(3)

Geography
By
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Vol-3

2014

1. Biogeography
2. Physical Geography of India
3. Indian Geography (Human, settlement etc.)

"PHYSICAL GEOGRAPHY of INDIA"

① Relief of India
- → Plateau
- → Mountain
- → Plains
- → Islands

② Indian Drainage

③ Indian Climate
- → Sequence
- → Regions

④ Geological Structure
- ↳ Gist of Indian resource
- ↳ Mineral & Energy types of resources

⑤ Biomes
- Forest
- Wildlife
- Soil

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⑥ MoEF
- WPA (1972) – Wildlife Protection Act
- FCA (1980) – Forest Conservation Act
- EPA (1985) – Environment Protection Act
  - ↳ INCCA + NAPCC

Lecture # 43

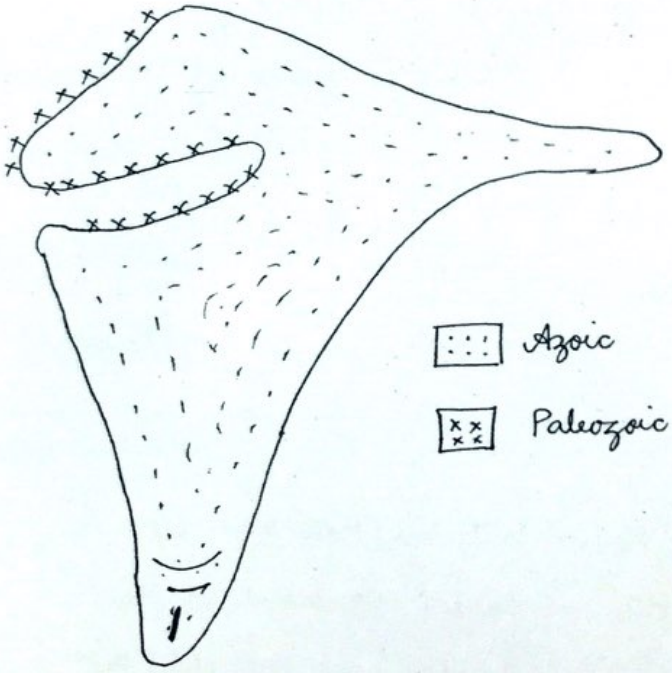
7/2014 "Oxford School Atlas for India" – MAP PRACTICE

RELIEF OF INDIA / PHYSIOGRAPHIC REGIONS

The 7th largest country of the world India incorporate representation of all the major categories of relief features. Identified to be triple tectonic zone by the Geological Survey of India, the country incorporate plateaus, mountains, plains and islands as chronologically evolved relief features.

The Indian Plateau

Eg: Indian Plateau Base Diagram



It is the oldest relief feature of the country primarily comprised of Indian Shield. Specifically this relief feature incorporate the imprint of all the three tectonic eras that are azoic, paleozoic

and cenozoic. Physiographically this oldest relief feature is classified into 2 bold categories:

(i) Central Highlands

(ii) Peninsular Plateau

⇒ (1) CENTRAL HIGHLANDS

The Central Highlands represent paleozoic formation involving the effect of both compressional and tensional stresses. This sub-unit is therefore comprised of =

(a) Old fold mountains

(b) Old horst-and graben topography

(a) The old fold mountains called Aravallis extends roughly from Delhi to Ahmedabad aligned in NE to SW orientations. Believed to be as mighty as Himalayas in the geological past, presently Aravallis represent the example of relict mountain. Its recognisable height is confined only in Rajasthan where in Abu Hills, Guru Shikhar forms the highest peak. This old fold mountain represents to be both climatic divide and water divide of the country. Being climatic divide it demarcates Western arid plains of the country from comparatively humid eastern region. As water divide, it demarcates the flow of R. Luni, the largest inland drainage of the country and R. Banas, which forms the member of Gangetic System.

In the broader perspective, Aravallis represent major part of national water-divide distinguishing the flow of south and north flowing rivers.

The horst-and-graben topography developed due to normal tensional stress incorporates Vindhiyans and Satpuras as old block mountains of the country.

The Vindhyan Range forms low-lying horst with average elevation of 600 mts, completely comprised of limestone. This low lying horst forms a significant water-divide sourcing the flow of extra-peninsular channels as R. Chambal. It is due to 'River dissection' that Vindhyian Range is divided into Vindhyan Scarpland, Baghelkhand and Kaimur Hills. Demarcated by R. Narmada to its south, Vindhyan Range paves way to southern, taller counterpart called Satpura. With the average elevation of 1300 mts, Satpura ranges incorporate Cenozoic Basaltic layers, forming the part of Deccan Trap. This taller horst, like Vindhyan, acts as national water-divide sourcing the flow of peninsular rivers. In the river dissection Satpura Range is also demarcated in well defined Ranges including Gwaligarh Hills,

Mahadeo Hills and Maikala Range, north of R. Tapi. Among these ranges, Maikala Range along Amarkantak relates to country's prominent-most radial drainage which includes west flowing Narmada River, north flowing Son River (Gangetic System) and south-flowing R. Hasdo (Mahanadi System). South of R. Tapi, Satpura Range is comprised of Salmala and Ajanta Ranges, which makes Satpura not just taller but more extensive horst topography compared to the Vindhyan Range.

② THE PENINSULAR PLATEAU

The Peninsular plateau representing major part of Indian plateau region incorporate well-defined sub-divides. These includes:

(a) Deccan Plateau
(b) Malwa Plateau
(c) Kathiawar Upland
(d) Chotanagpur Plateau
(e) Far Eastern Upland.

→ (a) The Deccan Plateau

It forms the largest part of Indian peninsular plateau covering near complete Indian peninsula. Roughly inverted triangular in shape, this physiographic unit is

sub-divided into :

(i) Ghats
(ii) Southern Hills
(iii) Interior Plateau

} Deccan Plateau

The Ghats are defined to be boundaries of Deccan Indian Shield. It is in accordance to the location that they are distinguished as western & eastern Ghats. Both these boundaries merges at the Nilgiris, that is southern hills. The Western Ghats extensive from south of R. Tapi to Nilgiris is also called Sahyadris. These represent most dominating examples of MOUNTAIN ESCARPMENT, developed during Paleozoic era. These mountain escarpments are identified to be significantly narrow physiographic unit barring the exceptions of Harishchandra & Balaghat Ranges in Maharashtra and Bangalore-Mysore Plateau in Karnataka. Standing at the avg. elevation of 1300 mts, Western Ghats make national water-and climatic-divide, demarcating the flow of big peninsular east flowing rivers as Godavari, Krishna, Kaveri from smaller west-flowing rivers. Acting as the important barrier for advancing monsoons, it is western Ghats that develops one of the important windward

slope with rainshadow interiors. These continuous Ghats incorporate minor gaps interrupting their continuity including Thalghat Gap (Gateway of Mumbai) and Bhorghat Gap (Gateway of Konkan).

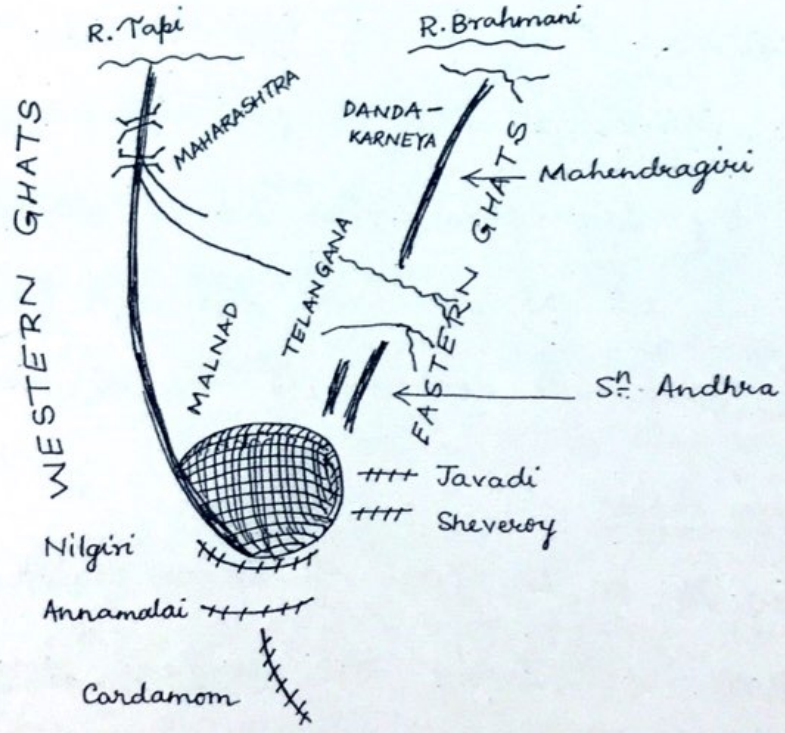
The Eastern boundary of Deccan Plateau is called Eastern Ghats which marks its extension from south of R. Brahmani to Nilgiris. At the avg. elevation of 600mts Eastern Ghats incorporate flow of all the major peninsular streams sourced from the western Ghats. It is in accordance therefore that Eastern Ghats are highly dissected. Among the recognisable parts, Mahendragiri - between Mahanadi and Godavari rivers; and southern Andhra's Ghats, comprised of Nallamalla, Erramalla, Velikonda, Palkonda and Nagari Hills; represents the dissection by big peninsular rivers called PENNERU rivers. It is at Nagari Hills that the Eastern Ghats marks its proximate location to the shoreline.

i) The Southern Hills

Representing to be the part of Deccan Plateau, the Southern Hills collectively are conical remains of Indian Shield. These are comprised of 5 major

constituents called – Nilgiri, Annamalai, Cardamom, Tavadi and Sheveroy Hills. Physiographically, the southern hills correlates to the highest peak of the peninsula – Anaimudi and involves Phalghat Gap, that is between Nilgiris and Annamalai, acting as Gateway of SW Monsoons in Tamil Nadu and Shencotta Gap in Cardomom Hills availing the transportation links between western and eastern coast via southern hills.

For all practical purposes southern hills are treated to be extension of Ghats.



Paleozoic	Azoic	Cenozoic → Mountains
W.G.	Chotanagpur	Satpura
Satpuras	FE Tablelands	Maharashtra Plateau
Vindhyan		Malnad Plateau
Aravalli		Malwa, Bundelkhand, Kathiawar

) The Interior Plateau : (3rd unit of Deccan Plateau)

Bounded by ghats and southern hills. includes absolute Azoic formations as Telangana Plateau and Dandkarneya Tableland. Distinguished from them are Maharashtra Plateau and Malnad of Karnataka that represent Cenozoic basaltic modification forming the part of Deccan Trap. [It is with similar characteristics, that is azoic formations and cenozoic basaltic modification tha Malwa - Bundelkhand and Kathiawar Upland are also related. For Malwa - Bundelkhand excessive river dissection by the rivers sourced from Vindhyan Range form additional feature involving bad-land topography of the country i.e. RAVINES in the part of Chambal Valley. The Kathiawar Upland - comprised of Gir Hills, Girnar Hills, Barda Hills - forms the location of radial drainage with small Kathiawar Channels - Bhadar, Bhogawa and Shetrunji. The other two constituents of peninsular plateau - Chotanagpur Plateau and Far-Eastern Tableland represents

bsolute azoic construct comprised of Chotanagpur ateau, Garjat Hills, Ramgarh Hills, Rajmahal Hills nd it is across Rajmahal-Garo Gap, filled up by iver alluviam, that Far Eastern Tableland, comprised of aro, Khansi, Jaintia, Mikir and Barail, are extensive.]

ORTHERN MOUNTAIN WALL

he Cenozoic fold mountains belonging to "mid-continental elt" representing the colliding boundary is the second hysiographic unit of the country called Northern ountain Wall. These mightiest mountains of the world epresent most developed examples of REVERSE FAULTS, epresenting the polygeosyncline. Among the recognised everse faults :- Indus Tsangpo Suture Zone, Trans-imalayan Fault, Main Central Thrust, Main Boundary Fault and Himalayan Frontal Fault are included.

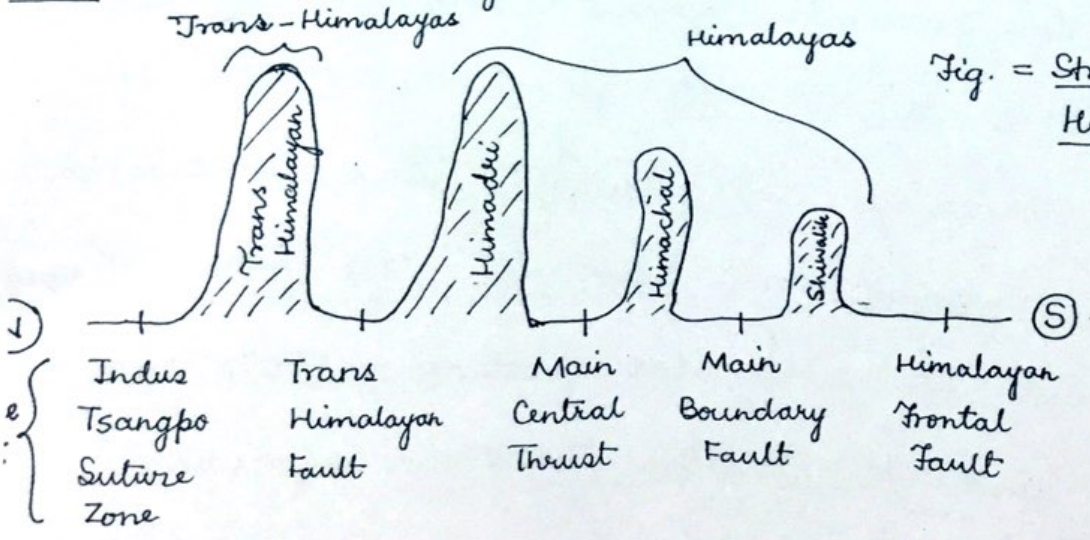


Fig. = Structure of Himalayas

Date
3/4/14

Lecture # 44

The Northern Mountain Wall physiographically is classified into 3 distinct units:

(i) Trans-Himalayan Range
(ii) Himalayan Ranges
(iii) Purvanchal

} Latitudinal Divide

i) The Trans Himalayan Ranges

Represent oldest young fold mountains of the country, extensive only in J&K. These are asymmetrical fold with average elevation of 6000 m. Extensive b/w Indus - Tsango Suture Zone and Trans-Himalayan Fault, these ranges are identified with lengthiest ALPINE GLACIER, Outside the temperate latitude, with the winter snout length of more than 60 kms. Among the important examples, Siachen glacier in Nubra Valley, Biafo and Baltoro glacier in Srinagar Valley, Hispar & Batura glacier in Hunza Valley are included. These ranges are also identified with high-altitudinal barren plains generating water-logged conditions during summers. Important examples include Aksai Chin, Soda Plains, Rupshu Plains

t is in these plains that Brackish Water Lakes adds ; the relief diversity with Pangong Tso and Tso rorari as important examples. Apart from including ighest peak of India - K^2, these ranges are known or important high altitudinal passes from among which Parpik / Khunjerab pass (Karakoram Highway traverses from it) , Chang La Pass (Gateway of Indus in India) are included. Trans Himalayan Ranges represents parallel running 3 demarcated Ranges because of the flow of river Indus and its tributaries. The demarcated ranges include Karakoram , Ladakh and Zaskar.

Himalayas

Himalayan Ranges representing mightiest young fold mountains makes the major part of northern mountain wall of the country. This mountain range, individually comprise of POLY GEO SYNCLINAL development, includes 3 very well demarcated parallel running ranges:-

(A). Himadri

(B). Himachal

(C). Shiwaliks

A. THE HIMADRI / GREATER HIMALAYAS

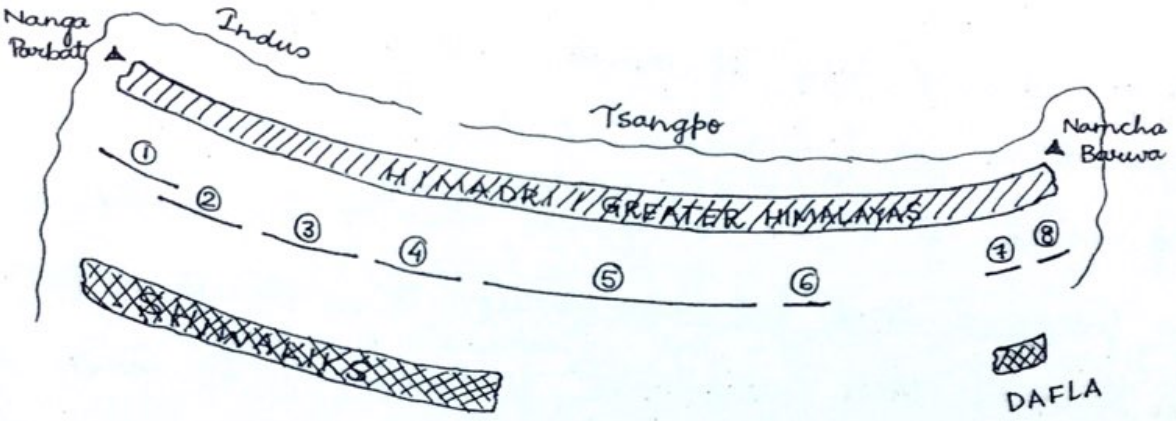
The Himadri representing its latitudinal extension b/w Trans-Himalayan Fault & Main Central Thrust is uninterrupted mountain wall extensive for ~ 2400 kms. b/w Nanga Parbat and Namcha Barwa. These either terminus of Himadri is also recognised with broken folds "NAPPE", SYNTAXICAL BENDS and GORGES (I-shaped valleys) of R. Indus and R. Tsangpo. Average elevation of Himadri is 6000 m and it forms the excellent example of asymmetrical fold. It is its height and expanse that makes it recognised as the GREATER HIMALAYAS and as it incorporates mountain ranges to both its north and south, it is called the INNER HIMALAYAS. Physiographically, Himadri is known for high altitudinal peaks with Kanchenjunga being its highest in India. It also involves ALPINE GLACIERS though significantly smaller in length ($\leq$ 20 kms) compared to trans-Himalayan counterpart with important examples being Gangotri, Milam, Pindari (Uttarakhand) & Zemu (Sikkim). High altitudinal strategicall important passes adds to its physiographic features with Burzil, Zojila (J&K), Baralapchala (Manali-Leh road link), Shipkila (Gateway of Sutlej in India) - in Himachal Pradesh; Lipulekh Pass (Mansarovar Pilgrimage)

in Uttarakhand ; Nathula Pass in Sikkim ; Bumla Pass, Thaukan Pass and Hpungan Pass in Arunachal Pradesh.

HIMACHAL / MIDDLE / LESSER HIMALAYAS

Running parallel to Himadri is the middle or lesser Himalayas called Himachal Range. Folded Simultaneous to Himadri, it marked its development as ISOCLINAL FOLD. Latitudinally this range is extensive between Main Central Thrust and Main Boundary Fault. Regionally, it marks less extension than Himadri as it is highly dissected by the rivers descending from Himadri. Among the important divided ranges Pir Panjal (largely in J&K) extensive b/w R. Jhelum and R. Ravi ; Dhaoladhar (largely in H.P.) extensive between R. Chenab and R. Sutlej ; Mussorie Range, Kumaon Range demarcated by R. Alaknanda confined in Uttarakhand. The extension of Kumaon Range therefore is between Alaknanda and Kali rivers. This range paves way to Mahabharata Range, completely confined in Nepal. In the eastern extensions, therefore, Darjeeling Hills (Sikkim – Sub-Himalayan West Bengal) drained by R. Tista and Miri, Abor hills in Arunachal Pradesh dissected by Subansiri river are in ded. These divided isoclinal folds with average elevation of 4500 mts are completely deprived of glaciers.

They are known for high altitudinal pasture lands called MURGS (in J&K) and BUGYALS in Uttarakhand. These are also identified with DUNS and DUARS i.e. alluvial filled main boundary fault. Duns being confined b/w Himachal and Shiwaliks is distinguished from Duars, where rivers descend to plains.



① Pir Panjal ③ Mussowrie (5) Mahabharata ⑦ Mirii

② Dhaola Dhar ④ Kumaon ⑥ Darjeeling ⑧ Abor

DUNS

DWARS

C. SHIWALIKS / OUTER HIMALAYAS

These are the youngest old fold mountains. Located at the plate boundary, it is prominently known for its earthquake-prone characteristics. These are least extensive range with average elevation of 1200 mts. These forms the examples of asymmetrical folds extensive between

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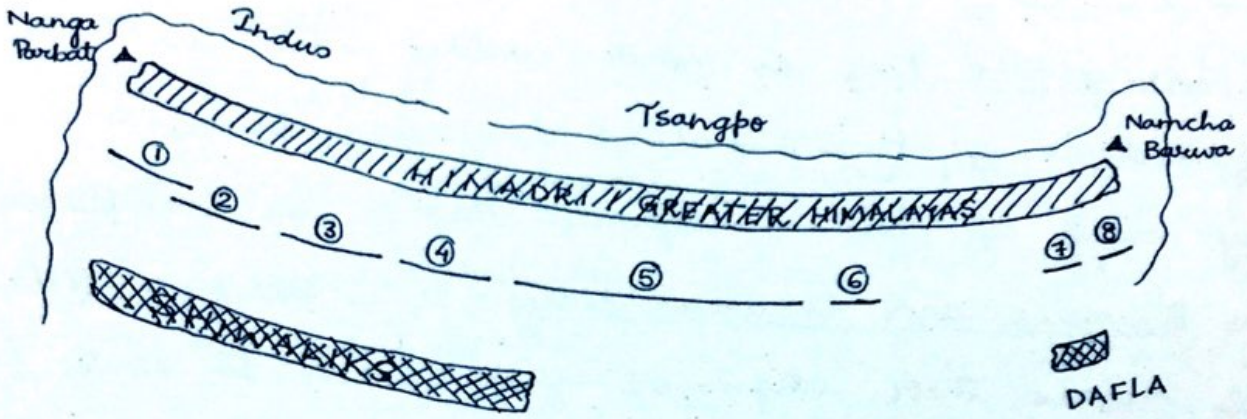

① Pir Panjal ③ Mussowrie (5) Mahabharata ⑦ Mirir

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rain boundary fault and Himalayan frontal fault lith all the big rivers as Sutlej, Ganga, Yamuna lescending to plains, Shiwaliks are known for large pebble deposits called BHABER at its piedmont location. Dafla lills in Arunachal Pradesh is considered to be discontiguous part of Shiwaliks.

Purvanchal

The young fold hills of north-eastern states are collectively referred to as Purvanchal. Distinguished from Himalayas, they mark up their development due to the compression b/w Burmese and Eurasian plates. It is therefore that these hills marks their alignment from north to south. These are comprised of Mishmi Hills and Patkaibum in Arunachal Pradesh, Naga Hills in Nagaland with Saramati as the highest peak of Purvanchal, Manipur Hills dissected by R. Manipur, Mizo Hills known for radial drainage, and Tripura Hills, the lowest lying Purvanchal.

Altitudinal Divide of Northern Mountain Wall :

① High elevated (6000 m +)

→ Trans-Himalayan

→ Himadri

② Mid elevated (4500 m)

→ Himachal

③ Low elevated

→ Shivaliks

→ Purvanchal

Regional Divide of Northern Mountain Wall :

① Punjab / Kashmir Himalayas

– B/w Indus to Sutlej

② Kumaon Himalayas

– B/w Sutlej to Kali

③ Central Himalayas / Sikkim Himalayas

– Kali to Tista

④ Arunachal Himalayas

– Tistā to Dihang

⑤ Purvanchal

– Beyond Dihang

Latitudinal Divide of Northern Mountain Wall :

① Trans-Himalayan

② Himalayan

③ Purvanchal

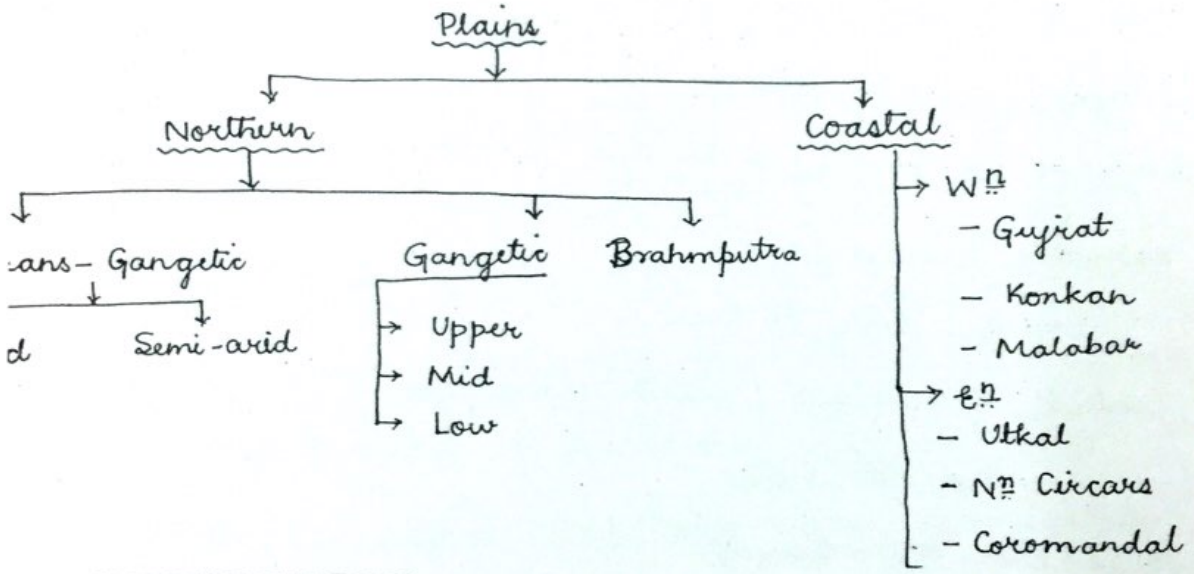
3 # PLAINS OF INDIA

e third order relief feature primarily developed by surface unoff represents featureless lowland called plains of ndia. Locationally this physiographic unit is classified into 2 major parts :

) Northern Plains

) Coastal Plains.

oth these categories are further sub-classified either in terms of location or prevailing climate. Among the recognised categories :=



IORTHERN PLAINS :

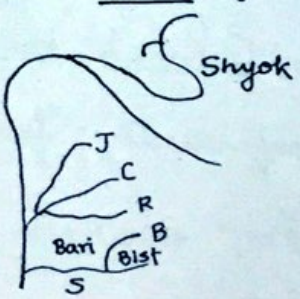
Transitional relief features developed between northern mountain wall and plateau, the northern plains of India involves he deposition of both peninsular and extra-peninsular drainage. Locationally these plains are divided into :=

) Trans-Gangetic
) Gangetic
3) Brahmputra

① THE TRANS-GANGETIC PLAINS :

This plain is comprised of the Great Indian Desert and Sutlej-Yamuna Plain. The Great Indian Desert called 'Marusthali' is a typical erg desert identified with shifting sanddunes called DHARIANS. These experience sudden torrential rains resulting in the formation of temporary PLAYA LAKES called DHANDS. Along with it the temporary gully-erosion called DHAROS adds to the relief characteristics. Along the eastern margins of the desert R. Luni, the largest inland drainage of the country correlates to the development of Rajasthan BAGAR, that is significantly coarse textured alluvial deposits which are also recognised in Haryana called Bhiwani BAGAR developed by R. Ghagghar.

The Haryana Plains along with Punjab Plains marks the descend of Rivers from Shiwaliks developing water logged conditions called CHOS. It is in Punjab plains that the 3 descending rivers Ravi, Beas, Sutlej correlates to the development of DOABs i.e. flood plain soils called BIST (Beas-Sutlej) and BARI (Ravi-Sutlej).



LECTURE # 45

Doab = Flood Plain Soils

24/2014

② THE GANGETIC PLAINS

Largest geographical expanse of northern plains of India correlates to Gangetic System. This is the only extra peninsular channel that is identified with complete course in India. The Gangetic plain, therefore, incorporates well defined 3 courses called upper-gangetic plain, mid-gangetic plain and lower-gangetic plain.

UPPER GANGETIC

The upper Gangetic plain marks its confinement in U.P. incorporating coarser texture (sandy) alluvial deposits. These deposits are primarily correlated to Ganga-Yamuna Doab and Ganga-Ghagra Doab. The western part of upper gangetic plain accounting for significant smaller size & elevation of upto 300 m are called the ROHILKHAND PLAINS. Compared to it, absolutely low-lying and more extensive eastern plains are called AWADH PLAINS.

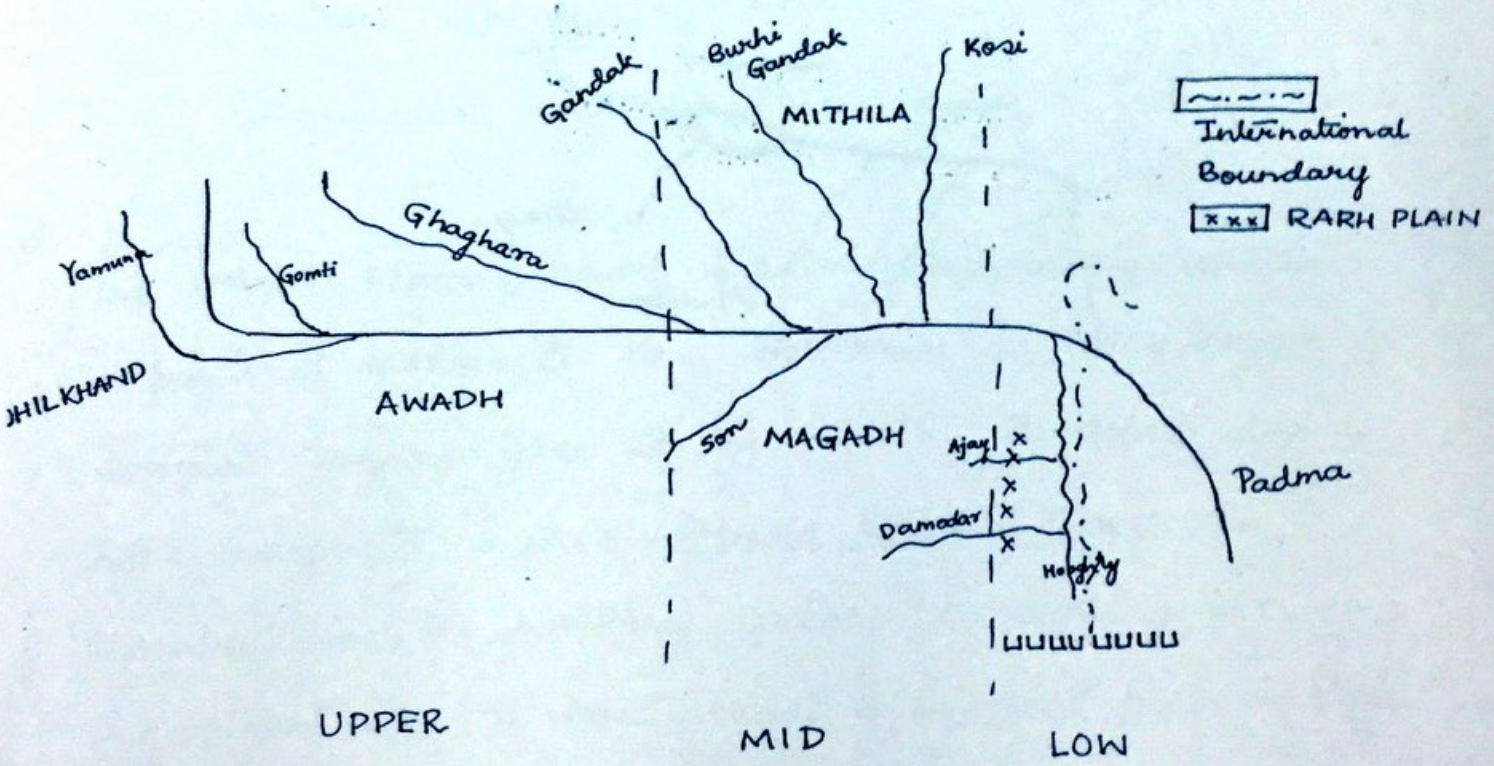
MID-GANGETIC PLAINS:

In the mid-Gangetic plain, it is river Ganga that divides the plains into almost 2 equal parts with northern plains called MITHILA and southern plains MAGADH. The Mithila plains drained by big Himalayan tributaries of R. Ganga as Gandak, Burhi Gandak, Kosi that it incorporates significantly fine textured alluvial deposits distinguished from coarser textured materials.

identified in Magadh plains as these southern plains are drained by comparatively small peninsular tributaries as R. Son (rising from Amarkantak). In the Magadh plains crystalline intrusions generates the platform for the accumulation of rainwater adding to the relief feature called CHAURS or KAVARTALS that are fresh water lakes.

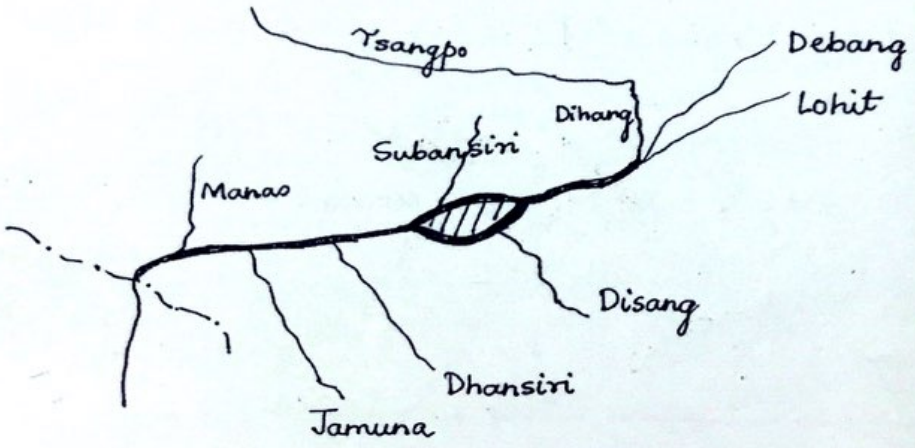
ii) **LOWER GANGETIC PLAINS:**

The lower Gangetic plains correlates to the state of W.B., drained by the distributary of R. Ganga called Hooghly River. The lower Gangetic plains, therefore, is known for deltaic alluvium developed by R. Hooghly. In this plain, additional relief feature called RAHR PLAIN is developed by tributaries of Hooghly as R. Damodar & R. Ajay which are small course rivers depositing coarser textured materials.



BRAHMPUTRA

The Brahmputra Plains forms the narrowest part of northern plains of India, developed by mid-course of the channel that is identified to be one of the largest river systems of the world. These narrowest plains are prominently known for world's largest RIVERINE ISLAND called MAJULI ISLAND, which is formed at the confluence of R. Subansiri and R. Disang with Brahmputra. Majuli Island also represents ANOSTOMOSTIC DRAINAGE PATTERN developed by R. Brahmputra as the only example in the country. This drainage pattern is recognised to be the permanent braid developed by any channel in the country.



B) COASTAL PLAINS

Largely like northern plains of India, the coastal plains also represent 3rd order relief feature. It, however, marks its distinction on being deltaic plains unlike flood plain dominated northern plains of India. Locationally the coastal plains are classified into:

① Eastern Coastal Plains
② Western Coastal Plains

① THE EASTERN COASTAL PLAINS

The Eastern Coastal Plains correlate to the shoreline of Bay of Bengal and is comprised of 3 well-defined divisions:

(i) Utkal Plains of Odisha
(ii) Northern Circars of A.P.
(iii) Coromandal Plain of T.N.

The Utkal Plains apart from incorporating delta deposits of Mahanadi and Brahmani is also known for largest lagoon lake of the country developed due to hook-deposits called CHILKA LAGOON LAKE. In comparision, the Northern Circars accounting for significant size of east-coast plain not just include

lta deposits of Godavari, Krishna & Penneru rivers but
e also known for Pulicat (the Lagoon lake) and Kolleru
he freshwater lake). Both Utkal plain and Northern Circars
rms the examples of shoreline of emergence not just
stifying their broader profile but also narrower
ontinental shelfs and complete absence of natural
arbours. Distinguished from them is the Coromandal
lain of TN which are tectonically stable plain. These
road deltaic plain apart from including delta deposits
f Kaveri includes fertile deltaic alluvial of smaller
eninsular channels as PALAR, VAIGAI, VAIPUR.

WESTERN COASTAL PLAINS

Extensive along the shoreline of Arabian Sea and its marginal extensions, western coastal plains of the country are significantly narrower than eastern counterpart. Along Arabian Sea, the coastal plains are divided as Konkan Plains & Malabar Plains.

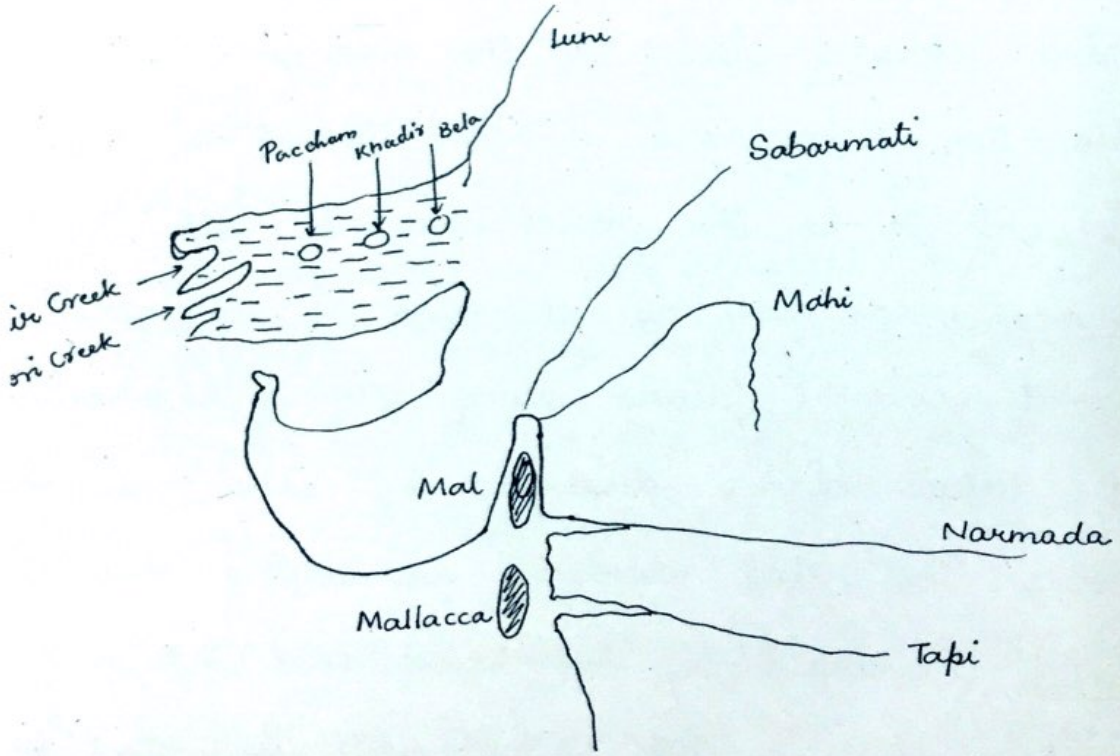
The Konkan Plains forms shoreline of submergence corresponding to the mountain escarpments of Sahyadris. These narrowest coastal plains extensive in Maharashtra, (Surya and Savitri), Goa (Mandavi and Zuari) and

Karnataka (Kalinadi and Sharavati) are drained by small rivers rising from western Ghats and developing coarser deltaic plains. At the shoreline of submergence Konkan Plains incorporate excellent natural harbors and have broad submarine shelf.

i) The Malabar Plain confined in Kerala represents tectonically stable plains and thus are comparatively broader. These plains are known for deltaic deposits of rivers like Beypore, Periyar and Pambiyar, and involves relief diversity as VEMBANAD (the lagoon lake) developed due to bar deposits and KAYALS (back-water lakes).

i) The western coastal plains in the marginal extension of Arabian Sea incorporate coastal plains of Gujarat that represent to be the combination of both shoreline of submergence as well as shoreline of emergence. The Gujarat coastal plains along Gulf of Khambat represent deltaic plains developed by Sabarmati and Mahi rivers. The relief diversity is added due to ESTUARIES developed by Narmada and Tapi Rivers as per their flow in Rift Valley with substantive gradient. It is therefore that Gulf of Khambat incorporates substantive alluviam deposits forming

AL and MALLACCA BANKS. In distinction, the Kutchh
ninsula forming shoreline of emergence thus retreat of
i. of Kutchh and development of salt marshes called
ANN OF KUTCH as its important physiographic-
haracterietics. These salt marshes forms the mouth of
inland drainages like river Luni and is known for
NLAND ISLANDS as PACCHAM, KHADIR & BELA. These
coastal plains involves most prominent relief feature
– the navigable CREEKS – with Sir Creek and Kori Creek
as important examples.



4# ISLANDS

The physiographic unit called island mainly represent oceanic category that are the islands located at significan distance from the shoreline. Chronologically oceanic islands qualifies to be the youngest relief as their formation corresponds to rise in the MSL after termination of Pleistocene ice-age. The oceanic islands includes:

(i) Andaman Nicobar

(ii) Lakshwadweep

i) THE ANDAMAN AND NICOBAR ISLANDS

The Andaman Nicobar islands form the continental island that are the peaks of submerged young fold mountains. This bigger group of oceanic islands extends from COCO CHANNEL to INDIRA POINT that is the southern tip of Indian union. The northern group called Andaman group forms the bigger islands with North Andaman, Middle Andaman, South Andaman, Little Andaman, Rutland and Havellock as important islands. Structural diversity of Andaman islands correlates to the fact that it also involves NARCONDAM and BARREN — the vulcanic islands of the country with range of coral banks. It is south of TEN

DEGREES CHANNEL that Nicobar Islands are distinguished. This smaller group of continental island is mainly comprised of Car Nicobar, Little Nicobar, Nancowry Island, Katchall Island, Tilanchung Island and Great Nicobar.

LAKSWADEEP ISLANDS:

In Arabian Sea, second category of oceanic island - the coral islands of the country - Lakshwadeep is demarcated. Significant examples of atoll islands developed over Lakshwadeep - Chagos Ridge, this island group is comprised of Minicoy, Cannanore and Amindivi. Minicoy is the largest atoll island of the country separated from largest group of atoll - Cannanore by NINE DEGREES CHANNEL. In the Cannanore group, Kavaratti, Agatti, Pitti, Suheli and Kalpeni forms important islands. The northern-most part called Amindivi is comprised of smaller number of small atolls with largely uninhabited characteristics.

PART II

INDIAN DRAINAGE

- Peninsular Channels
- Extra-Peninsular Channels
- Geological Patterns
  - Consequent
  - Subsequent
  - Obsequent
  - Antecedent
- Geographical Pattern
  - Trellis
  - Dendritic
  - Rectangular
  - Others
    - Braided
    - Radial
    - Superimposed
    - Inland

NDIAN DRAINAGE

Tropical monsoonal country India is identified to be incorporating dense network of surface runoff. It is this network that forms the major source of Indian water resource. The drainage pattern in the country is primarily analysed in the reference of location including the classification of:

(i) Peninsular channels

(ii) Extra-peninsular channels

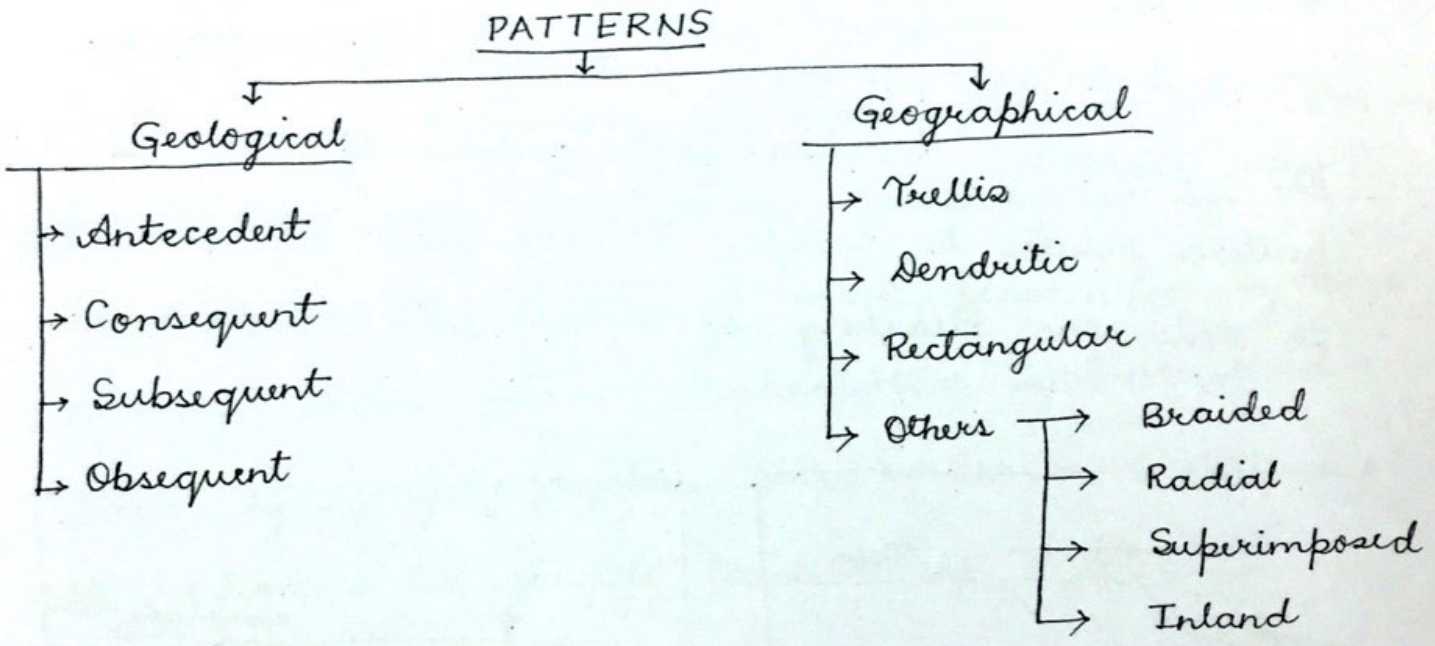
THE PENINSULAR CHANNELS

Primarily representing rain-fed characteristics, these incorporate major regime fluctuations having only the exception of R. Kaveri as this river system attains precipitation both during advancing monsoons and retreating monsoon seasons. The peninsular channels also represents similarity as they are identified with graded long profile and thus are engaged in horizontal abrasion and deposition as their prominent activities.

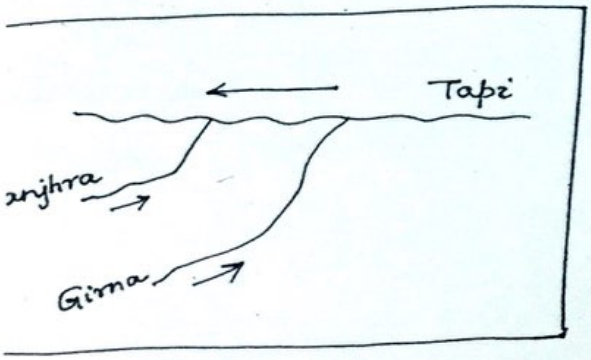
THE EXTRA-PENINSULAR CHANNELS :

These channels in comparision primarily represents glacier-fed characteristics and it is therefore that they represent minimal regime fluctuations. Additionally

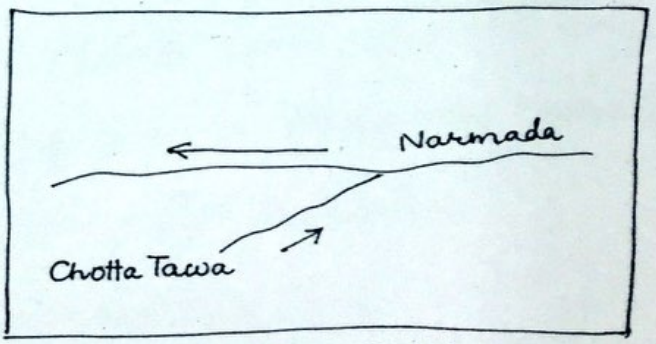
these channels are in their young stage of erosion & thus have ungraded long profiles making them actively engaged in valley-deepening with regular potentialities of change in their courses.] The analysis of drainage also correlates to difference in the generated patterns by the peninsular and extra-peninsular channels. These involve the study of both geological and geographical drainage pattern types. The specified categories include :=



he Consequent Drainage pattern is the outcome of original slope developed by endogenic forces, with every channel flowing following the gradient makes the examples of consequent drainage. Moreover as running water forms universal agent of gradation, it tinds to modify the original slope and thus its own course developing subsequent drainage pattern. It is therefore that all peninsular drainage forms excellent examples of subsequent drainage & all extrapeninsular - consequent drainage. The drainage pattern called obsequent develops when tributaries merger with main river flowing from opposite direction. Best example of this drainage pattern relates to R. Tapi. It can also be correlated to only one bubulory of R. Narmada, Chota Tawa.



OBSEQUENT



OBSEQUENT

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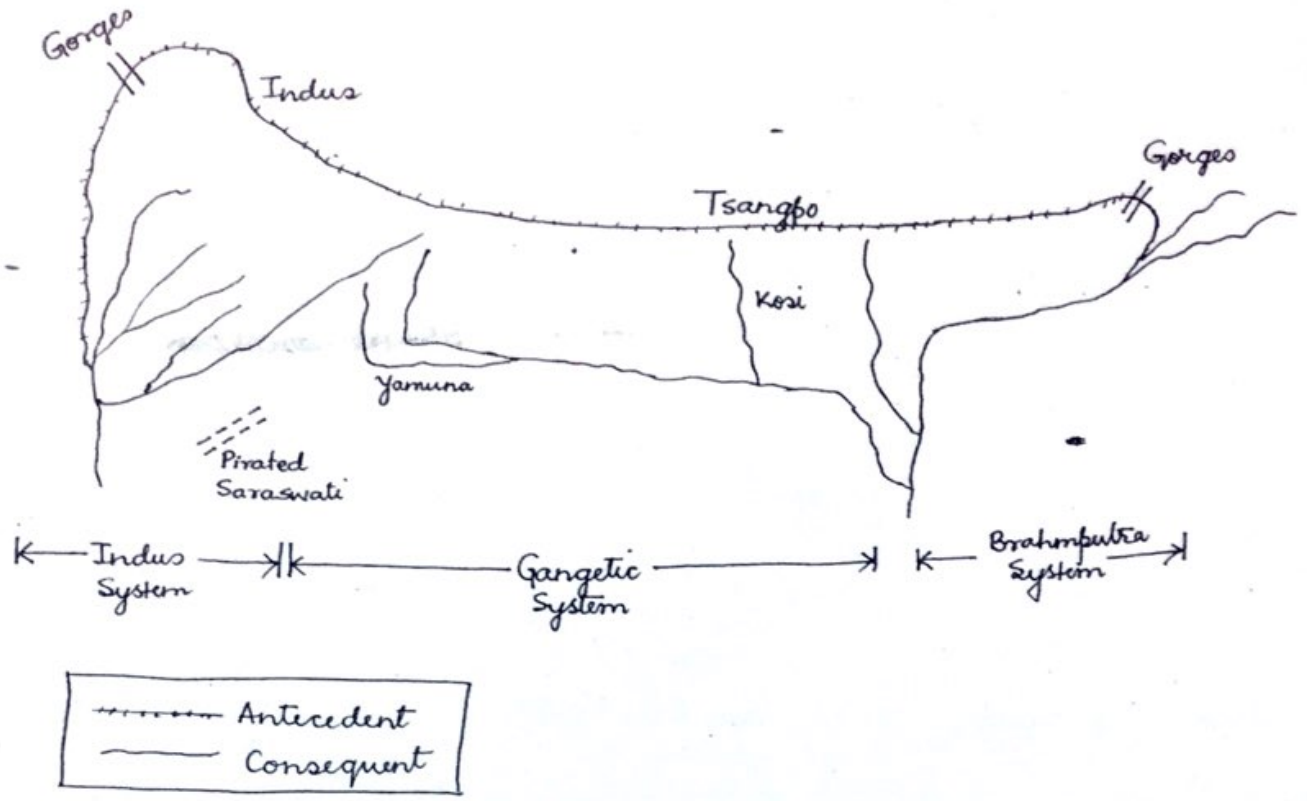
Lecture #46

ANTECEDENT DRAINAGE PATTERN

This drainage pattern develops when the surface channels are believed to be existing even prior to the development of the relief that they follow in present profile. This drainage pattern is correlated to extra-peninsular channels. The scholars like Pilgrim and Pascoe in their individual study concluded the presence of Indo-Brahm or Shiwalik River flowing parallel to Himalayan Gulf prior to the formation of northern mountain wall. With the beginning of orogenesis of Himalayas modifications in the existing slope resulted in dismembering of the Indo-Brahm River into 3 extra-peninsular systems namely Indus System, Brahmputra System and parts of Gangetic System. The evedences drawn by the scholars to justify existence of antecedent drainage includes:

(1) Longitudinal flow of Tsangpo and Indus Rivers.
(2) Deep Gorges carved out by both the channels
(3) The recorded change in course of river Yamuna during upper Cenozoic and Neozoic Eras.

Both Tsangpo and Indus marking their maximum flow parallel to Himalayas justifies the fact that these are not regulated by Himalayan Gradient which form the examples of asymmetrical fold. Added to it both the i-shaped valleys are too deep to be correlated with the age of Himalayas justifying the presence of river erosion prior to the formation of the Himalayas. Most convincing evidence however is the fact that till the beginning of Neozoic Era, river Yamuna continued to be the member of Indus system modifying its flow profile with the modification of Himalayan gradient becoming an individual system with R. Ghaggar, Luni and Saraswati as its tributaries and Gulf of Kuchcha as its mouth. By the beginning of Holocene further modification in the slope made R. Yamuna right bank tributary of Ganga with pirated water of Saraswati leaving Ghaggar and Luni as inland drainages. The antecedent drainage pattern applied only to extra peninsula forms unique example in the global perspective. Presently, all the rivers which have origin beyond the Himalayas are considered to be dismembered parts of Indo-Brahm River.



3. GEOGRAPHICAL DRAINAGE PATTERNS :

;) TRELLIS DRAINAGE

Represents the common drainage pattern where the structural control is such that all the channels of the system represents to be moving parallel to each other. This drainage pattern is very well developed in extra-peninsula with all the three major river system representing the examples. It is however best depicted by the Gangetic System with not just first order tributaries but also entire range of subsystems as yamuna sub-system, Son-Subsystem, Hooghly sub-system & Ghagra Sub-system depicting this pattern.

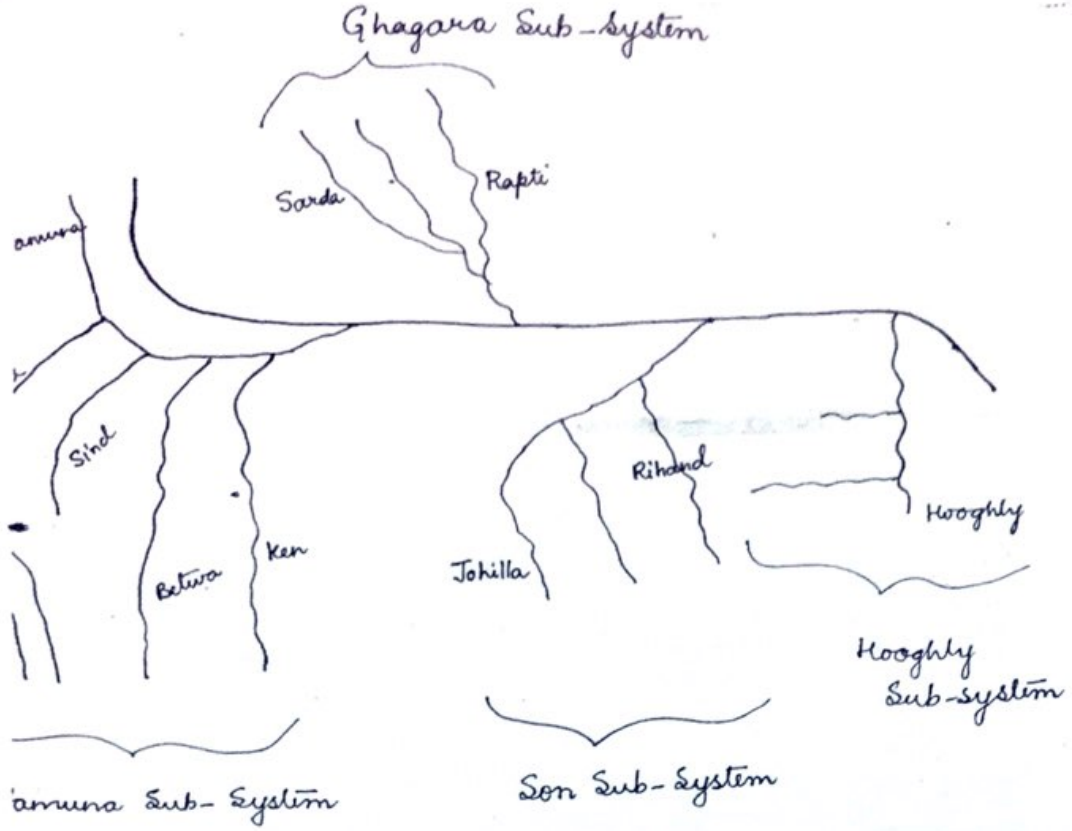
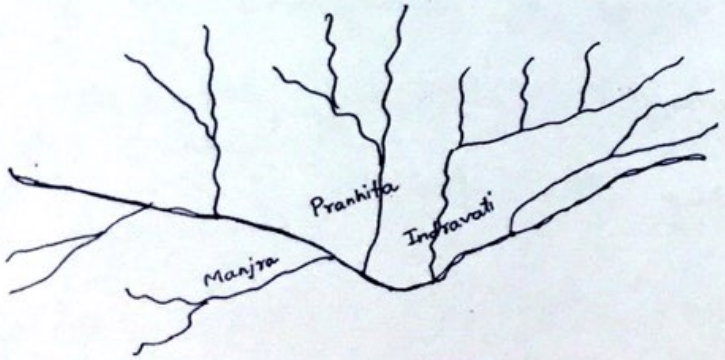


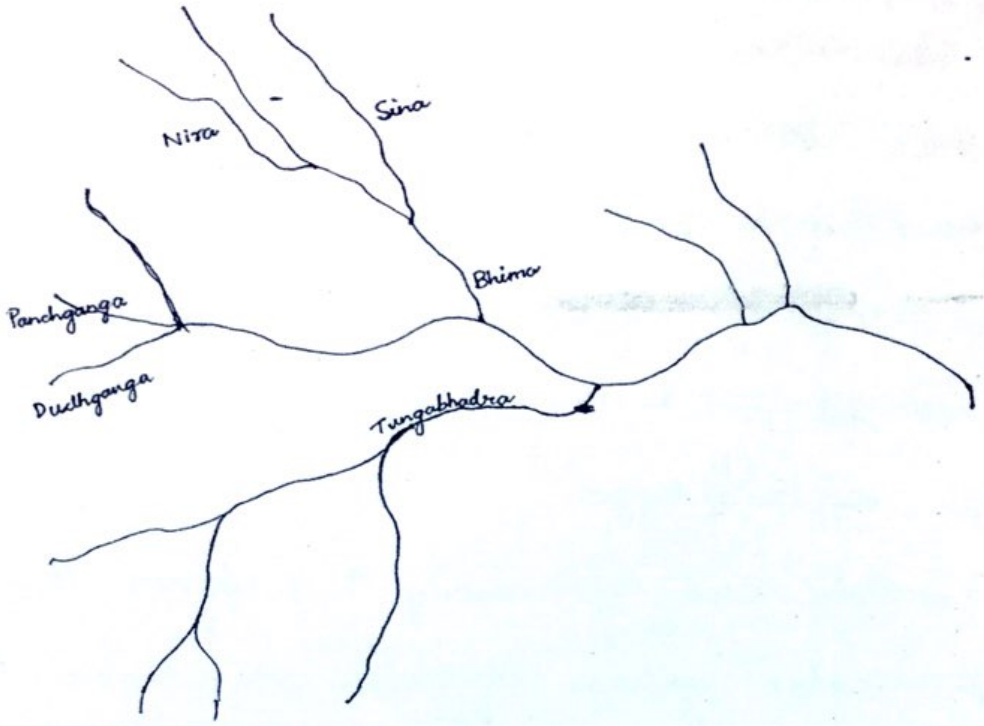
Fig. : Gangetic System - Trellis Pattern

ENDRITIC PATTERN

the peninsula both the big river systems that are odavari and Krishna systems represents dendritic drainage sattern. This pattern involves combination of parallel unning channels as well as right-angle merger. However, vith broader river basin the overall system incorporates ree-like pattern. Most defined characteristics of this drainage pattern includes broad river valley marks its dominance in the peninsular region of the country.

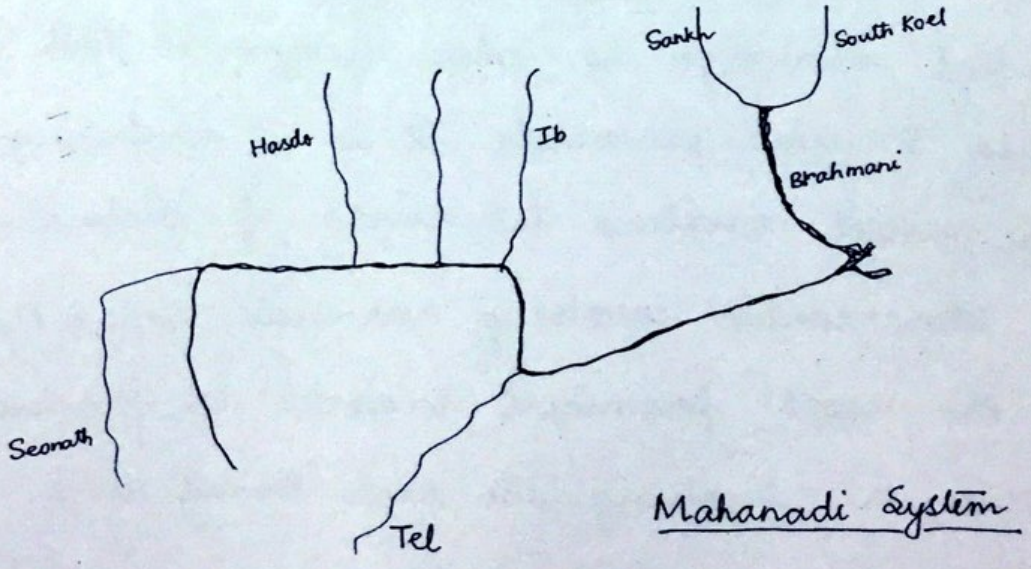


Godavari System



(iii) RECTANGULAR PATTERNS :

This type of drainage pattern develops with right angle merger of tributaries with the main channel. This pattern is best identified with Mahanadi System. Among the other major river systems that correlates to rectangular drainage, Brahmani and Pennern river systems are included.



Mahanadi System

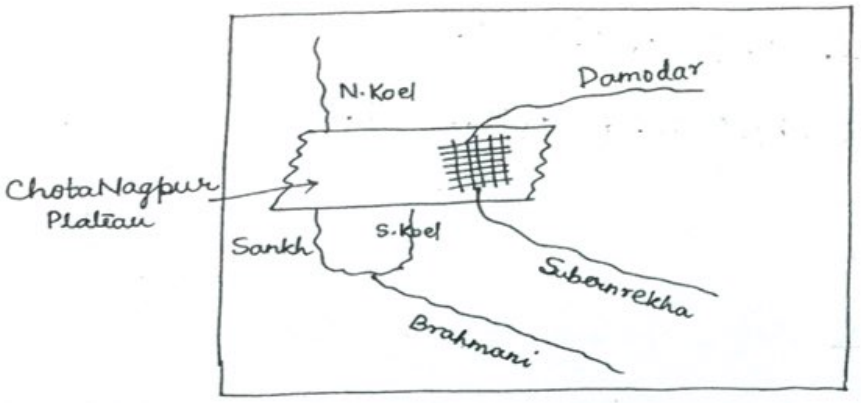
Other DRAINAGE PATTERNS :

Among the other drainage patterns identified in the country INLAND DRAINAGES correlates both to peninsula and extra-peninsula. Such patterns develop when river develops its mouth within land due to lesser volume of water. Prominent peninsular examples — R. Luni and extrapeninsular river example as R. Ghaggar.

The Braided pattern also representing both peninsular and extra-peninsular systems develops when river deposits in its own path obstructing its flow. for almost all the peninsular drainage, 'Piedmont ~~drains~~ braids' are absent and deltaic braids is commonly developed barring the exception of Narmada & Tapi. For the extra-peninsular drainage however piedmont braids are most common development with the absence of deltaic braids barring the exception of R. Hooghly.

The radial drainage is also recognised both with peninsula & extra-peninsula. It is a centrigugal drainage which involves the rivers of distinctive systems. Amarkantak involving Narmada, Son & Hasdo forms the most prominent example in peninsula & Mizo Hills — involving the river Barak and Dhaleshwari - in extra peninsula.

The superimposed drainage is developed when ancient drainage basin is occupied by present surface runoff either partially or completely. Chotanagpur plateau incorporates the only example of superimposed drainage with the ancient river basin being partly occupied by R. Damodar and partly by R. Subernrekha.



The surface runoff of the country to the tune of 85% of total discharge correlates to 13 MAJOR drainage basins. Drainage basin is defined to be the geographical area from where main channel attains its discharge from.