** – this formation rests conformably over the lipak formation. It is made up of succession of quartzite and shales. The chief fossils of this formation are bryozoan (fenestella), brachiopods (Productus, spirifer).

**Kuling group-** The “Kuling group” is composed of a succession of calcareous sandstone and shales. The calcareous sandstone yielded fossil of brachiopods of middle Permian age. The carbonaceous shales of the upper part of the Kuling group are called the “Productus shales”. These shales have yielded fossils of brachiopods, cephalopods of Permian age.