Anthropology Notes

Paper I

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CSE ANTHROPOLOGY SYLLABUS

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6. Anthropological theories:

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9.6 Age, sex and population variation as genetic marker- ABO, Rh blood groups, HLA Hp, transferring, Gm, blood enzymes.

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9.7 Concepts and methods of Ecological Anthropology. Bio-cultural Adaptations – Genetic and Non- genetic factors. Man's physiological responses to environmental stresses: hot desert, cold, high altitude climate.

9.8 Epidemiological Anthropology: Health and disease. Infectious and non-infectious diseases. Nutritional deficiency related diseases.

10. Concept of human growth and development: stages of growth – pre-natal, natal, infant, childhood, adolescence, maturity, senescence.

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11.2 Demographic theories- biological, social and cultural.

11.3 Biological and socio-ecological factors influencing fecundity, fertility, natality and mortality.

12. Applications of Anthropology: Anthropology of sports, Nutritional anthropology, Anthropology in designing of defence and other equipments, Forensic Anthropology, Methods and principles of personal identification and reconstruction, Applied human genetics – Paternity diagnosis, genetic counseling and eugenics, DNA technology in diseases and medicine, serogenetics and cytogenetics in reproductive biology.

Meaning, Scope and Development of Anthropology

- The word "anthropology" derived from the Greek terms "anthropos" (human being) and "logos" (study) and can be translated as "study of human beings". But that's not all. Anthropology tries to answer enormous variety of questions about humans such as:

    1. When, where and why humans appeared on the earth and why they have changed since then
    2. How and why modern human populations vary in physical features
    3. How and why societies on the past and present have varied in their customary ideas and practices.

- **Definition**: There are various definitions given by eminent anthropologists like
    - Krober defines it as "the science of groups of men and their behaviour and production".
    - Herskovitz defines it as" the study of man and his actions ".
    - Oxford dictionary gives it as " Study of mankind especially of its societies and customs; study of structure and evolution of man as an animal".
- These definitions seek to point out that anthropology is a distinct subject which adopts scientific so approach to study of social, physical and cultural behavior of man. It studies the prehistoric man and seeks to trace out various factors that are responsible for human physical and cultural and social evolution of man and makes use of this knowledge to offer solutions to problems pertaining to future of mankind.

Nature and Scope:

- Anthropology's special role among the many disciples that deal with humanity lies in its unique combination of holistic, historical and comparative methods.
- The basic proposition underlying holism in anthropology is that human behavior arises out of complex interactions taking place within a cultural system.
  The Holistic method involves the study of human beings or groups in terms of entire pattern of their lives. This human life will be studied in a combination of biology, social relations, economics, art, etc and each fields influence on the other and their influence on the human.
- Historical method involves an attempt to describe the entire course of biological and cultural evolution and attempt to place each way of life in a historical perspective. Thus archeology and ethno history attempt to reconstruct the origins, development and inter- relationships among various people, whereas cultural anthropology interprets cultures of existing peoples on terms of

historical influences on their present ways of life and on their probable future development.

- Comparative methods are used as a means of explaining the similarities and differences among various people of the earth. It attempts to isolate and define the laws and principles that account for development and perpetuation of such differences and similarities.
- In addition to these methods various approaches and themes make anthropological research and approach unique. Those themes and approaches are:
    - Comparative theme - Synchronic and Diachronic comparison
    - Holistic theme
    - Systems and process theme
    - Case study method
    - Emics and Etics Theme.

Relationship with other disciplines

6.1 Anthropology(A) and social science

As social science include history, sociology, economy and political science

1.history(H) : it studies particular civilization and culture on the basis of time period where as social anthropology studies the origin of civilization ,culture and process of evolution

2.both H and A study & describe human past and give importance to ancient aspects of man

3.Agy studies physical aspect along with the culture where as history approaches man purely in the chronological point

4.agy studies human culture and history studies of political event

5.sociology(S) : study of societies . both A and S are similar in many aspects

6.Agy is a science of man & studies human behavior in social surroundings the ideas durkhiem(scociologist) influenced Malinowski, R.brown, and thinkers idea of S and A similarity and dissimilarity.

7..sociology has borrowed ideas such as culture field, culture apparatus, interdependent tools., Culture lag, basic personality etc . aAy helped sociology disapproving ideas of racism

8.economic: it deals with production, distribution and consumption in modern societies. Where as agy studies all the above including primitive, peasant and even urban society.

9.economy deals commodities and their prices , values and so on. Where as agy clearly sees principles of modern economics cannot be applied to primitive societies

10.politcal science: deals with philospical ideals of plato and Aristotle and studies contemporary moder institutions of world . where as agy studies pre-literate, non literate societies

6.2 Anthropology and behavioral science

1.psychology studies man behavior in relation to environment. Agy studies mans holistically.

2.Agy is a comparative and analytical study of human behavior and experience.

3.The influence of psychology on agy and vice versa led to development of culture personality school ,

4.imp thinkers are M.Mead, R.Bendict, Kardiner etc

5. social psychology studies individual behavior under social environment and cultural agy studies institutions, human societies as a group.

6.both study man but different viewpoints, both try to understand man in the context of social behavior

7. case studies used by thinkers as how culture acts a social control and also culture influences development of personality and vice versa.

8. agy has given field work knowledge and cultural analysis of different societies where as psychology has given pschyo analysis techniques and helped in building national character studies

9. psychology helps in understanding root causes of human behavior in different societies.

10.some methods of observation are commonly employed in both of these sciences, some methods of psychology like the introspection method, are not used in agy

Main Branches of Anthropology:

7.1 Social cultural anthropology

Social - Cultural anthropology:

1. Charles Winick defines social anthropology as the study of social behaviour, especially the systematic comparative study of social forms and institutions. Ideally the comparative studies include all human societies, primitive, civilised and historic.

2. Making a distinction between the two, cultural anthropology(term popular in USA) studies historically, the cultural traditions and their content in diachronic approach whereas social anthropology(term popular in UK) focuses on behaviour and social interaction in a non-historical, synchronic approach.

3. Various subfields have emerged within socio cultural anthropology which include ecological, economic, psychological anthropologies, cultural history etc. with specialised study over the specific aspects of culture.

4. Ethnology and social anthropology, were once considered the same but are

now regarded as 2 different disciplines in that ethnologists try to reconstruct past history, even based on circumstantial evidences which the social anthropology doesn't do.

5. The emphasis of social anthropology has largely been on primitive societies, ie those in small number, territory with a simple technology and economy etc. This has been justified in that study of simple societies, could then be followed by complex. Also it is important in the context of vanishing societies.

6. The study of society as a whole in social anthropology provides better understanding rather than study of specific problems as in sociology.

7. Social anthropology has a wide scope - it studies culture, civilisation, institutions like family, kinship, political organisations, understanding of customs, traditions, religious beliefs etc based on systematic observation and does comparative analysis.

8. Comprehensiveness of approach is it's important characteristic. It also studies origin and development of the social organisations. Comparative study helps abolition of ethnocentrism.

9. Royal anthropological institute defines aims of social anthropology as study of primitive cultures in present form, study of culture contact, reconstruction of social history, search for universally valid social laws.

10. Thus it examines every aspect of a single culture, every aspect of a single society.

7.2 Biological Anthropology

Biological Anthropology

1. Physical anthropology is the oldest branch of anthropology. It is primarily concerned with human evolution within the context of culture. Biological sciences has made huge contributions to Physical anthropology, of these organic evolution and principles of genetics are significant.

2. There are three mains branches of Physical Anthropology,

a.Paleontology, It studies extinct primates and concerns itself with evolution of man.

b.Neontology , It studies living primates and examines comparative anatomy, physiology,

human variation in terms of population genetics.

c.Ethology , It's the scientific study of animal behaviour such as that of free ranging to

confined monkeys etc.

3. Physical anthropology tries to understand the extent to which biological factors exert influence upon the nature, behaviour and potentialities of humans. Human population Biology is a area of research in that studies adaptations of humans to differing environments and hereditary characteristics of living population.

4. Physical Anthropology is inter related with genetics, anatomy, physiology, taxonomy etc. . It's closely related with cultural anthropology. Mating, inbreeding patterns food resources food habits are elements of cultural anthropology that affect human physical form and racial history which are elements of physical anthropology. The studies from physical anthropology in turn are also useful in the study of cultural anthropology

5. The studies of Physical Anthropology can be broadly divided into two streams , Classical and New physical Anthropology.

a. Classical Anthropology is characterised with obtaining anthropometric measurements, computing indices and other statistics. It focussed heavily on data collection and tabulation.

b. New Physical Anthropology on other hand focuses on comprehending and interpreting the data collected.

6. New physical anthropology was aided by classical anthropology in the form of its vast data collected. Unlike Classical anthropology, new physical anthropology lays emphasis on understanding the nature and kind of adaptation and not merely enumerating it.

Even in its new form new physical anthropology continued to be study of human evolution , it concerns itself with sources of variation and direction of Change among individuals and groups in the past and present

7. This new orientation of anthropology necessitates the development of appropriate quantitative and descriptive methods, it also shows us the inter relationship with different subdivisions of anthropology on account of analysis of data corresponding to its environment

8. Appreciation and evaluation of human variability , examining the factors that cause these have been the basic concerns of physical anthropology, to which Anthropometrics has made a significant contribution. Genetics is also playing a key role in the investigations these days .

9. Physical anthropology has been always concerned with man's physical characters, their origin, evolution and present stage of development. Physical anthropology is the comparative science of man as a physical organism in relation to his total environmemnt i.e social , cultural and physical

10. Physical anthropology has contributed to the studies of Primatology, Primate Paleontology,

Raciology, Human population genetics, eugenics, forensic sciences etc.

7.3 Archaeological anthropology -

Deals wid retrieval n analysis cultural n non cultural remains left behind by extinct humans, reconstructing der envt, culture n society n identify de socio cultural evolution

Aim- to reconstruct pre historic past n early historic setting of human kind

Scope-

A. Text free archaeological anthropology - on de basis of evidence provided.by environmental factors n exposure of sites by natural processes

It has two sub branches namely old world n new world archaeology

B. Text aided archaeological anthropology - on de basis of written sources

C. Applied archaeological anthropology - includes salvage archaeology, war, industrial archeology n museology

New archaeological anthropology emphasised on cultural evolutionary perspective, systems approach n logico deductive reasoning

7.4 Lingusitic Anthropology

1. Study of speech and language as a socio-cultural phenomenon across space and time.

2. It is Linguistics in the context of culture and society. Therefore,Linguistic anthropology deals with history, structure, variation and meaning of language in the social and cultural contexts they occur.

3. Upto 1950's it dealt with only descriptive studies such as origin of language, classification and similarities and was called Anthropological liguistics.

4. Contemporary Lingusitic Anthropology is considered to be both descriptive and analytical. It has 5 sub branches.

5. Historical or comparitive Linguistics: study of emergence, divergence and dynamics of language over time in cultural context. 6. Structural Lingusitics: Construction of Language. Deals with Phonemic, syntactic and morphemic structures.

7. Socio-Linguistics: study of speech in social and situational contexts.Covers regional dialects, secret languages, magic languages, folktales.

8. Ehnosemantics: to understand culture from the point of view of people. studies meanings the words carry for a culture group for a particular situation.

9. Psycho Linguistics: studies processes underlying the acquisition,use, transmission of language.

10. Contemporary Linguistic Anthropology tries to understand the historical linkages and tries to devise scripts to languages without one. It helps in establishing contacts with Alien and foreign culture groups and in devising contents and curriculum under tribal education policies.

Biological Factors in Human Evolution

Hominization process is the evolutionary transformation of hominoids into hominidae. It includes all those aspects of structural and behavioral changes that occurred in the hominid line finally leading to the evolution of modern man. The biological factors are :

- **Erect Posture and Bipedal Locomotion**: The most obvious thing about human beings that differentiates them from all other animals is upright posture and bipedal locomotion. Many human morphological traits are directly attributable to these two facts of human life. Some of the changes are :
    - Enlarging of lower vertebrae to absorb the forces of compression.
    - A sharp backward curving of spine in lumbar region providing a solid platform to transfer the weight of body onto pelvis.
    - Increase in the size and number of bones in sacrum to take up transmission of weight through pelvis and legs. Pelvic region became basin shaped to support vertical weight transference.

Ischium a pelvic bone flattened allowing humans to sit comfortably.
    - Knee joints have enlarged to support increased body weight. Double knee action to reduce energy during walking.
    - The human foot is redesigned into a platform to support entire body weight rather than a grasping structure, toes got reduced and two arches developed to support weight.

- **Remodeling of face due to expansion of Brain**: The major trend of human evolutionary development was dramatic increase in the size of brain. Since the size of head as a whole shouldn't keep getting larger beyond limits allowed by process of birth, there was strong adaptive pressure to shorten the snout and reduce the size of face to make room for cranial expansion. The changes that took place were:
    - Foreman magnum is located at the centre of skulls base, with head balancing nicely on vertebral column.
    - The supra orbital ridges had diminished significantly, forehead became almost vertical, face became flat, nose became protruding, chin is prominent.

Cultural Factors in Human Evolution, Interplay of Biological and Cultural Factors

Theories of Organic Evolution

10.1

10.2 Pre-Darwinian (Lamarckism)

Attempts to explain the similarities and differences among species

Adaptations- are a major component to these theories.

Adaptations are features which make a species better suited to live and reproduce in its environment

Lamark

The evolutionary theory of Jean-Baptiste Lamark was based on the principle of:

1. Use and Disuse
2. Inheritance of acquired traits

Principle of Use and Disuse:

For an organism, new structures appeared in the course of evolution because they were needed. Structures that were present and were used became better developed and increased in size; structures that were not used decreased in size and eventually disappeared

Ex: muscles of an athlete vs. Appendix

Inheritance of Acquired Traits:

Useful characteristics acquired by an individual during its lifetime can be transmitted to its offspring

These acquired traits results in species that are better adapted to their environment

Ex: a giraffe's neck became longer as a result of stretching to reach higher branches. This acquired trait was then passed down to the offspring

Weisman

August Weisman did not agree with Lamark's theory of acquired traits

In a series of experiments, Weisman removed the tails of mice

The mating of these tailless mice produced offspring with tails of normal length

Weisman removed the tails of these mice and allowed them to mate

Again, offspring were produced with tails of normal length

The acquired condition of “taillessness” was not inherited

10.3 Darwin theory of evolution

Darwin in presenting his this theory of evolution in " origin of species " or " the preservation if favored race in struggle " made 3 observation & 2 deduction

Observation 1: all organism have potential for explosive population gr that would outstrip their food supply (idea from Malthus)

Observation 2 : population of sp. Remain more or less constant over generation

Deduction1: therefore must b struggle for existence

Observation 3 : nature is full of variations , even in one animal group individuals vary

Deduction2: therefore some of these variations r favoured & some r disfavoured

Postulates

1) Overpopulation

2) Struggle for existence : inter species , intra species , struggle against envi

3) Hereditary & variation : Useful , permanent variations are heridited , give long with hi reproductive succes

4) Survival of fittest /natural selection : nature selects organism with max useful variations

5) Origin of species : individuals selected by envi accumulate variations --> new species

Crticisim

1) Couldn't explain inheritance of characters. He didn't account fir arrival of fittest

2) Didn't explain causes of variations , didn't identify significance of macro variations

3) Didn't explain occurrence of connecting link

4) Couldn't explain inheritance if specialised organs

5) Didn't explain use& disuse of vestigial organs

6) Didn't distinguish b/w somatic & germinal variations

7) Mostly emphasised on competition not on cooperation

8) Didn't explain evolution of terrestrial from acquatic organism

9) Though he criticised Lamarck he adopted his use& disuse theory .

Later Darwin's based on scientific experiments & observation gave scientific shape to Darwin theory .

10.4 Post-Darwinian (Rediscovery of Mendel, Wagner)

Post Darwinian theories:

Darwin's explanation of evolution by Natural Selection was followed by various theories where other forces of evolution have been given. They are:

1. Theory of Isolation:

Proposed by Wagner, which says that two or more populations of same species get separated because of some physical or geographical barriers or they may occupy different areas. Natural selection thus occurs independently in each segregating population.

2. Theory of Mutation:

Hugo De Vries stated that evolution proceeds by large, discrete and sudden changes or variations called as mutations. These mutations are inheritable by the progeny.

- Mutations may occur in any direction. Nature selects those which are suitable for survival and continuity. Other unsuitable mutants are eliminated by nature.

- Genetists have shown that origin of species by mutations is common not only among plants but also among animals.

3. Rediscovery of Mendel's laws of heredity:

According to Correns and Tschermak, a) the factors given to the offspring by the parents do not mix but are segregated and b) if more than one pair of contrasting characteristics is considered in the same cross, the factors responsible for these are inherited independently.

4. Theory of continuity of germplasm:

Weismann proposed that somatoplasm makes up all bodily organs except reproductive cells and formation of complex organs during which they lose capacity to reproduce. Germplasm remains undifferentiated and retains its power to generate new life. Thus changes in somatoplasm are not transmitted but those in germplasm are transmitted to next generation.

5. Theory of Orthogenesis:

Haeckel and Lull's theories point out that variations or evolutionary changes occur along certain definite lines, guided by some undefined or inherent mystical forces.

Eimer views that laws of organic growth aided inheritance of acquired characters determine a straight line course of evolution.

6. Theory of recapitulation or embryological parallelism:

Proposed by Serres, it says an individual organism in its development tends to recapitulate or repeat the stages passed through by its ancestors.

Synthetic Theory Of Evolution

The need for this theory arose as Darwinism doesn't satisfactorily explain the origin and inheritance of variation. This theory consists of three main concepts

1. Production and redistribution of variation
2. Action of Natural selection on this variation
3. Role of isolation.

Factors that produce and redistribute variations:

1. Genetic Mutations: A mutation is a change on base sequence of DNA. For such changes to have evolutionary significance they must occur on sex cells as evolution is a change in allelic frequencies between generations. Mutations generally happen at gene level and bring about changes in hair, color, skin pigmentation and other somatic changes.
2. Chromosomal Aberrations: If a change happens above a gene level and chromosomes get changed then it's a chromosomal aberration. In this case there would be a change in either the structural aspects of chromosome or in the number of chromosomes present in the organism.
3. Migration and Gene Flow: Animals have a tendency to migrate and when they do that they come into contact with another population, it mates with the inmates of the population. Thus, genes of one population are transferred into another population which is called Gene flow. Gene flow brings about an addition or loss of genes in the gene pool and change in allele frequencies of the population.
4. Recombination: The genetic information is invariably reshuffled every generation because both parents contributes genes to the offspring in all sexually reproducing species. Such recombination doesn't in itself change allele frequencies but produce a whole array of genetic combinations on which natural selection can act and make every individual genetically unique.

5. Genetic Drift: It is an evolutionary force operating in small populations. In small populations the gene frequencies fluctuate purely by chance. Change in gene frequencies purely by chance is called genetic drift.

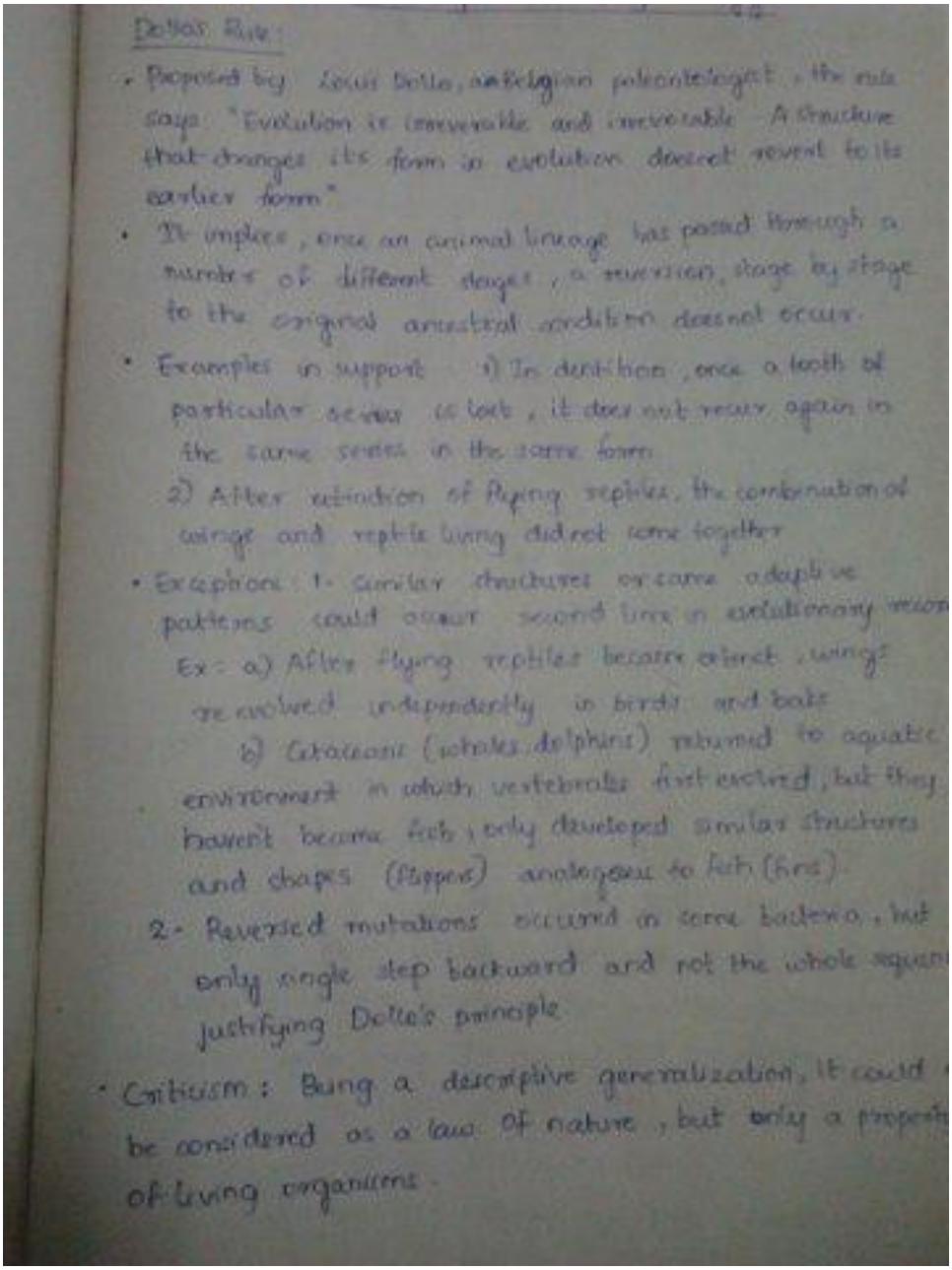
Action of Natural selection on Variation:

- The genetic variations produce new phenotypes which may have advantages or disadvantages. The organisms having genotype which gives it some advantage in a particular environment is said to be better adopted and the have better adapted genes. Such organisms reproduce at a higher rate and leave more surviving offspring in next generation.
- Such a differential reproduction is due to natural selection where one individuals produces more young ones than others and these adapted organisms contribute a greater percentage of genes to the gene pool. If such a differential reproduction continues for many generations the adopted genotypes will become predominant thus changing the gene frequency.
- Thus natural selection promotes the development of more and more new adaptive genotypes and phenotypes. So natural selection is a creative force which spreads genetic novelty.

Role of isolation in formation of species:

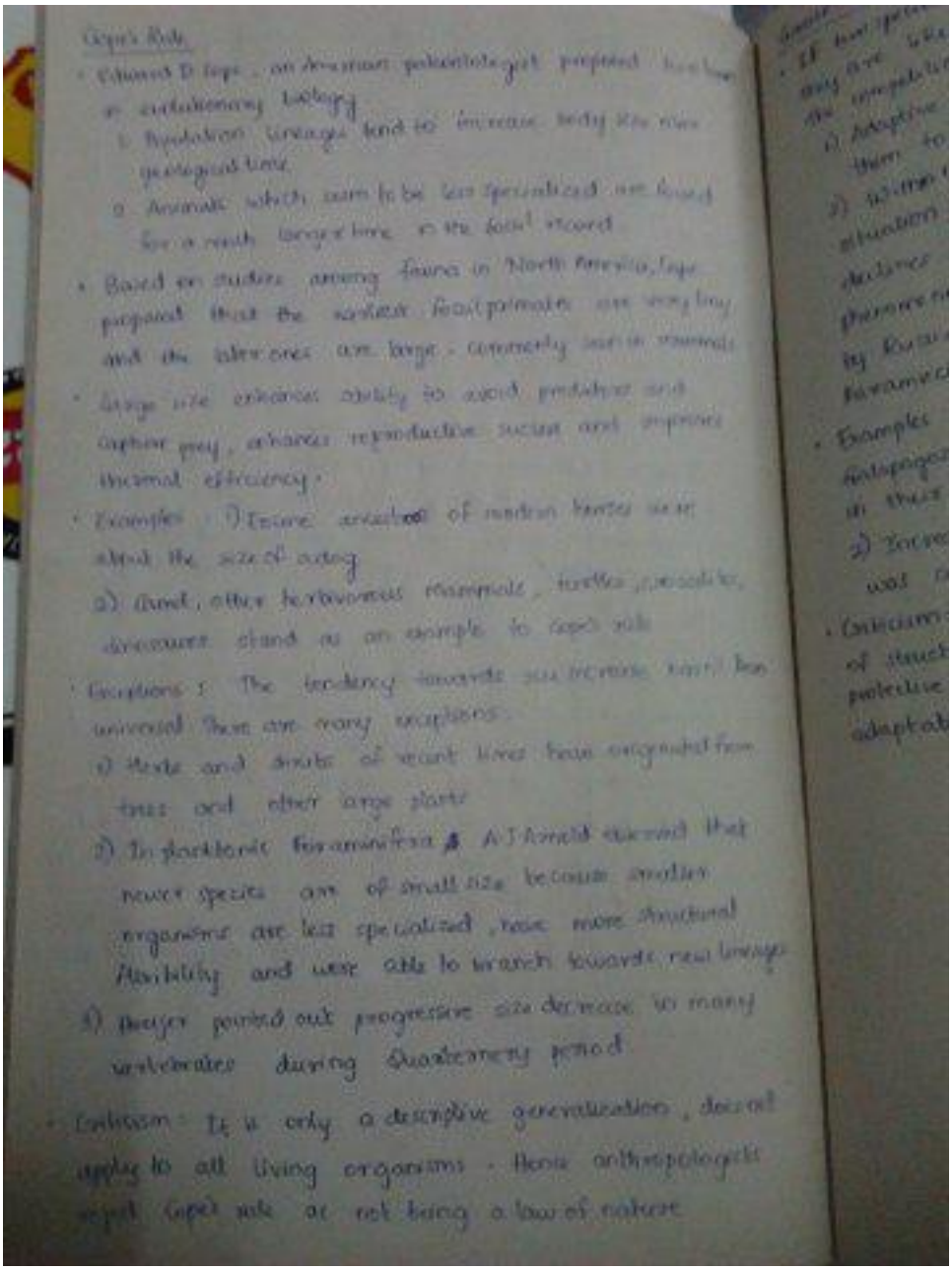
- Isolation is separation of species by some barriers which prevent interbreeding. That prevents the exchange or mixing of genes between populations.
- Geographical isolation causes physical separation of two populations. These separated populations are exposed to different kinds of environmental factors acquiring variation and these variations are processed by natural selection. The nature and actions of recombinations, natural selection and genetic drift are different in different populations and for different environments.
- This independent occurrence of elemental forces of evolution on those isolated populations leads to progressive genetic divergence. This divergence leads to reproductive isolations. When this happens populations fail to interbreed even if geographical isolation disappears. Thus a new species is formed and the cycle of evolution repeats.

Rules or Laws Governing Evolutionary Biology- Dollo's rule, Cope's rule, Gause's rule



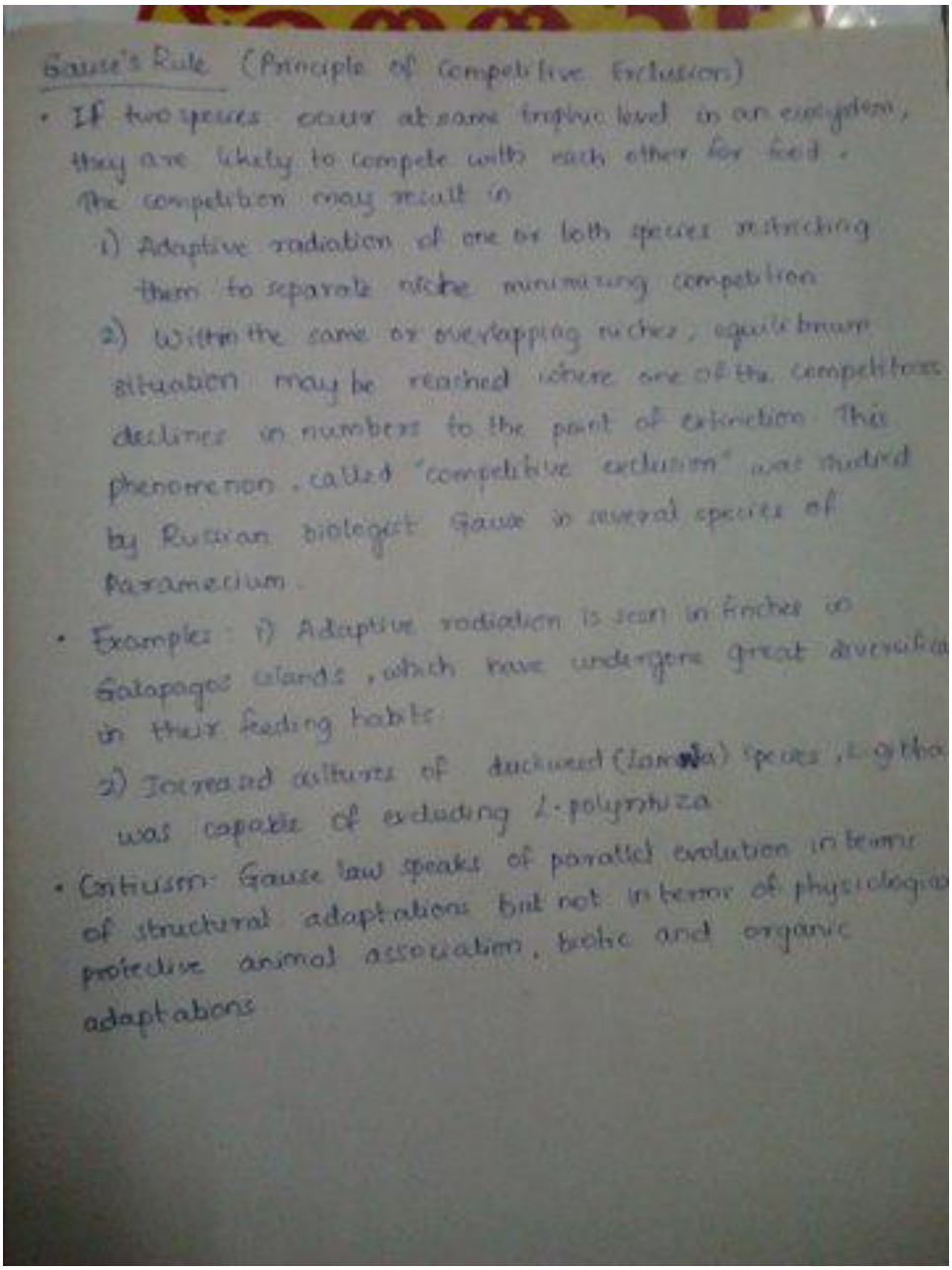
Dollos Rule:

- Proposed by Louis Dollo, a Belgian paleontologist, the rule says "Evolution is irreversible and irreversible. A structure that changes its form in evolution doesnot revert to its earlier form"
- It implies, once an animal lineage has passed through a number of different stages, a reversion, stage by stage to the original ancestral condition doesnot occur.
- Examples in support: 1) In dentition, once a tooth of particular series is lost, it does not recur again in the same series in the same form
  2) After extinction of flying reptiles, the combination of wings and reptile living did not come together
- Exceptions: 1- similar structures or same adaptive patterns could occur second time in evolutionary reco
  Ex: a) After flying reptiles became extinct, wings re evolved independently in birds and bats
  b) Cetaceans (whales, dolphins) returned to aquatic environment in which vertebrates first evolved, but they haven't become fish, only developed similar structures and shapes (flippers) analogous to fish (fins).
  2- Reversed mutations occurred in some bacteria, but only single step backward and not the whole sequen justifying Dollo's principle
- Criticism: Being a descriptive generalization, it could be considered as a law of nature, but only a propert of living organisms.



Cope's Rule

- Edward D Cope - an American palaeontologist proposed this law in evolutionary biology
  - Population lineages tend to increase body size over geological time.
  - Animals which seem to be less specialized are found for a much longer time in the fossil record
- Based on studies among fauna in North America, Cope proposed that the earliest fossil primates are very tiny and the later ones are large - commonly seen in mammals
- Large size enhances ability to avoid predators and capture prey, enhances reproductive success and improves thermal efficiency.
- Examples : 1) Entire ancestors of modern horses were about the size of dogs
  2) Camel, other herbivorous mammals, turtles, crocodiles, dinosaurs stand as an example to Cope's rule
- Exceptions : The tendency towards size increase wasn't too universal There are many exceptions.
  1) Birds and snakes of recent times have originated from trees and other large plants
  2) In planktonic foraminifera & A J Arnold observed that newer species are of small size because smaller organisms are less specialized, have more functional flexibility and were able to branch towards new lineages
  3) Bergen pointed out progressive size decrease in many invertebrates during Quaternary period
- Criticism : It is only a descriptive generalization, doesn't apply to all living organisms. Many anthropologists reject Cope's rule as not being a law of nature



Dollo's rule:

- Proposed by Louis Dollo, a Belgian palaeontologist, the rule says " Evolution is irreversible and irrevocable. A structure that changes it's form in evolution doesn't revert to it's earlier form".

- It implies, once an animal lineage has passed through a number of different stages, a reversion, stage by stage to the original ancestral condition does not occur.

- Examples:

1) In dentition, once a tooth of particular series is lost, it does not recur again in the same series in the same form.

2) After extinction of flying reptiles, the combination of wings and reptile living did not come together.

- Exceptions:

1) Similar structures or same adaptive patterns could occur second time in evolutionary record. Ex: a) After flying reptiles become extinct, wings re evolved independently in birds and bats

b) Cetaceans (whales,dolphins) returned to aquatic environment in which vertebrates first evolved, but they haven't become fish, only developed similar structures (flippers) and shapes analogous to fish (fins).

2) Reversed mutations occurred in some bacteria, but only single step backward and not the whole sequence justifying Dollo's principle.

- Criticism: Being a descriptive generalisation, it could not be considered as a law of nature, but only a property of living organisms.

Cope's rule:

- Edward D.Cope, an American paleontologist proposed two laws in evolutionary biology

1. Population lineages tend to increase body size over geological time.

2. Animals which seem to be less specialised are found for a much longer time in the fossil record.

- Based on studies among fauna in North America, especially mammals, Cope proposed that the earliest fossil primates are very tiny and the later ones are large.

- Large size enhances ability to avoid predators and capture prey, enhances reproductive success and improves thermal efficiency.

- Examples:

1) Eocene ancestors of modern horse were about the size of a dog.

2) Camel, other herbivorous mammals, turtles, crocodiles, dinosaurs stand as an example to Cope's rule.

- Exceptions: The tendency towards size increase hasn't been universal. There are many exceptions.

1) Herbs and shrubs of recent times have originated from trees and other large plants.

2) In planktonic Foraminifera, A.J.Arnold observed that newer species are of small size.

3) Hooijer pointed out progressive size decrease in many vertebrates during Quarternary period.

- Criticism: It is only a descriptive generalisation, does not apply to all living organisms. Hence anthropologists reject Cope's rule as not being a law of nature.

Gause's rule (Principle of Competitive Exclusion)

- If two species occur at same trophies level in an ecosystem, they are likely to compete with each other for food. The competition may result in

1) Adaptive radiation of one or both species restricting them to separate niche and minimising competition.

2) Within the same or overlapping niches, equilibrium situation may be reached where one of the competitors declines in numbers to the point of extinction. This phenomenon called "Competitive Exclusion" was studied by Russian biologist Gause in several species of Paramoecium.

- Examples:

1) Adaptive radiation is seen in finches in Galápagos Islands, which have undergone great diversification in their feeding habits.

2) Increased cultures of duckweed (Lamna) species, L.gibba was capable of excluding L.polyrrhiza.

- Criticism: Gause law speaks of parallel evolution in terms of structural adaptations but not in terms of physiological, protective animal association, biotic and organic adaptations.

Concepts and terms in Evolutionary Biology.

1. Convergence : It refers to the development of similar characteristics or adaptations in animals that differ in direct ancestry. It usually applies to one or a few characteristics of the animal than to its entirety.

Eg. : Retinal cells i.e rods which are more sensitive to dim light are present in deep sea fish, bats, lizards and lemurs.

2. Parallelism : This refers to when a common ancestor of two organisms was not very ancient and evolution in descendent lines followed more or less the same course. Parallelism implies a similarity in biological makeup of the ancestral forms, whereas convergence doesn't.

Eg : Lack of tail in gibbons, great apes and humans could be as their common ancestor had tails but eveolved devoid of them in a parallel fashion in separate evolutionary lines after they diverged.

3. Homology and Analogy : Homology refers to similarity in origin i.e a common ancestor.

Homoplasy refers to similarity in appearance but not in origin. Analogy is similarity in function but not in origin. It can be learnt that parallel evolution following divergence leads to homologies while analogies and homoplasy might result in convergent evolution.

Eg. : Wings of species of birds is homologous while wings of birds and bats are analogous.

4. Serial Homology : It is the similarity of structures between one part of an animal with another part of the same animal

Eg. Arm and leg of a man, i.e humerus bone of upper arm corresponds to femur of leg.

5. Adaptive Radiation : It is the evolutionary spread and differentiation of the descendents of one type of animal of whatever level of classification. It refers to the way a species evolves into progressively dissimilar organisms

Eg. Mammals adapted in the Tertiary era while dinosaurs did not and hence became extinct.

6. Dollo's Law : It states that Evolution is irreversible to the extent that throwbacks to earlier forms do not occur in detail

Eg. Cetaceans may have returned to the aquatic environment in which vertebrates first evolved but they haven't become fish, they retain air breathing lungs etc. That are traces of their terrestrial past

.

7. Mosaic Evolution : This principle states that evolution of species tends to be inconstant and asymmetrical , i.e it may be rapid at once and slow another time , some times it might even stop.

Eg. Bipedalization and Encephalization , these traits evolved distinctly and separately with bipedalism preceding encephalization.

8. Cope's Rule : This principle states that living organisms have a tendency to increase in their size during the course of organic evolution . Though a majority of the present species are probably the largest of their respective class, this principle is not universal and has exceptions in both plant and animal kingdoms.

9. Gause's Rule :According to this rule, two organisms that occupy the same trophic level in the ecosystem in the process of achieving equilibrium might cause the one organism to dominate the other and adapt very effectively ultimately resulting in exclusion of the competitor. This adaptation by the dominating organism will be absent in if there is no competitor.

Primates Evolutionary Trends and Behaviour

The series of evolutionary trends given by Sir Wilfred E.LeGros Clark are:

1. Preservation of basic structure of limbs: Single bone in upper segment, paired bones in lower segment to permit some degree of rotation with five digit (pentadactyl) extremities for grasping, clavicle or collarbone retained in shoulder gridle to permit upper limb to have greater reach and range of movement in several directions.

2. Enhancement of free mobility of digits for climbing by grasping: It is indicated by the ability to move the digits (like thumb and great toe) independently. But unlike primates, in Humans the foot has become weight bearing organ rather than a grasping organ.

3. Evolution of flattened nails from compressed claws and development of highly sensitive tactile pads on the digits. These modifications were for facilitating a secure grip in the trees.In primates the palms and soles are naked of hair for better grip. 4. Abrreviation of snout or muzzle: Due to increase in the overall shape of the skull, there is a tendency for facial portions of the skull like snout area to become relatively small. This trend is supported by behaviour trends where the higher primates use eyes and hands to do things that a prosmian would use his snout and mouth for. This is also accompanied by decrease in sense of smell due to decrease in olfactory areas of brain.

5. Evoultion of visual structure: It is due to enlargement of visual areas of brain, change in structure of retina and nerves connecting it with brain for better coordination between sensory stimuli and muscular response, moving forward of eyes in head to permit stereoscopic vision. ex: the eyes of living tree shrews are located on the sides of head and in higher primates they are directly forward.

6. Changes in Dentition: Reduction in number of teeth due to reduction in face and jaws. preservation of simple cusp pattern of the molar teeth

7. Progressive expansion and elaboration of brain resulting in more accurate sensory perception and greater variety of behavioral responses to environmental factors. The changes are more predominant in cerebral cortex which has become expanded and its surface folded.

8. Development of gestational processes for nourishment of fetus before birth.In primates the mother gives necessary nourishment to the young through placenta, mammary glands. This association enables the young to learn various forms of behaviour which promote their survival.

9. Prolongation of Postnatal life periods: There is a well-marked trend for a lenghtening of the period of growth and development and delay of maturation. This resulted in longer gestation period, increasing immaturity of infant at birth, longer postnatal growth period and later attainment of sexual maturity. The female primates usually have one infant at a time and thus the evoultion is characterized

Behaviour pattern of primates

Primate Behaviour A large part of primate behaviour is learned rather than innate. Despite the diversity in behavioral patterns of primates primatologists like Jane

Goodall (Chimapnzee), Dolhinow (Langur), George Schaller (Mountain Gorilla), C.R.Carpenter(Gibbon and Howler monkey) identified the following primate behaviours: 1. Group Living: for benefits like defense against predators, enhanced food gathering, intensive social learning, assistance in rearing offspring and increased reproductive opportunities. ex: Baboons live within troops for entire life, social unit of chimpanzees is ever-changing.For primates particularly those that are diurnal, group life may be crucial to survival.

2. Communication : through body movement, vocalizations, olfactory signals and facial gestures. Physical aggression ranges from simple gestures to violence.

3. Dominance-hierarchy and Dominance submission: ranking of primates in social status determined by physical strength, age, aggression and ability to attract others. dominance submission is the result of dominance hierarchy.For ex in Chimpanzees, if two males go after same fruit the subordinate holds back.

4. Dependency and Development: the prolonged dependency of infant monkeys and apes offers an evolutionary advantage by allowing infants more time to observe and learn the complex behaviors essential to survival.

5. Training and Learning: Primates ofen learn many things in social groups. for ex Method of feeding among chimpanzees:Termite fishing using a grass stalk to withdraw termites from a termite mound.

6. Sexual behavior: It varies among primates. Gibbons are monogamous, Chimpanzees are promiscuous. Thus most of the behavior patterns are learned and show a great diversity within the group and between groups of primates.

Primate Adoptations and Locomotion

What is a Primate?

- First, primates are members of the vertebrate class: Mammalia
- + 4000 mammals
- Primates are part of the subgroup of placental mammals

Three types of primates

- Prosimians (pre-monkeys)
- Monkeys (Old World and New World)
- Apes

Common Mammal Traits

- Fur (or body hair in Humans)
- Long gestation & live birth (relative to other types of organisms)
- Heterodontism (different kinds of specialized teeth)
- Ability to maintain constant body temp (Homeothermy)
- Increased brain size (greater ability for learning and behavioral flexibility)

Characteristics of Primates

- Difficult to define by one or two common traits
- Primates are generalized (rather than specialized) mammals.
- Defined by evolutionary trends
- Not all traits found in every member of the order.

Characteristics of Primates:

Limbs and Locomotion

- Tendency toward erect posture.
- Flexible, generalized limb structure
- Engage in a number of locomotor behaviors.

Hands and Feet

- High degree of grasping ability.
- 5 digits on hand and feet.
- Opposable thumb and partially opposable great toe.
- Tactile pads enriched with sensory nerve fibers at the ends of digits.

Diet and Teeth

- Lack of dietary specialization and tend to eat a wide variety of foods.

Generalized dentition, teeth are not specialized for processing one type of food.

Senses and the Brain

- Color vision (excerpt for nocturnal primates)

- Depth perception
- Decreased reliance on the sense of smell (olfaction)
- Expansion and increased complexity of the brain

Maturation, Learning, and Behavior

- Longer gestation, fewer offspring, delayed maturation, and longer life span.
- Greater dependence on flexible, learned behavior.
- Tendency to live in social groups.
- Tendency for diurnal activity patterns.

<u>Primate Adaptations:</u>

Habitats

- Most are found in tropical or semitropical areas of the New and Old Worlds.
- Most are arboreal, living in forest or woodland habitats.
- Some Old World Monkeys have adapted to life on the ground.
- Gorillas and chimpanzees spend considerable time on the ground.

Diet and Teeth

- Primates are generally omnivorous.
- Most eat a combination of fruits, leaves, and insects.
- Most have four types of teeth: incisors, canines, premolars and molars.

Locomotion

- Most are quadrupedal, using all four limbs in their locomotion.
- Brachiating (arm swinging) is found among the apes.
- Prehensile tails, found only among the New World Monkeys, are used as an aid to locomotion.

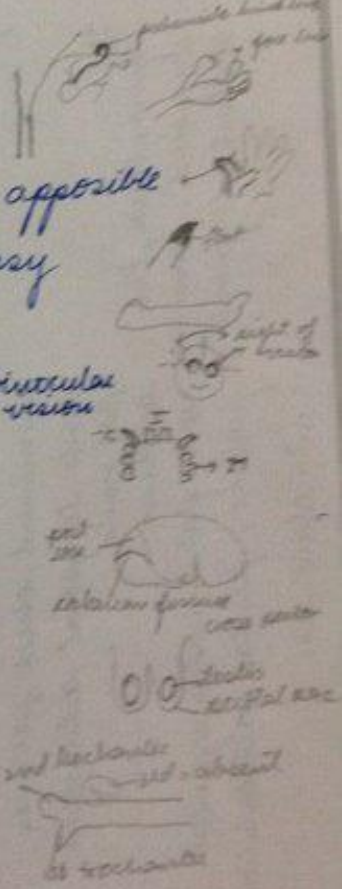
Fossil Primates

Fossil Primates

Primates are remarkably recent animals whose evolutionary radiation is our own evolutionary history. Carolus Linneaus classified them under the phylum Chordata & has shown how important their position is in animal kingdom.

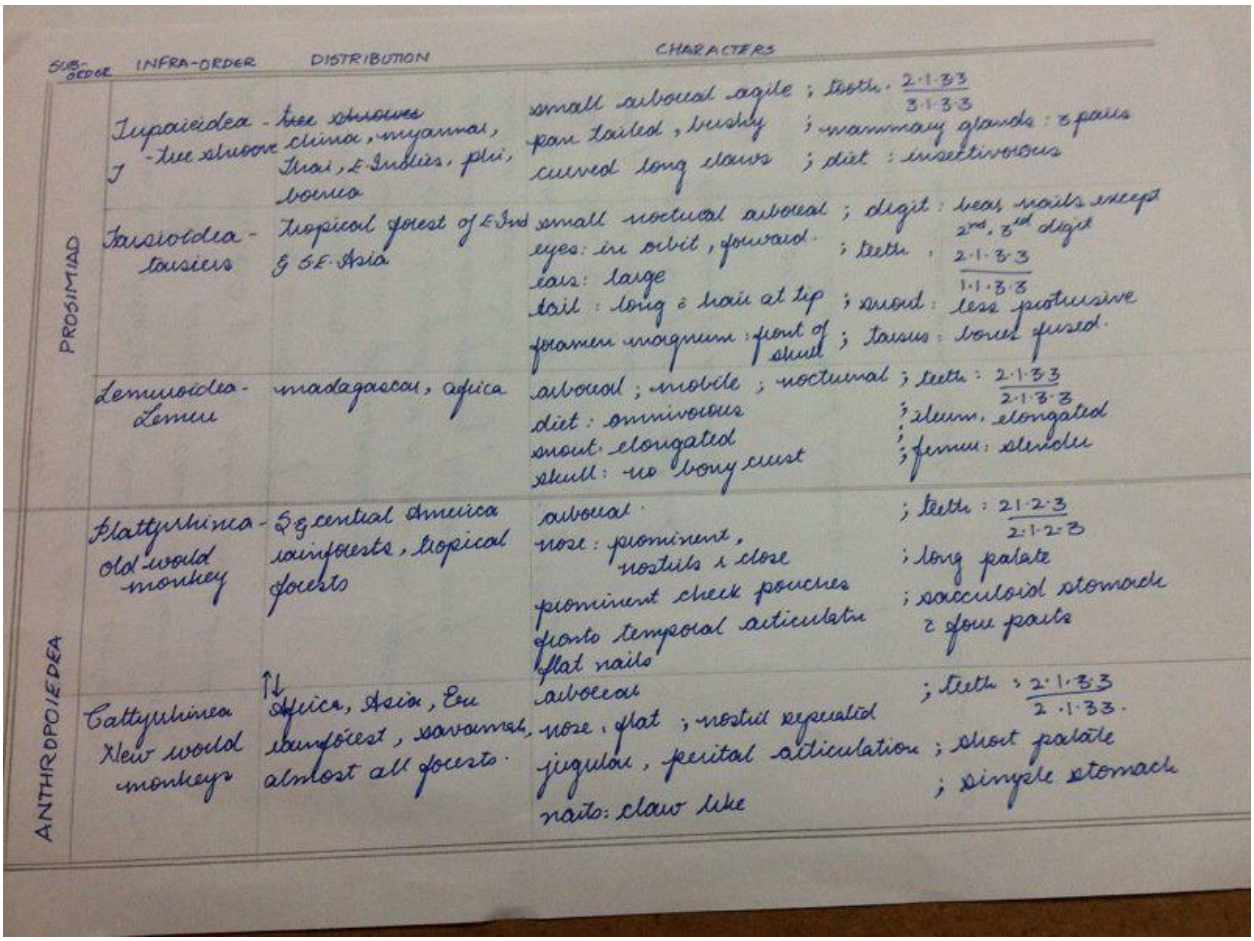
GENERAL CHARACTERS

- prehensile limbs for arboreal life
- Either thumb or great toe or both are opposible
- flat nails making grasping function easy
- well developed clavicle
- eye orbits surrounded by rims (bony) + binocular vision
- atleast three kind of teeth [I, C, M]
- two pectoral mammae.
- brain : calcanean fissure + post. lobe
- testes descending in scotum
- penulus penis
- stomach simple
- femur doesn't have third trochanter



CLASIFFICATION

Primates are further divided into two sub order, infra ord



Man as Primate, Anatomical Similarites and Dissimilarities between Man and Ape

18.1

18.2 Man as a Primate

Humans are placed within the order of primates within mammals. Primates lack a general specialization to describe them, and are characterised based on the series of evolutionary trends given by Clark. The following characters of man as a primate can be noted.

1. Primates have prehensile limbs adapted for arboreal life

2. Either the thumb or great toe or both are opposable.

3. They bear flat nails upon their digits, making grasping function of hands and feet easier.

4. They have well developed clavicle.

5. The orbits are completely surrounded by bony rings.

6. Dentition is diphyodont and heterodont, with different teeth to perform different functions.

7. Fewer offsprings, generally one at a time, with an efficient gestational process.

8. There are two pectorals located mammary glands.

9. There is pendulous penis and the testes are descended into the scrotum.

10. The stomach is simple.

11. Binocular vision and presence of bony eye sockets is observed.

12. Increased ability for adaptation to diversified ecological conditions is the most significant characteristic of man, highest being seen in man amongst all primates.

18.3 Living Primates

SUB ORDER	INFRA ORDER	SUPER FAMILY	FAMILY	SPECIES/ SUB FAMILIY	DISTRIBUTION	CHARECTERISTICS
Prosimii	**Lorisiformes**	**Lorisoidea**	**Lorisidae**	lorisids (14 species)	Central Africa, South and South East Asia	Large eyes, small ears, little or no tail; Nocturnal, Arboreal, Slow creatures. Length -17 to 40 cm, Weight- 0.3 and 2 kg. Dental formula: 2.1.3.3 / 2.1.3.3

			Galagidae	galagos (19 species)	Continental Africa	Large Eyes, Strong Hind Limbs, Batlike Ears, long tail; Fast, Agile, Nocturanl creatures. Remarkable Jumping abilities. Dental formula: 2.1.3.3 / 2.1.3.3
	Lemuriformes	**Lemuroidea**	**Cheirogaleidae**	dwarf lemurs (34 species)	Madagascar	Lemurs are Nocturnal, primarily arboreal, with size as small as 13 cms in case of Dwarf lemurs which are the smallest primates and aye-aye which grows upto 3 feet which is the largest nocturnal animal. They have long tails and known for their
			Daubentoniidae	aye-aye (1 species)		
			Lemuridae	ring-tailed lemur(21 species)		
			Lepilemuridae	sportive lemurs (26 species)		
			Indriidae	woolly lemurs (19 species)		

						jumping prowess. Dental formula: 2.1.3.3 / 2.1.3.3
	Tarsiiformes	**Tarsioidea**	**Tarsiidae**	Tarsiers (11 species)	South East Asia	Enormous Eyes, eyeball is 16 mm in diameter and is as large as its entire brain. Body length- 10-15 cms, tail- 20-25 cms. Nocturnal. Dental formula: 2.1.3.3 / 1.1.3.3
Anthropoidea	**Platyrrhini**	**Ceboidea**	**Callitrichidae**	marmosets and tamarins	Central, South America	Mid sized, ranging from 14 cms long, 120 gms weight-pygmy marmoset (world's smallest monkey) to 70 cms long, 15 kgs weight-southern muriqui. They have
			Cebidae	capuchins and squirrel monkeys		
			Aotidae	night or owl monkeys		
			Pitheciidae	titis, sakis and uakaris		
			Atelidae	howler, spider, woolly spider and woolly monkeys		

						flat noses which is a major distinction from old world monkeys & have prehensile tails. Opposable thumb is absent. Arboreal. Dental formula: 2.1.3.3 / 2.1.3.3
	Catarrhini	**Cercopithecoidea**	**Cericopithicidae**	Cericopithecinae Colobinae (langurs)	Africa & Asia	Medium to large size, have tails but not prehensile. Nostrils face sideways. Partially omnivorus, matrilenial in natural. Gestation period of 5-7 months. Dental Formula: 2.1.2.3 / 2.1.2.3

		Hominoidea	**Hylobatidae**	Gibbons (17 species)	South East Asia	Smallest Apes, upto a height of 3 feet. Use Brachiation for locomotion, they are the fastest tree dwelling mammals. Arms excessively long when comparision with legs. Great toe is far apart from other digits helping in grasping branches. No opposable thumb. Cranial capacity- 76-90 cc. Dental Formula: 2.1.2.3 / 2.1.2.3
			Pongidae	Gorillas (2 species)	Equitorial Africa	Largest Ape weighing upto 270 kgs and height of 5'11"feet.

						Knuckle walking for motion. Has most human features among all the apes. Human gene sequences differ only 1.6% on average from the sequences of correspon ding gorilla genes, Opposable thum present, can walk erect sometimes . Spend most of the time on ground. Cranical capacity- 450-550 cc. Dental Formula: 2.1.2.3 / 2.1.2.3
				Orangutans (2 species)	Borneo & Sumatra	Arboreal, Cautious Brachiator, weight

						upto 90 kgs and 5 feet long. Great toe is small and opposable, No hair found on face, ears, palm, soles. Forearm much longer than upper arm. Solitary lifestyle. Cranial capacity- 416 cc. Dental Formula: 2.1.2.3 / 2.1.2.3
				Chimpanzees (2 species)	Tropical Africa	Body proportions of chimpanzees show tendecy towards humans reaching a maximum height of 5'6" feet and 70 kgs. Generally knuckle walk but

						can walk upright while carrying objects in hands. Poor supraorbitals. Thumb is small and opposable. No hair on face, hands and feet. Polyandrous mating behaviour. Cranial capacity- 400 cc. Dental Formula: 2.1.2.3 / 2.1.2.3
			Hominidae	Humans (1 species)	All over the World	Erect posture, Bipedal locomotion, Complex brain, Power of speech makes humans unique in the animal kingdom. Arms became shorter,

						legs enlarged, great toe not opposable, well developed heel. Parabolic dental arcade, foramen magnum situated in the centre of the skull, well developed chin, diminished canines, modified molars for grinding. Snout vanished, sense of smell diminished, power of sight increased, steroscopic vision, rectangular orbits, bulging forehead are some of the distinguishing charecteris

						tics of humans. Cranial capacity- 1300-1450 cc. Dental Formula: 2.1.2.3 / 2.1.2.3

18.4 Anatomical similarities and dissimilarities between Man and Apes

	SIMILARITIES	DISSIMILARITIES
Chimpanzee and Man	1.Skull and Pigmentation of Body. 2. Chest proportion of Chimpanzee	Canines

Orangutan and Man	1.High forehead 2. same number of pair of ribs.	1.shortness and degenerate character of legs. 2. Adoption of feet for suspension.
Gibbon and Man	1.Length of legs. 2. erect gait	1. excessive arm lengths 2.general size 3. Pelvis 4. Hands and feet 5. Length of canine teeth 6. Size of brain
Gorilla and Man	1.Hands 2. Feet 3.Pelvis 4.Size of brain.	Massive Jaws of gorillas

Skeletal Changes due to Erect Posture and Its Implications

A. Skull- skull well balanced on first vertebra, foramen magnum centrally placed

B. Vertebral column - elastic ligaments between vertebral lamina, four alternative curves, extensor n spinal muscles in de direction of spinal process

C. Thorax- transverse diameter more than dorsoventral diameter

D. Pelvis- ileum has become short, sacral part enlarged, head of femur enlarged, acetabulum thicker n larger, n it is centrally placed

E. Limbs- kegs longer dan arms to withstand body weight

F. Femur - muscle attachments n ridges more sharply defined. Linea aspera is a characteristic feature of humans

G. Foot- less opposibility of graat toe, shock absorbing arches, medial n lateral arches, calcaneum larger n stronger, wedge shaped development of other tarsal bones

Phylogenetic Status, Features, Spatial Distribution, Cultural Characteristics and Differences among:

20.1 Australopithecines- Australopithecus (Gracile)

Australoplithecines:
The fossils of Australopithecus were found at different places in Africa and outside Africa. It is a small brained bidep with a number of species within the same genus. Most of these variants are associated with savanna living.

Divided into two groups
1. **Gracile:**
- It is considered to be an ancestor of Homo
- Small and gracile in terms of body weight, skeletal features like dentition, facial musculature and cranial capacity.
- Omnivore and probable tool maker. Feebly developed supra orbital ridges proves his diet

It includes
1. A.Anamensis: Earliest Australopithecus species found in Northern Kenya
2. A.Afarensis:
- found at Lateoli in Tanzania and Hadar in Ethiopia
- human like footprints found at lateoli which confirm them to be bipedal
- Large ape like canines but did not fit into diastema. Thus side to side movement of lower jaw was possible
- A complete skeleton of gracile female called Lucy fossil was discovered by Donald Johnson at Hadar(Ehtiopia)

3. A.Africanus (Southern ape of Africa)
- First Australopithecus to be discovered. Raymond Dart
- Taung fossil: Juvenile fossil, Foramen Magnum located underneath the skull indicating bipedalism and erect posture, incisors and canine teeth were short like humans
- Initially it was difficult to conclude on Australopithecus Africanus features based on child fossil but later discoveries by Robert Broom at Sterkfontein and others at Makapansgat helped in deriving a complete picture:
- Brain case is rounded, well developed forehead, moderate brow ridges.

2. **Robustus or Paranthropus**
- Large and robust with features such as supra orbital ridges and sagittal crust
- Larger dentition
- considered to be extinct with changing climate

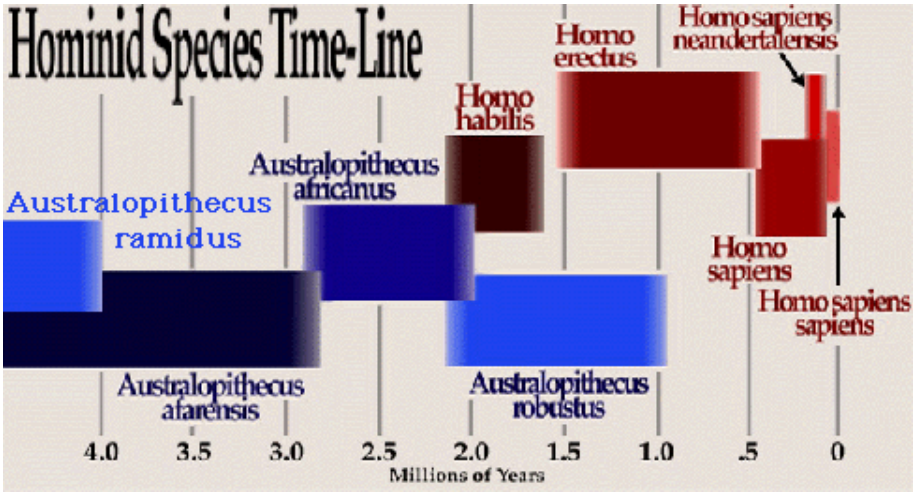
It includes
1.A.Aethiopicus: earliest known robustus found in North Kenya and South Ethiopia
2.A.Robustus: discovered by Robert broom at Kromdraai. It is found to be living at the same time of A.Africanus though they have marked different hominid features.
3.A.Boisei or Zizanthropus: Discovered by Louis Leakey at Olduvai Gorge in Tanzania.The discovery demonstrated the presence of early hominids in east Africa.

Geographical disrtibution:

South Africa:
Gracile:
1.Taung - A.Africanus
2.Sterkfontein - Plesianthropus Transvellenis
3.Makapansgat - A.Prometheus
Robust:
4.Kromdraai - A.Robustus
5.Swartkrans - Paranthropus Crassidens

East Africa:
1.Omo(ehtiopia) - both gracile and robustus
Gracile:
2. Hadar(Ethiopia) - A.Afarensis
3. Laetoli(Tanzania) - A.Afarensis
Robusutus
4.Olduvai(Tanzania) - A.Boisei

20.2 Homo Habilis

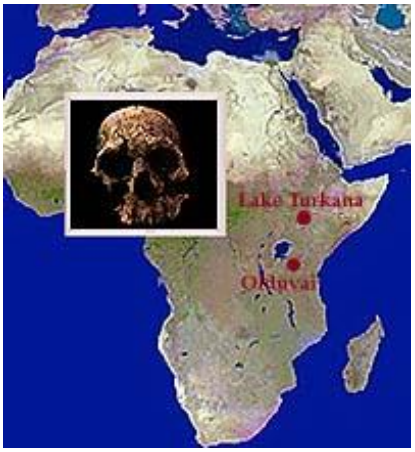


***Homo habilis* (ca. 2.5-1.6 mya)**

- The earliest member of our own genus *Homo*
  - is *Homo habilis*,
  - who lived 2.5-1.6 million years ago
- Its remains were first found at Olduvai Gorge,
    - Tanzania,
  - but it is also known
  - from Kenya, Ethiopia, and South Africa
- *H. habilis* evolved from the *A. afarensis* and *A. africanus* lineage

  - and coexisted with *A. africanus*
  - for about 200,000 years
  - Only a few fossil remains have been discovered so far, but these specimens exhibit a clear trend toward larger brain size.
  - **H. habilis** brains are about 30% larger than those of **A. africanus**.
- Brain size much bigger than Aus. (500-800)
- Teeth smaller, thinner enamel, more parabolic dental arcade.
- Skulls rounder, less prognathic, jaw muscles reduced.
- East and South Africa, same time as robusts.
- Handyman, associated with Pebble choppers (more later).

***H. habilis* finds**



Sexual Dimorphism

- Males were much larger than females,
- The male is pictured on the left.
- Sexual dimorphism in habilis is expressed in significant size differences.

First Stone Tools:
Oldowan Pebble Choppers

Tool Technology

- Oldowan Pebble Choppers
- rounded pebbles
- portions broken to form sharp edge
- flakes used for butchering

Behavior

- Meat eating
- Home base, food sharing, sexual division of labor.
- Archaeological evidence
  - Animal bones and stone tools at sites (Olduvai)
  - Hunting or Scavenging?

- ***Homo habilis***
- Height1.0 metres
- Physique Relatively long arms
- Cranial Volume 500 – 650
- Known Date2.0 – 1.6 million years ago
- Distribution Eastern & S? Africa
- Skull form Relatively small face; nose developed
- Jaws/Teeth Thinner jaw; smaller, narrow molars

20.3 Java man & peiking man

Homo erectus lived for more than one million years and spread from Africa to Asia . The fossils obtained were nick named as Java man and Peking man based on the location from which they were obtained .

Java man

· The discovery of Java man was first major Hominid find and helped understand the evolution and anatomy of early man. Its extinct remains were found in Java, Indonesia

General features

· They weigh around 70kg .

· Height : ~170cm

Anatomical features

· Skull : small in size with complex supra orbital region and broad , rounded occipital region

· Cranium : dolicocephalic with lower cranial vault And complex cranial sutures

· Forehead : receding , flat

· Teeth : smaller canines but largess incisors and molar. Diastema occurs in upper dental arch . They r essentially human with partly ape like features (overlapping canines)

Peiking man

Peiking man is an extinct hominid species of H. erectus , known from the fossils found in a village in Beijing. The story of the famed Peking Man fossils is one of discovery and loss.He is considered as ancestor of Chinese people . He post dates Java man

General characters

· Weighs around ~50 kg and shorter in stature than Java man

Anatomical features

· Skull : large in size with heavy continous forrows separating forehead from supra orbital region

· Cranium : Dolicocephalic , has cranial capacity nearing modern man

· Forehead : receding but has bump like development

· Teeth : essentially modern , though with large canines & molars

· Limb bones : almost like modern man

Tools of H.erectus

· Used more advanced, sophisticated tools as hand axes . Mostly acheulnian tools

· Tools associated with Java man are yet to b found but tools of Oldowan-technology are found in Java.

With better foraging and hunting skills they could exploit the environment . Judging by their long duration of stay it can b concluded that they were better adapted group.

Neanderthals:

The term 'Neanderthals' is derived from an assemblages of fossils found in Neander valley of Germany. There are two types: Classical Neanderthals and Progressive Neanderthals.

- Time Period: Appeared during third interglacial period from arounf 1,20,000 years ago to 30000 years ago
- Height and Weight: Male: 164-168 cms, 77 kgs; Female: 152-156 cms, 66 kgs
- Distribution: Mostly in Europe, Central Asia and Middle East

The main differences between Classical and Progressive types are in the skull. Both have similar post cranial features. The differences in the skull are:

Character	Classical Neanderthals	Progressive Neanderthals
Cranial Capacity	1600 CC	1400 CC
Skull	Large and broad	Long and less broad
Cephalic Index	Lower	Higher
Vault of skull	Lower	Higher
Forehead	Receding	Less Receding
Occipital Region	Protruding	Less Protruding
Supra Orbital Ridge	Large and continuous	Large and separation in middle
Orbits	Less rounded	More rounded
Upper Jaw	Projecting	Not Projecting
Nose	Broad and Large	Less Broad
Chin	Absent	Well Developed
Teeth	Always Large	Not always Large
Body Built	Stocky	Medium
Face	Long and Prognathic	Medium to short
Surface of Skull	Rough	Less Rough

Post Cranial Features are:

- The vertebral column was short and stout
- Ribs were strong indicating large thorax

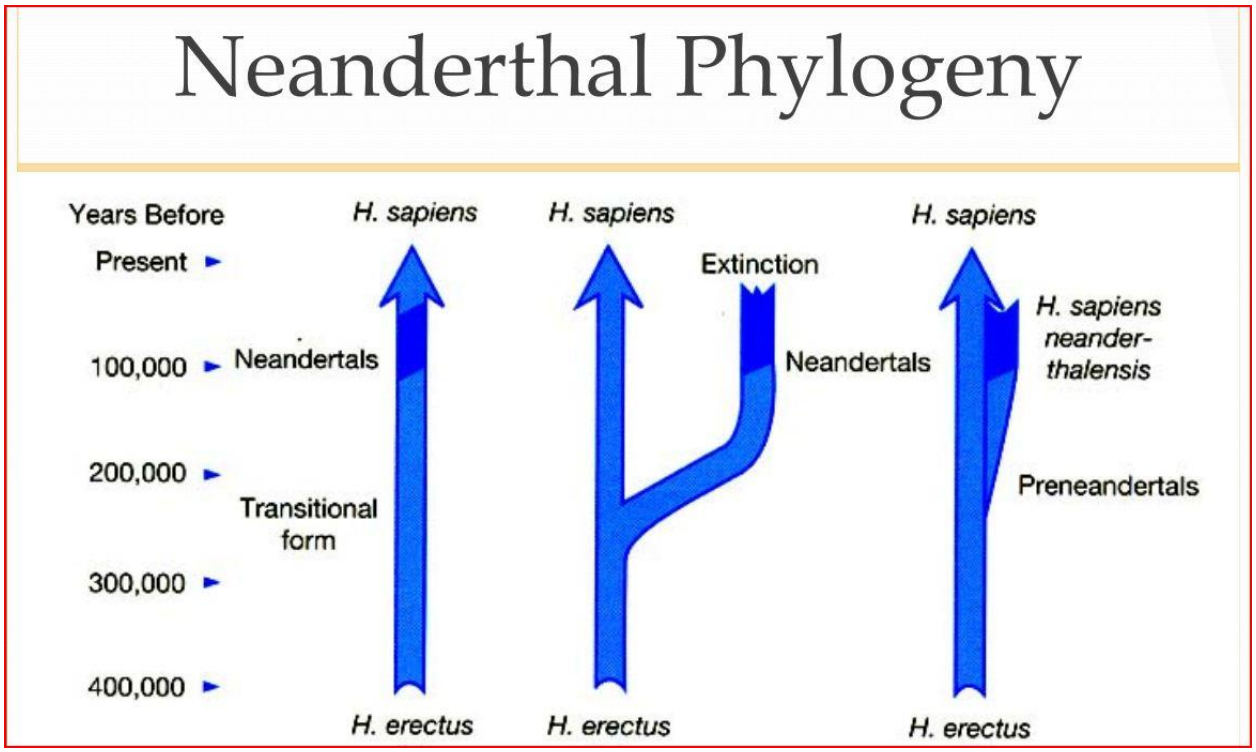
- Limbs were shorter but stouter with powerful muscular attachments which was characteristic of Neanderthal man.
- Fingers were large and robust
- Femur was strong.

Cultural Characteristics:

- The flake industry of Mousterian tool technology always accompanied Neanderthal skeletal remains. It had smaller proportion of core tools like cleavers and hand axes and bigger proportion of small flake tools like scrapers. Some tools like Points might have been hafted or attached to shaft. Tools were involved in killing and butchering of animals and processing that food,
- As ice sheet advanced into plains of Northern Europe people started living in Cave or rock shelters. These shelters are made comfortable for winter living by covering them with animal skins. Fire is regularly lit for warming and cooking.
- Winter clothing: Recovery of Bone needles prove beyond doubt that Neanderthals tailored clothes which became very essential due to glacial climate.
- Bear-cult: In a number of excavated caves the skulls of bears are placed in a rectangular lined pit covered with an enormous slab. Thus the big brown bear might have been an object of great reverence.
- Language: Language development os doubtful as the pharynx is poorly developed which show their inability to pronounce vowels.
- Ritualistic Burials: At certain places ritualistic burials with animals are indicated where dead body is associated with goat or bear skull. Many times bodies are accompanies with burial offerings such as flint tool kit and food offerings. Family cemeteries are also found.
- Society and Religion: Group activities such as hunting, migration might have led to formation of nomadic society with inter personal relationship. This might have paved way for leadership and political system. To keep society in harmony some sort of religion must have appeared.
- Neanderthals Philosophy: Neanderthals perhaps had awareness of dignity of individuals and interdependence of individuals and society.

Phylogeny:

There is a lot of controversy regarding the phylogenic position of Neanderthal. There are a number of theories best represented by a diagram below:



Rhodesian man

In 1921 t.twigelaar found human remains in broken hill mine rhodeisia in south Africa.

It consisted of a skull with lower jaw , parts of femora, a tibia, a sacrum, portion of 2 pelvis and some fragments of other individuals. It belongs to upper Pleistocene period.

Tools had variations from olduvian to la Mousterian tool culture(predominance of flake tools)

Features of skull is very long and narrow, height is about 131cm

Cranical capacity around 1250 to 1400cc

Forehead receding and supra orbital ridge are prominent

Nasal aperture is very large

Orbit are high and great size

Teeth are of modern proportion. Canine is normal

He exihibits feature of neandertal and modern sapiens and therefore considered intermediate

Cro-magnon man

1.old man of cromagnon, first discovered in 1868 in the cromagnon cave in france by Lartet. Its estimated to be 30-40 thousand years

2.aurignacain culture of upper Palaeolithic consisting of bone and stone tools, cave painting sculpture and female figures. The tool culture is called reindeer culture , there was evidence of fishing

3.burial practise was elaborate in cromagnon people, cave painting were elaborate.

4 cranial capacity 1500 to 1650 cc

5.skull was dolicosopaly

6face and skull present a disharmony

7.craium is pentagonal in shape with wide rectangular orbit, bulged occiput .

8.strong and prominent face bones, long and narrow nose and well developed chin

Post cranial feature

9.well developed linear aspera, the bone texture indicates muscular individuals

10 stature 169 to 182cm (limb portion indicate negroid but overall he resembles more to caucosids)

22.1

Homo Sapiens- Cro Magnon Man, Grimaldi Man, Chancelade Man

23.1 Grimaldi Man, Chancelade Man

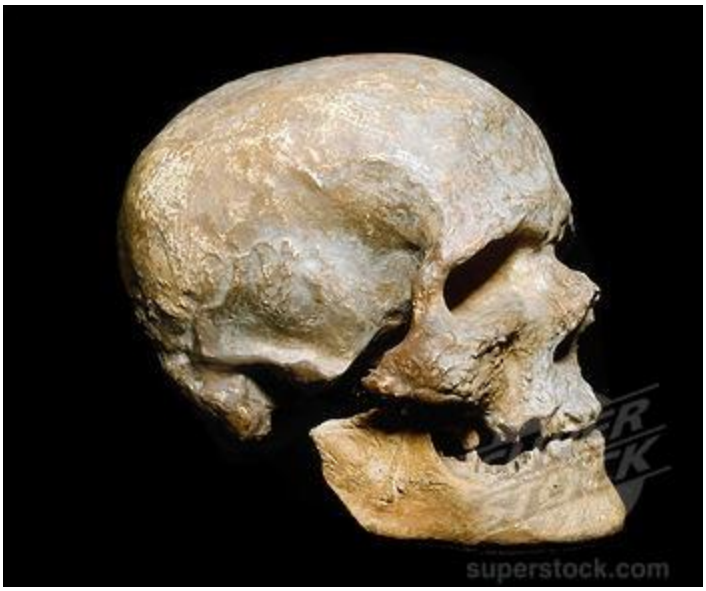
	Grimaldi Man	Chancelede Man
1. Discovery	At Grotte Des Enfants cave, near Grimaldi village on mediterranean coast, In Italy	At Rock shelter in Chancelede, Dordogne, France in 1888
2. Skeletons	Woman of 30 years, Boy of 15 years; Stained in red ochre implies intentional burial	Old man with arms folded and knees doubled up against body; Stained in red ochre implies intentional burial
3. Physical similarities with	Negroid; Acc to Prof Sollas and Boule - with Bushmen and Hottentots	Eskimos

4.Time & technology	Upper Paleolithic, Aurignacian	Upper Paleolithic, Magdalanian
5. Culture	Grave material has tools like double edged flints, knives, gravers, saws etc	Tools of ivory, bone, antler. Blades and harpoons were dominant. Evidence of cave paintings
6. Cranial features	cranial capacity 1250cc - 1450 cc ; Sexual dimorphism seen	cranial capacity 1530 cc(Keith), 1710 cc(Testut)
	skull has elliptical contour	
	small mastoid process	well developed mastoid process
	long, narrow and high skull - hyper dolicocephalic	dolicocephalic dkull with sagittal crest
	face- large and short, narrow at chin; disharmonic face	face: wide and long ; prominent cheek bones
	feeble supraorbital ridges	supraorbital ridges slightly developed
	bulbous forehead	vertical forehead
	large and rectangular orbits	quadrilateral orbits
	platyrrhine	leptorrhine
	alveolar prognathism	
	strong and broad jaws	body of lower jaw is narrow, broad at the joint with skull
	teeth are large in general	lower teeth are not very large
7. Post cranial features	Lower limbs much longer than upper limbs, so less energetic bipedalism	Upper limbs comparatively longer than lower limbs - eskimo feature
	shaft of femur is strongly bent	femur bent and linea aspera well marked
	short stature	short stature

Grimaldi Skull

Chancelede skull

Cro Magnon skull



Paleolithic

Lower Paleolithic

- Occurs in Pliestocene epoch.
- Rugged tools which were heavy and unsophisticated.
- First tools found in oluvian region of East Africa.

Tool Culture:

1. Hand axes:

Pear shaped tools with cutting edge narrower than the butt. The evidences of Chou-kou-tian show that the tools must have been used for hunting big animals. Chellean, Abbevellian and Acheulian are the three kinds of hand axes found. Abbevellian and Acheulian were later in time to chellean hand axes.

2. Cleavers:

They have a broader cutting edge and are generally found along with Acheulian culture region

3. Pebble tools:

Chopper and chopping tools which were used for cleaning the hides and scrapping the barks for covering bodies.

chopper tools have unifacial cutting edge whereas chopping tools are bifacial.

Found in Burma, east Africa and India.

Oluvian culture: Coexistence of pebble tools and hand axes.

Materials used:

Hand axes were made with pressure flaking of quartzitein India, china and Java.Further, Metamorphic rocks in India, sedimentary rocks in Europe.

Lifestyle:

- biological evolution during this period was Homoerectus.

Emergence of perfect bipedalism aided the manufacturing of tools and big game hunting.

- Social aspects:

Glynn Issac opined that enculturation process continued as in Great apes with more details.
"Man and Hunter model" proposed by Issac and Leaky propounded that factors like physical strength and requirement of long duration of time for hunting made man involved in big game hunting. The female was involved in child care and thus institution of family evolved.
Jane Goodall rejected the man the hunter model and gave examples of chimpanzees, Gllanas of Kalahari where female were involved in food collecting.

Middle Paleolithic

Tool culture: Flake tools
1. Burin: used for engraving
2. scrapper: scrapping barks of tree and dressing the hides
3. Points: Manufactured by levallosian method or simple pressure flaking. are or various shapes and sizes. Large sized points were used as arrow head and small ones for fishing.
4. Borer: to drill holes.

Lifestyle:

- Biological evolution was Neanderthal man who lived in rock shelters and caves for the access of stone.
- Belief in supernatural powers evident from burial practices.
- Belief in after life as skulls wwere places in particular directions along with tools
- In shanidar fossils were found along with flowers indicating intentional burial.

Upper Paleolithic

Blade tools and use of non-lithic material.
Tool material was bone and ivory along with stone.
Tool culture
1. Aurignatian or Blade-Burin culture:

- Discovered at La Aurignae.
- found knife blades, engraved blades, burin
- Sub species associated with this culture was Cromagnon.

2. Solutrian or Needle culture:

- discovered at Solutre
- flakes and needles both eyed and uneyed
- Cromagnon

3. Magdalanian culure or Art form culture:

- La Magnalene
- flake tools made of bones with art forms engraved which indicate their beliefs and lifestyle

- Ivory and horn were used extensively
- many of the evidences were in colder climate and there was dependence on reindeer.

Lifestyle:
- emergence of hunting and fishing societies
- use of animal hides to cover bodies
- building of shelters using bones and horn
- It is believed that language in a rudimentary form emerged
- social political life resembled band organisations.

Mesolithic Age (Middle Stone Age)

 Period during which early humans began to control fire and develop language (11,000 – 6,000 B.C.) Mesolithic Age (Middle Stone Age)

Mesolithic Age - Middle Stone Age (11,000 – 6,000 BCE) The name "Mesolithic" comes from two separate words, Mesos=Middle and Lithos=Stone.
Mesolithic Age is a period of transition from Old Stone Age to the New Stone Age. .
 MAIN FEATURES OF MESOLITHIC AGE

- Mesolithic Age is basically the blend of two societies, existing almost at the same time according to their immediate environment;
- Pastoral Societies.
- Horticultural Societies.
- Not only use stones but bones,
    - Bows and arrows
    - Fish hooks
    - Harpoons
- Characteristics:
- 1) formation of forests after melting of ice caps
- 2) started to depend on rivers
- 3) started domestication of animals

 MAIN FEATURES:

- Horticulture is technology based on using hand tools to cultivate plants.
- Pastoralism is technology that supports the domestication of animals.
- Both of these strategies are capable of producing material surpluses.
- Farming communities began to be established. During this period, humans hunted and fished, and began to learn how to domesticate animals and plants. The late Mesolithic hunters are now known to have developed pottery (ceramic objects) and a sedentary lifestyle.

 LIFE STYLE OF THE PEOPLE

- Such a large span of time involves quite a bit of variety.
- Cultures included: gradual domestication of plants and animals, formation of settled communities. People started living in huts instead of caves.

 MESOLITHIC HOUSE

 MAIN FEATURES:

- 1. Hunter-gatherers began to store food in containers (Surplus food).
- 2. Less reliance on large mammals for food -- more on fish.
- 3. Domestication of animals began with domestication of dogs.
- 4. Use of animals and much developed tools, instead of human, emerged in the field of cultivation. Slash and burn technique used by horticultural societies and use of stick and hoe for cultivation.

 You would find farming tools, such as a stone hoe, during this time period.

- 5. Animals became smaller in size and faster than before, so human had to develop his stone tools (Microliths) and weapons made of bones and wood, in a lighter and more practical form, also some personal ornamentation and daily use items such as combs.

 TOOLS USED

- Mesolithic tool kits were based on chipped stone and often include microliths (very small stone tools)

 MAIN FEATURES:

- War fear was frequent as compare to Paleolithic age, as they used to quarrel over animals, pastures (in the desert areas), land (for cultivation) and water.

- Religion:

- In that period several religions were followed, mostly Islam, Judaism, Christianity were followed. (Ancestors worship was also followed)

- Nomadic / Sedentary:

- The people of this age were Nomadic as well as sedentary according to their surroundings.

 Mesolithic Age vegetation
 9. SOCIAL COMPLEXITY:

- In this age people started to form a leader ship to combat war fear and to resolve their problems. (Governance started).

- They started to elect their leader politically, which was authorized to take decisions and was powerful enough to punish any one on behalf of his people.

 10. EDUCATION:

- Education was informal and was not institutionalized.

- Children used to learn from their elders as well as their own experiences.

- 11. MALE DOMINENT:

- During this age males started dominent as food production was mainly the job of males.

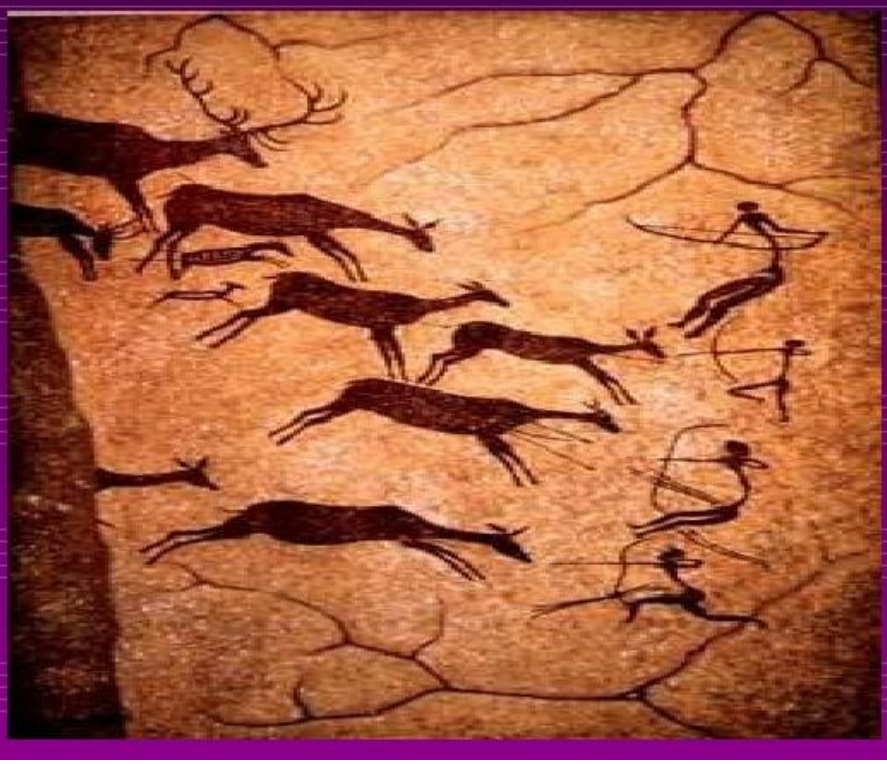
 Review – Prehistoric Art
Three periods of Prehistoric Art .
Paleolithic Art – Cave Paintings, Venus figurines.

Mesolithic Art – Simple, no figures, only red used.

Neolithic Art – Figures, Pottery and Megaliths.

 Mesolithic Art: The rich art of the Paleolithic is replaced by a Mesolithic art with many changes in style as well as meaning. Paleolithic cave art depicts colored drawings and expressive features of animals. A full range of color is used. Mesolithic art in contrast is schematic; no realistic figures are present and only the color red is used.

Bowmen and Deer, Cliff Painting
Los Caballos, Spain,10,000-9000 BC



Neolithic revolution

The concept of " Neolithic revolution" was propounded by Gordon. Childe in his book , New light on most ancient . Though it's called revolution it doesn't imply a single catastrophic change but his change was actually a gradual progress that began centuries earlier . So , it's generally treated as a 'transformation ' or 'evolution ' rather than revolution

CHANGES WITNESSED :

1. Food : hunting gathering to food production

2. Technology : complex . Different instruments for producing cereals , oil seeds etc.

3. Lifestyle : nomadic to sedentary . Establishment of small towns , monopolisation of land by the ones who came earlier ie , renters & owners . Later increase in population

4. Society : for the first time rich & poor classes ie land possessing - rich & those who don't have land - poor came up ; socio economic stratification & inequality

5. Specialisation : with increased technology people had leisure time . New skilled professionals as pot making , weavers , tool making came up

6. Political life : with increased means of production , land controlling power with his supporters base began assuming political authority.

7. Religion : complex . Hitherto dependent on nature but now with planting seeds , attributed the power to germinate to ' Mother Goddess'

Later multiplied Gods , each one being offered special rituals

Thus with favourable changes in climate and advancement of technology Neolithic phase phases showed remarkable changes.

Bronze Age

The Bronze Age is the period in that society when the most advanced metalworking happened by smelting copper and tin into an alloy of bronze and casting them into bronze artifacts. The Bronze Age is the second principal period of the three-age Stone-Bronze-Iron system.

Time period:
Middle East and Egypt: 3150 BC- 1200 BC
Indian Subcontinent: 3300 BC- 1700 BC
China: 2000 BC- 700 BC
Europe: 3200 BC- 600 BC

Characteristics:

- It was the beginning of usage of metal and metal implements by humans
- This time period is marked by usage of bronze, an alloy of copper and tin
- This period is characterized by development of proto writing
- The unorganized settlements of humans of stone age developed into highly evolved civilizations.
- Cities prospered for the first time in human history. Town planning was a characteristic of Indus valley.
- Trade networks developed and giant strides were made in the science of navigation.
- The potter's wheel was invented which had transformed how humans travel.
- Many aspects of social life developed during this period like government, law codes, empires, social stratification, slavery, organized warfare etc.
- One significant lacking in this period was that modern methods of accounting were not available. This led to what many believe that ancient empires were prone to disvalue staples in favor of luxuries and thereby perish by famines created by uneconomic trading

Seima Turbino Phenomenon: The Atlai Mountains in southern Russia and Mongolia have been identified as a point of origin this phenomena. Changes in climate in this region around 2000 BC and the ensuing ecological, economical, political changes triggered a rapid and massive migration westward into northeast Europe, eastward into China and southward into Vietnam, Thailand across 4000 miles. This migration taking place across 5-6 generations led to spread of metal working technologies, horse breeding and riding techniques across the frontiers.

With the discovery of iron technology in the middle of 2nd millennium a revolution in metal working and using followed which led to the end of Bronze Age and inception of iron age.

The biological basis of life

28.1 DNA Replication

DNA replication occurs in the synthesis or S phase of the interphase of cell cycle. It is called semi-conservative type of replication as it results in double helices consisting of one old and and one new strand.

Steps

1. Recongnition of origin: The point where the replication begins whidh is recognized by specific cell proteins.

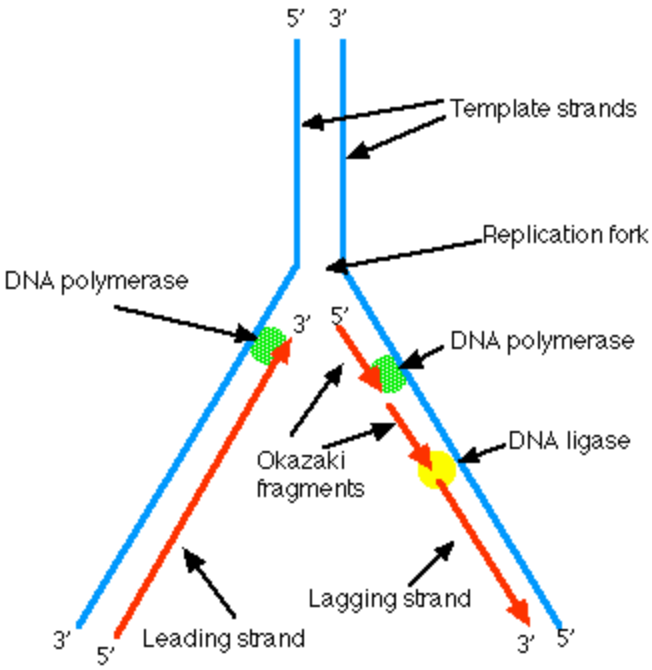
2. Unwinding of the parental duplex: An enzyme called helicase unwinds the DNA by breaking the hydrogen bonds which hold the bases.

3. Holding the template stands apart: some DNa binding proteins bind to the strands to keep them apart and a knot is put a little away from the replication fork.

4. Initiation of new daughter strands: A RNA primer, complimentary to DNA is made in the 5'->3' direction by an enzyme primase. Neucleotides are added to the 3' end of the primer.

5. Elongation: Leading strand: one strand of DNA (3') is elongated continuously to give a leading strand and the synthesis is along the direction of replication. Lagging strand: other strand(5') synthesis is in opposite direction to the direction of replication. This is made of small fragments which are later combined by removing the RNA primers.

6. Rewinding: After replication DNA binding proteins (step 3) are released and each of the two strands rewind separately. DNA thus produced is packed onto nucleosomes and chromatin fibres.



28.2

28.3

28.4 Protein Synthesis

The DNA Code

- The order of bases along the DNA strand codes for the order in which amino acids are chemically joined together to form a polypeptide
- Protein synthesis involves two types of nucleic acids:

    DNA (deoxyribonucleic acid)

    RNA (ribonucleic acid)

RNA

- RNA, like DNA, is a polymer formed by a sequence of nucleotides
- Three Types of RNA:

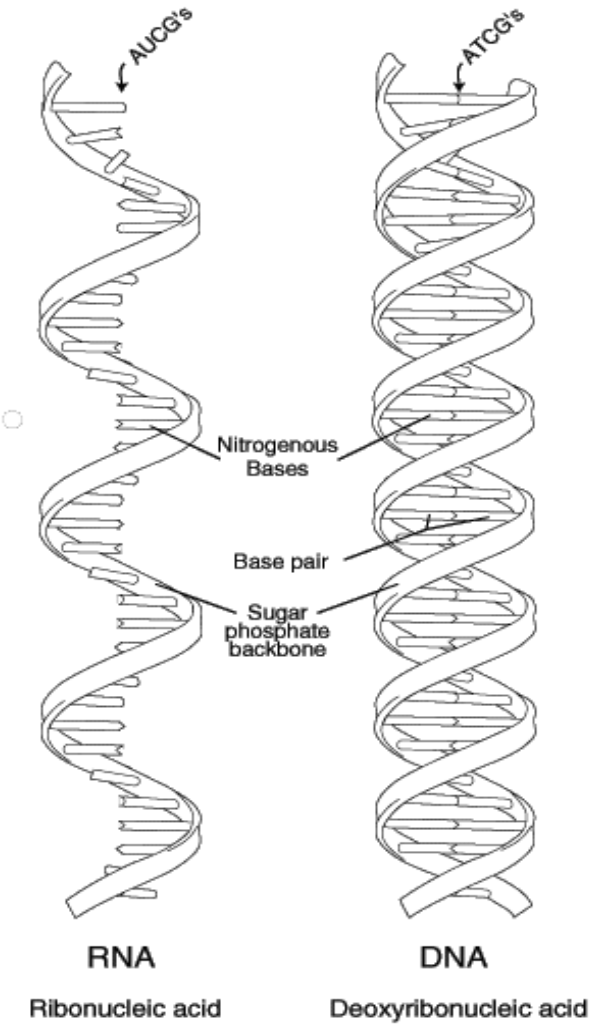
    messenger RNA (mRNA)

    transfer RNA (tRNA)

    ribosomal RNA (rRNA)

Differences Between DNA and RNA

DNA	RNA
double-stranded	single-stranded
sugar = deoxyribose	sugar = ribose
bases = A,T,C,G	bases = A,U,C,G (uracil takes the place of thymine)



Protein Synthesis

involves two processes:

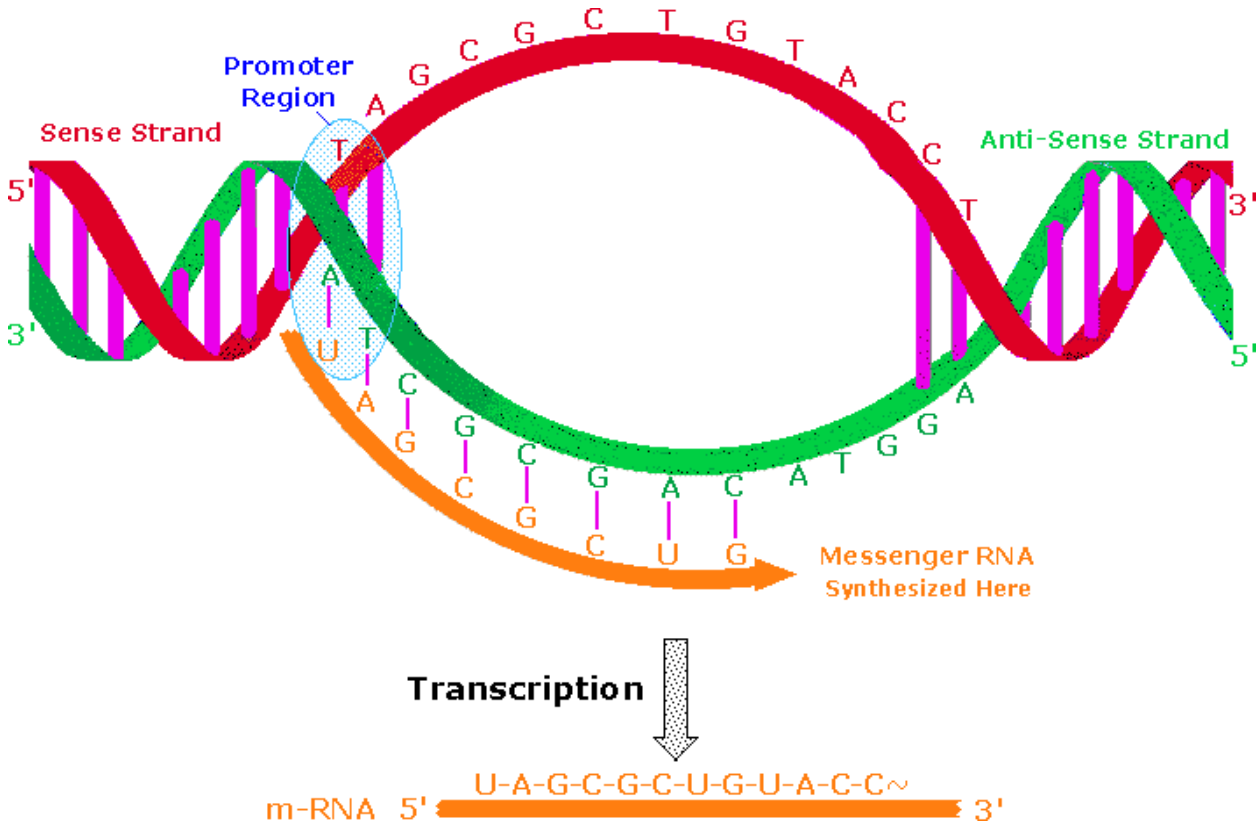
1. **<u>Transcription</u>**: the copying of the genetic message (DNA) into a molecule of mRNA
2. **<u>Translation</u>**: mRNA is used to assemble an amino acid sequence into a polypeptide

Transcription

- occurs in the nucleus of the cell

1) DNA strand separates and serves as a template (pattern) for mRNA assembly

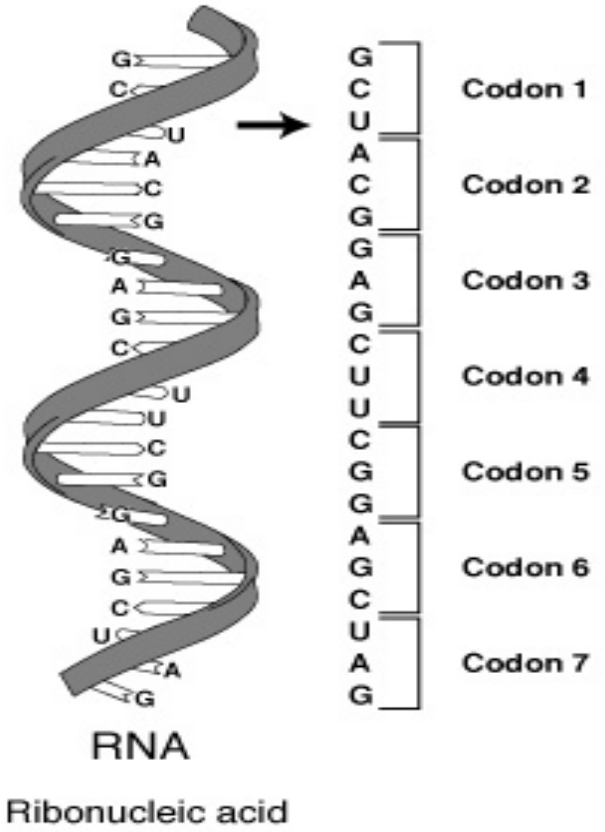
2) free mRNA nucleotides match up to the exposed nucleotides on the DNA strand



3) mRNA strand leaves the DNA strand when a "stop codon" is reached

4) the mRNA strand carries the code for the production of one polypeptide

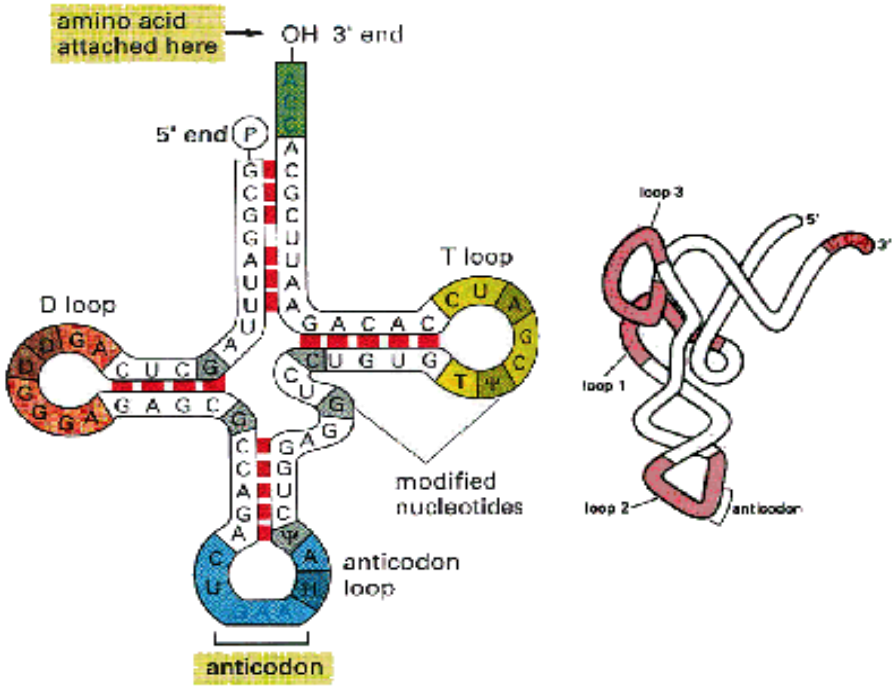
A sequence of 3 bases called a **codon** codes for one amino acid



Translation

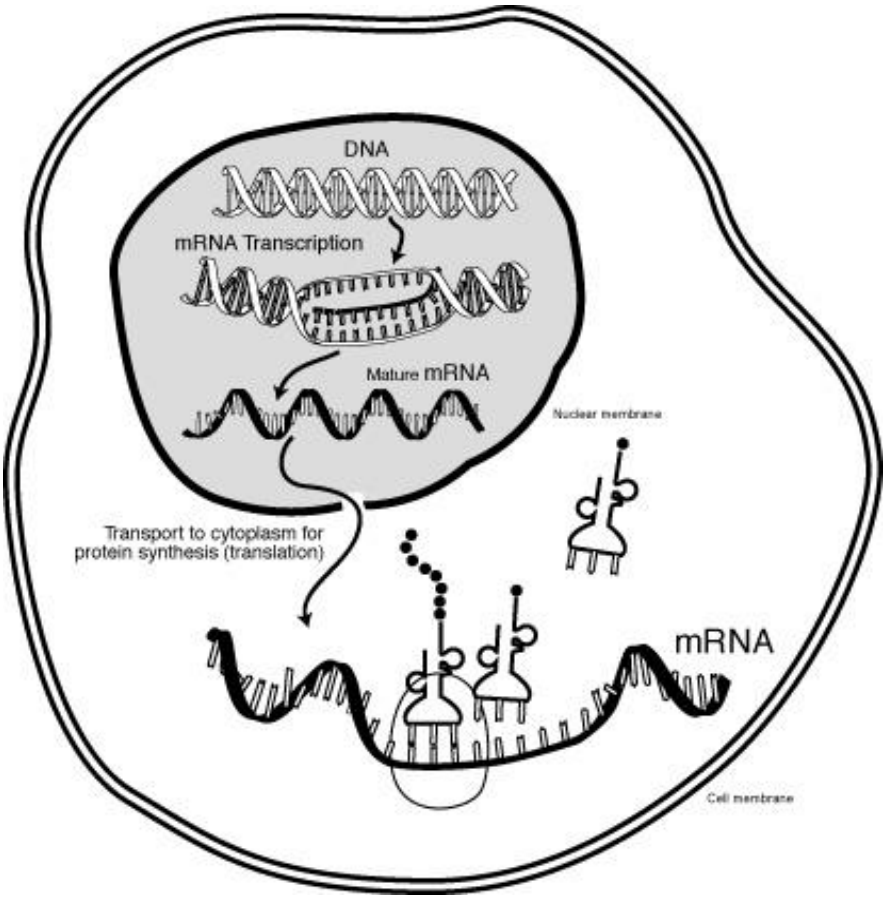
- occurs in the cytoplasm of the cell, at the ribosome
- 1) mRNA moves out of the nucleus and into the cytoplasm to a ribosome
- 2) mRNA is “read” by the ribosome and is converted to a chain of amino acids with the help of tRNA

1st position (5' end)	2nd position U	2nd position C	2nd position A	2nd position G	3rd position (3' end)
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	STOP	STOP	A
	Leu	Ser	STOP	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G



3) As the mRNA moves across the ribosome, tRNAs temporarily attach. The amino acids are joined by a chemical bond by enzymes until a stop codon is reached

4) a polypeptide is produced



28.5 MUTATION

Mutation is essentially an error that occurs in the replication of DNA . Mutations that occur in sex cells pass on to subsequent generations and will be present in all the body cells. Mutations can occur in any part of the DNA, but obviously those that occur in structural or regulatory genes are much more critical than those that occur in noncoding regions or introns .

There are several different kinds of mutations.

1. POINT MUTATION: It occurs when a single base in a gene is changed. They can attribute to number of diseases. Eg : sickle cell disease.It is caused by an abnormal form of the protein hemoglobin. In those with sickle sell disease sixth amino acid(glutamic acid ie CTC) in beta chain is replaced by valine (CAC)

A) INSERTION MUTATION : change in the base sequence of a gene that results from the addition of one or more base pairs in the DNA.

B) DELETION MUTATION : A change in the base sequence of a gene that results from the loss of one or more base pairs in the DNA.

C) “Bad” Mutations : Reduction in the protein’s ability to function, causing mild reduction in fitness If the protein is essential, could be a lethal mutation incompatible with life

D) “Neutral” Mutations: Point mutation that results in codon that codes for the original amino acid. No change in protein structure or No change in protein function

E) “Good” Mutation : it’s a Point mutation. Mutation in regulatory ne that greatly increases production of an enzyme. It might cause mild Increase in fitness and quickly spreads throughtout the population.

2. GROSS MUTATION : Changes occur in more than one nucleotide pair or entire gene .They occur due to rearrangement of genes

Causes of mutations

1. Some mutations occur spontaneously

2. Other mutagens are : radiations as alpha, beta , gamma , UV ; chemicals as colchine , peroxides ; environmental -temperature , light .

Effects :

... Negative : Most of the bad mutations lead to lethal or sub lethal genes leading to number of diseases as sickle cell disease , huttingtons disease etc

...Positive : Good mutations increases organisms chance of surviving and reproducing . The process of natural selection makes good mutations to be spread over thought a population. Once this happens they are no longer called mutation but are just normal or wild type.

Though few mutations are harmful but without mutation, there could be no natural selection.

28.6 MEIOSIS

Most plant and animal cells are diploid. The term diploid is derived from the Greek diplos, meaning “double” or “two”; the term implies that the cells of plants and animals have two sets of chromosomes. In human cells, for example, 46 chromosomes are organized in 23 pairs. Hence, human cells are diploid in that they have two sets of 23 chromosomes per set.

During sexual reproduction, the sex cells of parent organisms unite with one another and form a fertilized egg cell. In this situation, each sex cell is a gamete. The gametes of human cells are haploid, from the Greek haplos, meaning “single.” This term implies that each gamete contains a single set of chromosomes—23 chromosomes in humans. When the human gametes unite with one another, the original diploid condition of 46 chromosomes is reestablished. Mitosis then brings about the development of the diploid cell into an organism.

The process by which the chromosome number is halved during gamete formation is meiosis. In meiosis, a cell containing the diploid number of chromosomes is converted into four cells, each having the haploid number of chromosomes. In human cells, for instance, a reproductive cell containing 46 chromosomes yields four cells, each with 23 chromosomes.

Meiosis occurs by a series of steps that resemble the steps of mitosis. Two major phases of meiosis occur: meiosis I and meiosis II. During meiosis I, a single cell divides into two. During meiosis II, those two cells each divide again. The same demarcating phases of mitosis take place in meiosis I and meiosis II.

As shown in Figure 1 , first, the chromosomes of a cell duplicate and pass into two cells. The chromosomes of the two cells then separate and pass into four daughter

cells. The parent cell has two sets of chromosomes and is diploid, while the daughter cells have a single set of chromosomes each and are haploid. Synapsis and crossing over occur in the Prophase I stage.

The process of meiosis, in which four haploid cells are formed.

The members of each chromosome pair within a cell are called homologous chromosomes. Homologous chromosomes are similar but not identical. They may carry different versions of the same genetic information. For instance, one homologous chromosome may carry the information for blond hair while the other homologous chromosome may carry the information for black hair.

As a cell prepares to enter meiosis, each of its chromosomes has duplicated, as in mitosis. Each chromosome thus consists of two chromatids.

Meiosis I

At the beginning of meiosis 1, a human cell contains 46 chromosomes, or 92 chromatids (the same number as during mitosis). Meiosis I proceeds through the following phases:

Prophase I: Prophase I is similar in some ways to prophase in mitosis. The chromatids shorten and thicken and become visible under a microscope. An important difference, however, is that a process called synapsis occurs. A second process called crossing over also takes place during prophase 1.

During prophase 1, the two homologous chromosomes come near each other. Because each homologous chromosome consists of two chromatids, there are actually four chromatids aligned next to one another. This combination of four chromatids is called a tetrad, and the coming together is the process calledsynapsis.

After synapsis has taken place, the process of crossing over occurs. In this process, segments of DNA from one chromatid in the tetrad pass to another chromatid in the tetrad. These exchanges of chromosomal segments occur in a complex and poorly understood manner. They result in a genetically new chromatid. Crossing over is an important driving force of evolution. After crossing over has taken place, the four chromatids of the tetrad are genetically different from the original four chromatids.

Metaphase I: In metaphase I of meiosis, the tetrads align on the equatorial plate (as in mitosis). The centromeres attach to spindle fibers, which extend from the poles of the cell. One centromere attaches per spindle fiber.

Anaphase I: In anaphase 1, the homologous chromosomes separate. One homologous chromosome (consisting of two chromatids) moves to one side of the

cell, while the other homologous chromosome (consisting of two chromatids) moves to the other side of the cell. The result is that 23 chromosomes (each consisting of two chromatids) move to one pole, and 23 chromosomes (each consisting of two chromatids) move to the other pole. Essentially, the chromosome number of the cell is halved. For this reason the process is a reduction-division.

Telophase I: In telophase I of meiosis, the nucleus reorganizes, the chromosomes become chromatin, and a cytoplasmic division into two cells takes place. This process occurs differently in plant and animal cells, just as in mitosis. Each daughter cell (with 23 chromosomes each consisting of two chromatids) then enters interphase, during which there is no duplication of the DNA. The interphase period may be brief or very long, depending on the species of organism.

Meiosis II

Meiosis II is the second major subdivision of meiosis. It occurs in essentially the same way as mitosis. In meiosis II, a cell containing 46 chromatids undergoes division into two cells, each with 23 chromosomes. Meiosis II proceeds through the following phases:

Prophase II: Prophase II is similar to the prophase of mitosis. The chromatin material condenses, and each chromosome contains two chromatids attached by the centromere. The 23 chromatid pairs, a total of 46 chromatids, then move to the equatorial plate.

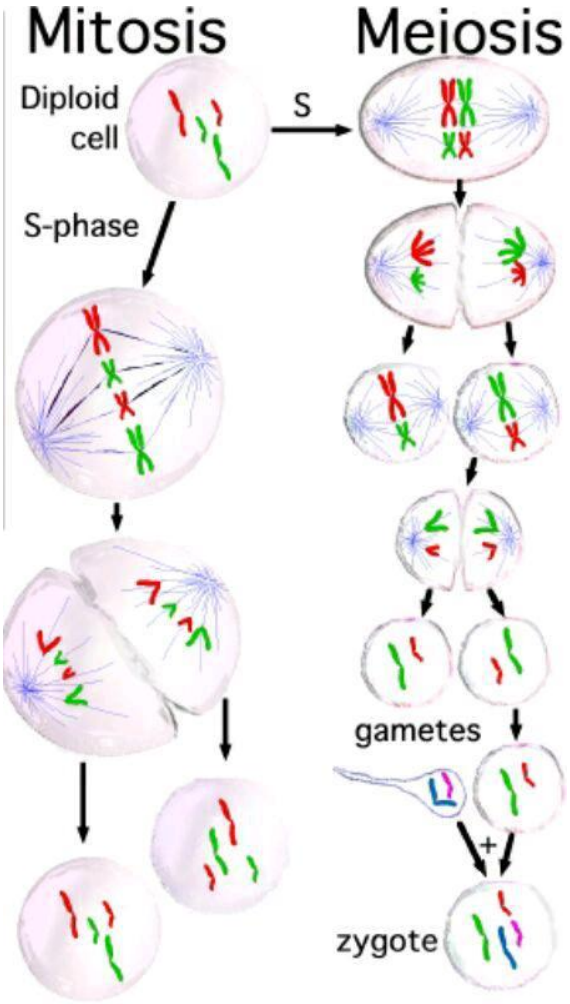
Metaphase II: In metaphase II of meiosis, the 23 chromatid pairs gather at the center of the cell prior to separation. This process is identical to metaphase in mitosis.

Anaphase II: During anaphase II of meiosis, the centromeres divide, and the 46 chromatids become known as 46 chromosomes. Then the 46 chromosomes separate from one another. Spindle fibers move one chromosome from each pair to one pole of the cell and the other member of the pair to the other pole. In all, 23 chromosomes move to each pole. The forces and attachments that operate in mitosis also operate in anaphase 11.

Telophase II: During telophase II, the chromosomes gather at the poles of the cells and become indistinct. Again, they form a mass of chromatin. The nuclear envelope develops, the nucleoli reappear, and the cells undergo cytokinesis as in mitosis.

During meiosis II, each cell containing 46 chromatids yields two cells, each with 23 chromosomes. Originally, there were two cells that underwent meiosis II; therefore, the result of meiosis II is four cells, each with 23 chromosomes. Each of the four cells is haploid; that is, each cell contains a single set of chromosomes.

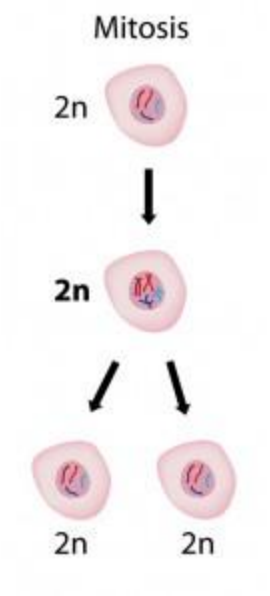
The 23 chromosomes in the four cells from meiosis are not identical because crossing over has taken place in prophase 1. The crossing over yields variation so that each of the four resulting cells from meiosis differs from the other three. Thus, meiosis provides a mechanism for producing variations in the chromosomes. Also, it accounts for the formation of four haploid cells from a single diploid cell



28.7 Mitosis (M Phase):

Mitosis is a type of cell division which produces 2 daughter cells that are genetically identical. It produces daughter cells with the diploid number of chromosomes. It is used for the growth and repair of tissues.

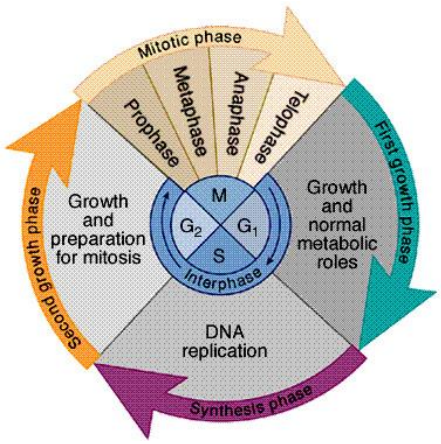
It is called equational division as the no. of chromosomes is same in parent & progeny cells.



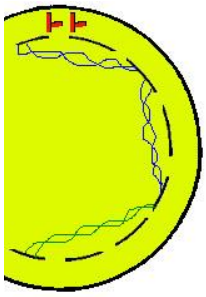
Prior to this phase, the genetic material of the original (parent) cell has replicated during the S phase of interphase, so that when the cell enters mitosis it undergoes four major phases which culminates in the formation of two identical (daughter) cells.

Interphase

- ✓ It is the "resting" or non-mitotic portion of the cell cycle.
- ✓ It is comprised of G1, S, and G2 stages of the cell cycle.
- ✓ DNA is replicated during the S phase of Interphase



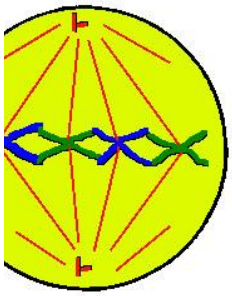
Mitosis is divided into following 4 stages: Prophase, Metaphase, Anaphase & Telophase.



Prophase - the first stage of mitosis.

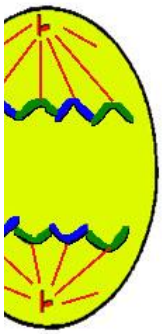
- The chromosomes condense and become visible
- The centrioles form and move toward opposite ends of the cell ("the poles")
- The nuclear membrane dissolves
- The mitotic spindle forms (from the centrioles in animal cells)
- Spindle fibers from each centriole attach to each sister chromatid at the kinetochore

2. Metaphase



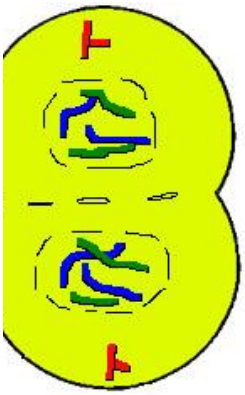
- The Centrioles complete their migration to the poles
- Spindle fibres attach to kinetochores of the chromosome
- The chromosomes are moved to spindle equator & get aligned along metaphase plate through spindle fibres to both poles.

ıase



- Spindles attached to kinetochores begin to shorten.
- This exerts a force on the sister chromatids that pulls them apart.
- Spindle fibers continue to shorten, pulling chromatids to opposite poles.
- This ensures that each daughter cell gets identical sets of chromosomes

hase



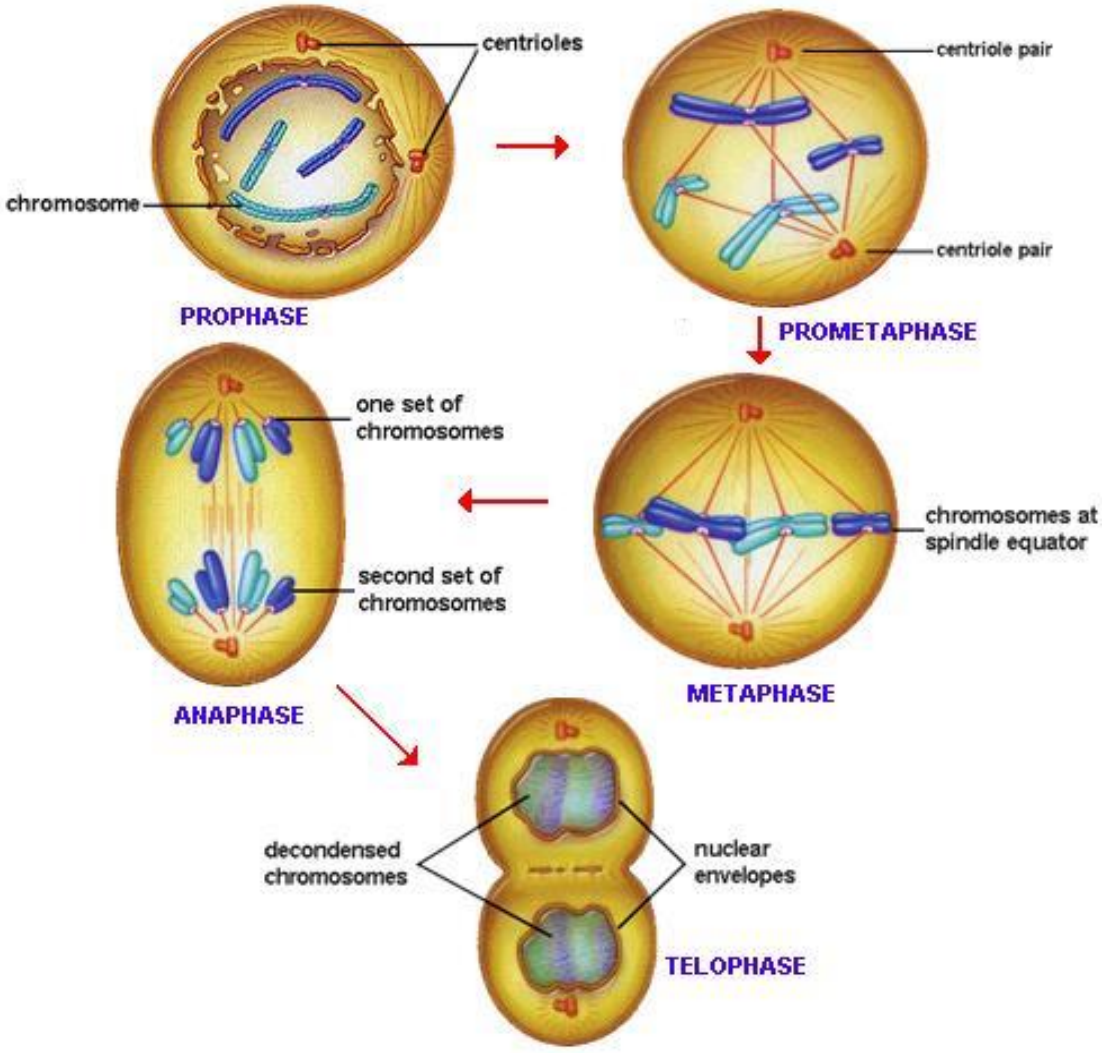
- The chromosomes decondense & lose their individuality
- The nuclear envelope assembles around the chromosome clusters
- Nucleus, golgi complex & ER reform.
- Cytokinesis reaches completion, creating two daughter cells

It is accomplished not only by the karyokinesis (segregation of duplicated chromosomes into daughter nuclei), but the cell itself divide into two daughter cells by a separate process called **cytokinesis** i.e. division of cytoplasama, which marks the end of cell division.

In animal cells, cytokinesis occurs by a process known as **cleavage**

- First, a **cleavage furrow** appears which is a shallow groove near the location of the old
metaphase plate

- Cytokinesis in plant cells is different because plant cells have cell walls. There is no cleavage furrow. During telophase, vesicles from the Golgi apparatus move along microtubules to the middle of the cell (where the cell plate was) and coalesce, producing the **cell plate.**



Significance of Mitosis

a) Development and growth

The number of cells within an organism increases by mitosis. This is the basis of the growth of multicellular body from a single cell, i.e., zygote

b) Cell replacement

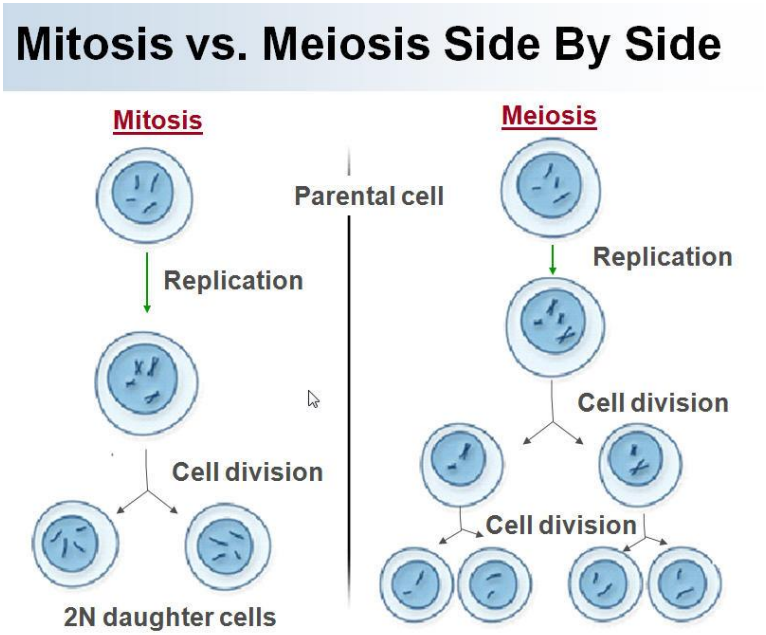
In some parts of body, e.g. skin and digestive tract, cells are constantly sloughed off and replaced by new ones by mitosis. In same way, new RBCs are also formed by mitosis.

c) Regeneration

Some organisms can regenerate body parts. The production of new cells in such instances is achieved by mitosis. e.g. starfish regenerate lost arms through mitosis.

d) Asexual reproduction

Some organisms produce genetically similar offspring through asexual reproduction by mitosis. For example, the hydra reproduces asexually by budding. The same division happens during it or vegetative propagation in plants.



Iron age

Universally it is confirmed that iron age succeeded the copper age.
Source of iron age includes archaeological excavations and literary source which makes the study of iron age more authentic.
Adoption of iron is coincided with changes in economic and political system i.e settled agriculture and specialization in metallurgy
Iron age in india 11th century while in greek 12th century Europe 9th century . the Americans did not have iron age until the arrival of europenans.
First use of iron was in 4000 BC in ancient Egypt and in summerian civilization
According to clayton first use of iron was unintentional it coulb have been a byproduct of smelting of other metals.

6. **iron age in india can be classified into**

1.gangetic region(1350) :
a)recently excavated by rakesh tiwari in 2005 revising the time period given by clayton and sankalia
b)cultivation of barely and rice, residential habitation constructed with mud bricks
c)large complex of graves in timargh, taxila, chavada, mirzapur
d)evidence of terracotta figurins horse, camel, individual and group of humans
e)wide presence of swastik which later formed part of mainstream hindusim

2.central region(1500-1300)
a) Consisting of saurashtra, malwa and northern Maharashtra ,
b) sparse of evidence of iron in the form of weaponary, no site indicated smelting

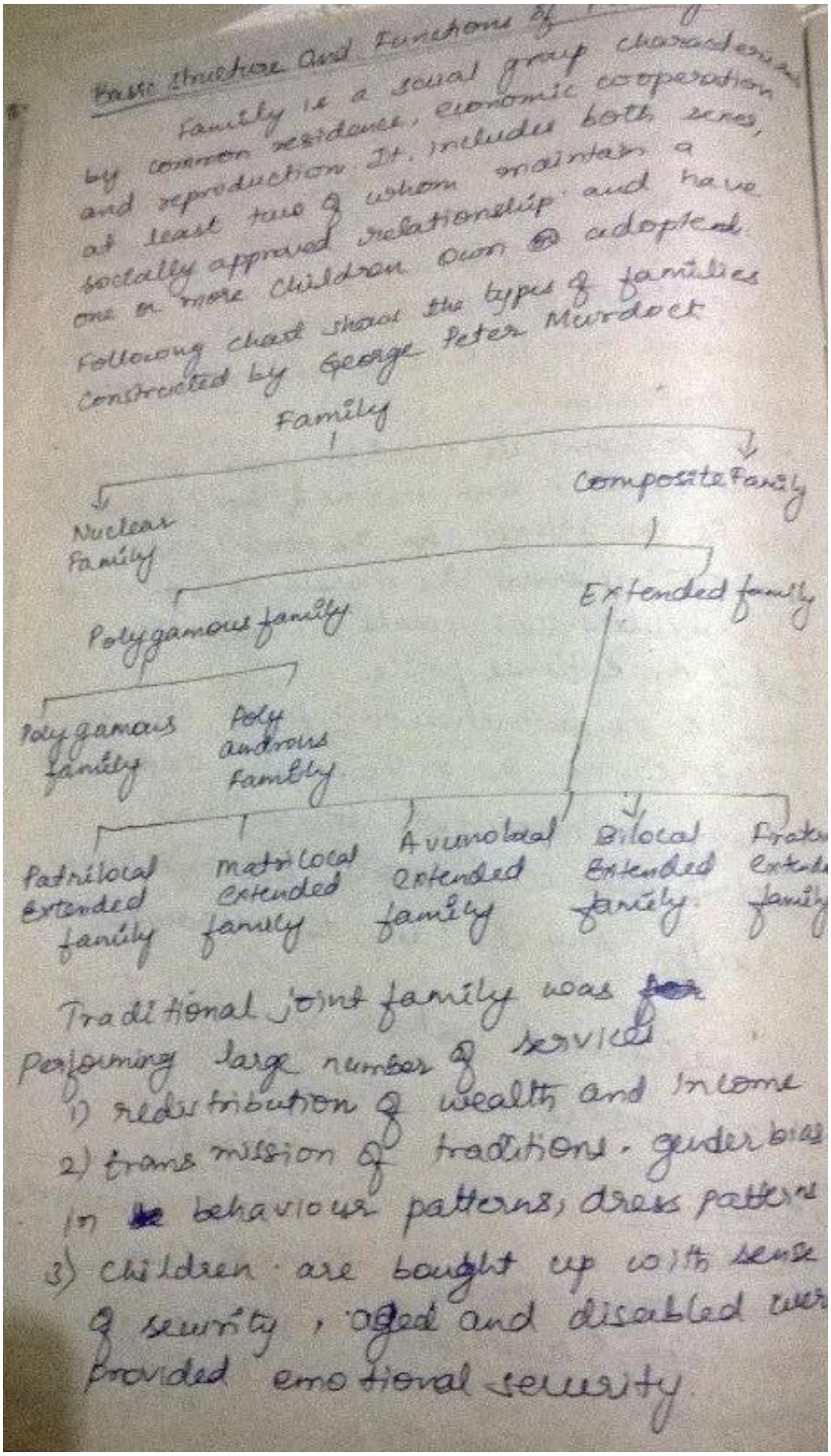
3.central region(800-500 BC)
At muski there is a evidence of iron face cover for horses and horse shoe made of iron
a)burning of dead bodies and the bone remanates buried in vessels along with the iron objects
b)megalithic structure of cists are found only in south india
c)presence of sarcophagic

d)rock cut caves used as chambers for dead body
e) pottery was black and red ware with conical shaped lids
f) iron implements sickle, swords with art engraving, tripods and trilids.

Typology of family

- nuclear family
  - based on conjugal ties
  - comprise of couple and child
  - They are independent entity
  - They have small kin group
  - divorce dissolves family
  - there is little difference in role of Husband and Wife
  - suitable in industrial and HG socieities
- extended family
  - consanguinal ties
  - made of 2 or more lineally linked people of same sex and their spouses, offsprings
  - they may be organised on patrilineal or matrilineal basis
  - suitable for agricultural societies
  - large kin group
  - In such societies land is important
- compound
  - aggregate of nuclear family linked by common spouse
  - they may be either polygynous or polyandorus

Basic structure and functions of family



The structural functional theory sees the family as a social institution that performs certain essential function for society. If these functions are not carried out then the family is said to be dysfunctional. The family is like our body that has different parts & each part has different functions.

Lundberg Enumerated basic functions of family as

1) Regulation of sexual behaviour & reproduction
2) An institution providing care and nutrition to children
3) Economic functions of co-operation & division of labour
4) Serving as a primary group satisfying the economic subsistence requirements

NIMKOFF and OGBURN Gives six categories of functions

1) Affectional
2) Economic
3) Recreational
4) Protective
5) Religious
6) Educational.

Thus family is the backbone of the society & if it fails to pass on certain values & attitudes to its members then society will be affected.

Approaches to study family

34.1 Typological and processual

· Socialogically family may be defined and discussed from 2 different angles

o Typological – Study of family as an entity, group or association related by kinship bonds and the group is directed to serve important cultural purposes. Eg: Nuclear family, extended family, consanguinal family, conjugal family, joint family

o Processual – Herein family is looked at as a process which can be divided into 3 to 4 well defined stages as follows

 1) Formative stage - individual growing as a child preparing for adult hood

 2) Pre-nupital stage – individual as a youth preparing themselves for marriage/ courtship and procreation

 3) Nuptial stage – Individual concentrates on his family for procreation

 4)post nuptial stage – When one generation passes on their tradition, culture to the new generation.

Impact of various factors on a Family

35.1 Impact of education and feminist movements on family

1. Feminist movements and the increased entry of women into the workplace beginning in the twentieth century has affected gender roles and the division of labor within the family.

2. Better education has resulted in greater financial independence and more career choices for women.

3. Women have begun to shun marriage. According to the U.S. Census Bureau, in 2005, unmarried households became the majority of all U.S. households.

4. Even after they marry, many of today's women put their careers above children, or put off having a family for several years.

5. The changing status of women has lead to a more equal division of household responsibilities. 6. Husbands increased their participation by only a small amount and the wives reduced the number of hours they devote to various household

tasks. The most pressing problem in a family as a result is that of child care. A majority of working mothers pay for child care, even if not on a daily basis.

7. It has resulted in children feeling deprived of mother's attention. Many believe that this will effect children adversely leading to psychological problems and deviant behavior. But various studies have proved this notion as wrong.

8. It has affected the sex role attitudes of children. In general, when mothers work their children are more likely to approve of working women and of a more egalitarian division of domestic tasks.

9. The additional income of wives have improved the standards of families in which women work.

10. But some studies have reported that husbands of working wives experience less marital satisfaction with their marriages and a generally lower mental and physical well being than husbands whose wives stay at home.

11. With women becoming more independent and assertive, the divorce rates have shown an increasing trend.

12. The increased contribution of women to family income has given them a stronger voice in family decisions.

13. All these changes are substantial in some societies but insignificant in many.

Political aspects of kinship :

1. Kinship is the basis of classification in the small residential units

2. It acknowledges bond between members of the major named groups of the society

3. It provides the link with elders & in particular kinships who exercise political & religious formations for the groups , & for the society as a whole

4. It regulates the ownership of lands

5.it is the common basis of assistance in primary economic cooperation

6.it prescribes certain types of sex union & marriage

7.it is the basis for the assemblage of the members of the society of the birth , initiation

8.it largely recounts of the origins of present day social groups and distribution of territory among them

9.it projects the super natural world

Culture and Civilization

1. Culture can be defined as a complex whole which includes knowledge, belief, art, moral, law, custom and any other capabilities acquired by man as a member of the society.
2. Civilization is considered as the most advanced stage of culture. It includes material things used by man such as house, household commodities, weapons, instruments etc.
3. The relationship between culture and civilization:
   i. Culture and civilization are interdependent. Culture needs civilization for further growth and civilization needs culture for its vital force and survival.
   ii. The objects of civilization after a period of time acquire a cultural significance. Civilization tries to put certain limitations on culture - it determines the degree to which cultural activity can be pursued.
   iii. Culture and civilization are interactive - civilization is a vehicle of culture, culture responds to the stages of technological development.
   iv. Every change in culture and its valuations has repercussions on the civilization structure. Civilization is the driving force of society and culture is its steering wheel.
4. Differences between culture and civilization:
   i. Civilization has a precise standard of measurement but not culture - while comparing the products of civilization, we can prove which is superior and which is inferior. eg. a car runs faster than a bullock cart. But, there is no measuring rod by which we can assess cultural objects. eg paintings of Picasso may appear to some an abomination while to others they are invaluable.
   ii. Civilization is always advancing but not culture - The various constituents of civilization like machines, means of transport are constantly progressing. But concerning culture it cannot be asserted that art, literature, thoughts of today are superior to those of the past
   iii. Civilization is transmitted without effort, but not culture - Objects of civilization can be easily adapted form generation or country to another but culture is not adapted with equal facility because it is related to inner tendency. The adoption of culture depends on personality and nature or people.
   iv. Civilization is borrowed without change or loss, but not culture - eg. railways, motors, machines etc are borrowed as they are from one country to another but

the elements of culture such as religion, art, literature are not borrowed in their original character.

v. Culture is internal and an end while civilization is external and a means - civilization is inclusive of external things while culture is related to internal thoughts, feelings, ideals and values. Civilization is what we have and culture is what we are.

Cultural relativism and ethnocentrism

1. Concept of ethnocentrism proposed by W G Sumner

2. It is a point of view where one's own group is considered superior to other groups

3. It results in an intense "we" feeling among members of a group

4. Ethnocentric studies of culture result in prejudices

5. Hence there is a need for non ethnocentric study of culture

6. Cultural relativism proposed by Franz boas as a scientific study of culture

7. It is based on premise that there is no absolute good or bad. A trait is good or bad in relation to culture in which it operates

8. Cultural relativism promotes tolerance and pluralism unlike ethnocentrism which propmotes contempt and hatred

9. Cultural relativism is characterised byinclusiveness and open mindedness while ethnocentrism is characterised by exclusiveness and close mindedness

10. Drawbacks of this concept

a. It knowingly allows injustices to occur around the world

b. According to cultural relativism,human rights are culturally relative

c. This means it is entirely acceptable for women in the Middle East to get stoned to death for adultery, totally fine for girls to be denied schooling,

d. Instead of understanding why certain cultures believe what they do, and engaging those cultures in open discussion about systems of beliefs, cultural relativism takes an entirely hands off approach

DESCENT

Rules of descent govern the kinship and relationships among the members of a society.

· Unilineal Descent - descent through either of the sexes

- Matrilineal - descent traced through the female line

eg. Khasi of NE India

- Patrilineal - descent traced through the male line

- Parallel Descent - males trace their descent through the male line, and females through the female line

eg. Saha of Colombia is the only reported society

· Non-Unilineal Descent - descent through both the sexes

- Double Descent - descent is matrilineal for some purposes and patrilineal for other purposes

eg. Yako of Nigeria

- Bilateral Descent - descent is traced through both the parents simultaneously

eg. modern families of the west

· Ambilineal Descent - in each generation, an individual has an option regarding the lineage

Filiation - It is the allocation of individuals to a descent group, as described above.

Complementary Filiation

- In societies with unilineal descent, people also recognise kinship links with relatives who do not belong to their own descent group.

- In Patrilineal societies, individuals have important social links with members of mother's family, and vice versa.

- While lineage links always have a political and hierarchical character, complementary filiation is more emotional and personal.

- Concept originally used to describe African societies, such as Tallesi of Ghana by M Fortes.

Economic Aspects of Marriage (Types of bride price and dowry)

1. In about 75% of the societies known to anthropology, one or more explicit economic transactions take place before or after the marriage.
2. Such economic transactions may take several forms: bride price, bride service, exchange of females, gift exchange, dowry or indirect dowry.
3. BRIDE PRICE
   i. Or bride wealth is a gift of money or goods from the groom or his kin to the bride's kin.
   ii. The gift usually grants the groom the right to marry the bride and the right to her children. It may be paid in goods, money, land or livestock.
   iii. Of all the forms of economic transactions involved in marriage, bride price is the most common - 44% of societies with economic transactions during marriage.
   iv. It is not payment for women, but rather is seen as a way of valuing the labor of women, the effort involved by the bride's family in raising the female and the labor value of the woman's offspring.
   v. It is more common in patrilineal and patrilocal systems. It is also common where land is abundant and the labor of women and children contributes to group welfare.
   vi. eg. Nandi tribe, Subanun of Philippines, Manus of Admiralty Islands.
4. BRIDE SERVICE - Requires the groom to work for the bride's family, sometimes before the marriage, sometimes after. It varies in duration, from a few months to several years. eg. North Alaskan Eskimo
5. EXCHANGES OF FEMALES - A sister or female relative of the groom is exchanged for the bride. eg. Tiv of West Africa.
6. GIFT EXCHANGE - Involves the exchange of gifts about equal value by the two kin groups to be linked by marriage. eg. Andaman Islanders
7. DOWRY
   i. It is usually a substantial transfer of goods or money from the bride's family to the bride, the groom, the groom's kin or the couple.
   ii. A woman's dowry might include personal possessions such as clothing and jewels, money, servants or land.
   iii. It was practiced in medieval Europe and is still prevalent in South Asia.
   iv. In India, it has become a matter of controversy and a subject for legal reform because of a large number of incidents in which women have been harassed and even murdered to extort richer dowries.
8. INDIRECT DOWRY

i. The dowry is provided by the bride's family to the bride, the groom or the couple.
ii. The payments to the bride originate from the groom's family. Because the goods are first given to the bride's father, who passes most of it and not all to her, this kind of transaction is called indirect dowry.
iv. eg. Basseri of Southern Iran.

Preferential, Prescriptive, proscriptive and open systems

· Marriage Rules/Regulation:

o Proscriptive

o Prescriptive

o Preferential

· Proscriptive Rule : These are negative rules which restrict ppl from marrying certain categories of relatives.

o Eg : Incest Taboo

· Prescriptive Rule : Under this rule one is has to marry within a select category only. There following are the types

o Endogamy : Where one is permitted to marry within his/her own group. Endogamy occurs in several forms. Eg: Tribal endogamy, caste, sub-caste, class, race, ethnic, village, deme (grouping based on certain socio-economic laws as in the Bedouins of Saudi .Arabia), moiety (division into 2 groups)

o Exogamy : Where one must marry someone outside ones group. Occurs in several forms. Eg. Village level, lineage, clan, miety, Gothra exogamy (khaps in N. India)

o Hypergamy (Anuloma): Herein a man marries a girl from his caste or a lower caste. Eg. Rajputs, Jats

o Hypogamy (Pratiloma) : Herein a woman marries a man from her caste or a lower caste. This is generally not permitted in the traditional hindu society

· Preferential Rule : In this several forms of mate selection are available but one is more likely/preferred than the others. Eg: Sister exchange as in case of Urali and Malaipandaram of Kerala, Cross cousin marriage in case of Gonds (AP), Kallar (TN), Kharia (Ch), Munda (Jh), Uncle – Niece marriage as in Konda reddis (AP), Parallel cousin marriage in arabs, Bedouins, Yanmamo red Indians (Venezuela)

Types of Marriage

Marriage is a customary transactions that function to establish the legitmacy of new born children as acceptable members of society.

Depending on the number of spouses,Marriage is divided into Monogamy & Polygamy.

Monogamy-:

Monogamy is a form of relationship in which an individual has only one partner during their lifetime .The term is also applied to the social behavior of some animals, referring to the state of having only one mate at any one time.Scientists use the term monogamy for different relationships. Biologists, biological anthropologists, and behavioral ecologists often use the term monogamy in the sense of sexual, if not genetic, monogamy.Modern biological researchers postulated the following four aspects of monogamy:

- Marital monogamy refers to marriages of only two people.
- Social monogamy refers to two partners living together, having sex with each other, and cooperating in acquiring basic resources such as shelter, food, and money.
- Sexual monogamy refers to two partners remaining sexually exclusive with each other and having no outside sex partners
- Genetic monogamy refers to sexually monogamous relationships with genetic evidence of paternity

When cultural or social anthropologists and other social scientists use the term monogamy, the meaning is social or marital monogamy. Marital monogamy may be further distinguished between:

marriage once in a lifetime;
marriage with only one person at a time, in contrast to bigamy or polygamy
and serial monogamy, remarriage after death or divorce.

Polygamy-:

Marriage to more than one person is called as a Polygamy .There are 2 forms of Polygamy Marriage.

Polygyny-: Marriage of one men to two or more women
Polyandry-:Marriage of one women to two or more men

Polygyny is found in tribes like Naga, Gonda, Baiga, Toda.

Polyandry is restricted in its distribution. It is found among Khasa, Ladakhi, Nayars.

In Polyandry, several brothers share similar wife it is called as a Adelphic or Fraternity Polyandry. It is found among Khasa, Toda. There need not be any class relationships between husbands and wife goes to spend some time with each husband.As long as woman live with one of her husbands , others doesn't have any claim on her. Polyandry is found to lead to fewer children to every woman and high incidence of sterlity among women.But we are not yet certain of biological reasons. Among Khasa, there is a double standard of mortality.

Hypergamy-:

To prevent a woman from loosing casting & becoming ritually impure, manu & Ancient law givers prescribed Hypergamous(Anuloma) Marriage. Under which a man can marry from his own caste or from those below, But woman can marry from her own caste or above.

Hypogamy-: It is also called as pratiloma. Marriage of woman to a low caste is not permitted. Social consequences of such a practice have been borne out by historical facts. Brahmin girls had to choose between polygyny& spinsterhood. Among the Sudra's, Males have a consequences of Hypergamy, either to pay a high bride price or to choose between polyandry & bachelorhood. This has often led to marriage by capture among lower castes.

Group Marriage-: Group Marriage is a type of marriage in which sets of males and sets of females share equal rights over each other

Eg-: Marquesans of Polynesia.s

Marriage stability

1. A marriage ends when a divorce takes place. Divorce is a situation wherein husband and wife seperates and gives up vows of marriage

2. Divorce in different societies is viewed differently. In traditional hindu society marriage is a sacrament and therefore divorce is a sin. But in most simple societies and western nations marriage is only a contract and divorce is much easier

3. There has been an increase in divorce rates in many parts of industrialised world. Major reasons for this are

a. Rise in individualism due to modernisation

b. Religious tolerance to divorce

c. Legal tolerance to divorce

d. Reduced social control

e. Increasing hetrogenity in population leading to greater socio cultural incompatibility between spouses

4. Divorce among simple society is much more frequent and easier. Ex-among jad Bhotias , marriage can be dissolved by breaking a threat in front of village panchayat

5. However in societies where marriage payments are substantial or where women as an important economic asset, getting divorce is difficult

LIVE-IN RELATIONSHIP

Live-in relationship, also known as cohabitation is a consensual arrangement where in a couple lives together without entering a formal marriage. It need not necessarily involve sexual relations. It may be equivalent to Social Monogamy.

Reasons for live-in

- to test compatibility before marriage

- do not want the hassles of a formal marriage

- see no benefit in the institution of marriage

- not in a position to legally marry

Elderly persons who have lost a partner or got divorced are increasingly preferring live-in relationship.

In some countries like UK & US, there is a provision for live-in partners to get themselves registered as domestic partners, but this does not make formal divorce necessary.

Indian Scenario

- Live-in relationship is not illegal but considered socially and morally improper.

- Legally, it is permissible only in unmarried major persons of opposite sex.

- If a live-in relationship is continued for a long time there is a presumption of marriage, and all the laws regarding domestic violence, legitimacy of children, maintenance rights, inheritance rights are applicable.

Kinship terminology, topology

1.L.H morgan was the first to study kinship terminology. In his " consaguinity and affinity in primitive societies"he defines it as naming the kins.

2.G.P. murdoch classified it into classificatory and descriptive.in classificatory no. Of different kins are grouped together and called bysame kinship terms. In descriptive the kinship term reflects the relation an individual as with his kin.

3.murdoch extensively studied kinship systems of :

4.eskimo-rare system used by anglo Indians and food foraging people of central America. It emphasizes importance to nuclear family given by individual specific terms.

5.Hawaiian-system is least complex. Usage of small no. Of terms.they pactice bilocal residence.

6.sudanese-most descriptive system

Terms are associated with specific duties and responsibilities attributed to individual.

7.omaha-complex one followed in matrilineal society. Mother and her sisters ,father and his brothers referred to by same name.

8.crow indian-mirror image of omaha. Iniduals in mothers matrilineal group are not lumped whereas father's matrilineal group are.

9.Iroquois-similar to omaha and crow indians with regard to parental generation but not in regard to our own generation.

10.thus kinship terminology indicates relative importance or unimportance given to kins. It reflects kkind of family ,rules ofdescent ,residence .

Laws and justice in primitive society

Law is a cultural universal& social norm. If it is violated by society takes appropriate steps to
take action against the violator.
According to Radcliffe Brown," law is social control through which systematic application of
force of politically organized society". In simpler terms, Law is specific ways of enforcing rules.
In his view, simple societies have no laws,although all have customs which are supported by
sanctions.
Malinowski argues that rules of law are distinguished from rules of custom, that " they are
regarded as the obligations of one person &the rightful claimof one person not by
psychologicalmotive but by definite socialmachinery of binding force based uponmutual
dependence".
According to Gluck man primitive societies have rule of law but not legal rules and calls such
societies as legal. Brown calls legal as Jeiral,meaning law in the sense of something enacted.
Whether it is advanced society with "legal rules"or a primitive society with "rule of law", it does
notmatter . But rules of all societies are same.They safeguard life & L imb, rights of Property. So
justice means giving people their right rather than enforcing laws.
Primitive Laws-:
Laws in the primitive societies are unwritten laws. There is neither any court nor any codified
body of laws. They vary fromsociety to society.Every society has its own specified customs and
conventions,which comply with the norms of the respective society.
Sources of Primitive Laws-:

1) Customs-: L ike the civilized societies, Primitive societies also have a laws to regulate the
individual and social life. Social customis the most important source of law. Laws in primitive
societies have their origin in social custom. The people who adopted useful behaviour of social
life are good people and those people who do opposite are considered as a bad people.This
helps people to adopt those behaviours, and later on takes place the social custom. Thus social
customs are handed over from generation to generation and tradition goes on forming.When a
social custom is approved and if it breaches consider as a punishment, then custom becomes a
social law.
2) SocialOrganization- : All primitive societies has an organization,which is headed by chief or
leader to regulate the individuals. Sufficient power is provided to leader, but he shouldn't do
anything against the interests of tribe as a whole. In some cases,decision of leader is considered
as a law and allmembers has to abide by the decision.
3) Public opinion- :It is very important in primitive societies and if any one violates the public
opinion,he/she has been subjected to punishment. Thus public opinion has a control on
members of primitive societies in the form of a law.
4)Religion-: The compliance of rules and regulation connected with the names of deity as a
compulsory and no one dares to violate.
5)Panchayats-: Some primitive societies has Panchayats, to regulate the individuals and also o
settle the disputes among them. The decision of Panchayat is regarded as a law.
Characteristics of primitive law-:
1)Primitive law is considered in terms of kinship rather than territorial terms.
2) In primitive societies, public opinion ismore useful. Public opinion in the primitive societies
originate fromthe moral and ethical notions of the concerned.
3)Fails to discriminate between private and public wrongs as in the modern tents of justice.
4)Primitive law is predominantly a criminal law. The scope of civil law is limited.
5)Everybody in primitive society is a representative

6)Sin and supernatural punishment is associated with the primitive law.
7)Intention is not recognized in primitive law.
8)The main characteristic of Primitive law is the kinship tie and the collective responsibility of kin.
9) Primitive law is not associated with legislative, executive and judiciary.

Nature of Primitive Law-:

1) Kinship bond is the basis for primitive law and which unites differentmembers of society.
2)Most of the problems in primitive societies are solved through Public opinion. Since it is a small society, collecting the opinion of allmembers is easy and also is generally a correct judgement.
3) It is a common belief in the primitive societies is that, if crimes are not punished by society some supernatural power will punish the society. So, they keep watch on the crimes and when detected they are subjected to punishment.
4)In Primitive society more attention is paid to the misbehaviour than intention.
5)There is collective responsibility behind primitive law because it rests on the principle of kinship bond.

Justice in Primitive Societies- :

Justice in primitive society is very simple.here face to face relations generally followed due to the fear of public opinion. Since a primitive society is generally a little community, social mockery is the biggest punishment. Primitive societies establishes guilt on the basis of evidence.
In this context it resorts to supernatural devices like Divination, conditional,ordeal, oath.
Divination-: It is the process of evoking knowledge of some secret by manipulative techniques. L ike, the Azande of Africa fed poison to chechin, declaring repeatedly " If this change be true, let the chechin die or if it is lie, spare to live"
Conditional-: Conditional cense enters a judicial procedure among almost all people. It is assertion that always implies the sentence " I f what i say is not true, then supernaturalmay destroy me".
Oath- : Oath is a formal declaration that testimony given is true.The offender has to take an oath and has to tellwhether he has committed offence or not, If he tells lies some supernatural

power will punish. This is the belief of Primitive societies. Itmay or may not sanction a
supernatural power against falsehood. I t is accompanied by ritual act.
Ordeal-:Sometimes the persons accused are put to torture in primitive societies before the
declaration of judgement in criminal cases. If he set free of injury he is believed to be non-guilty.
Punishments- : Punishments are in several forms.Punishment is normally eye for eye,murder fo
r murder(eg-Nuer)s.There are no prison institution in primitive societies, there are provision of
mutilationwhich resulted in death of culprit.Capital punishment is given in case of homicide, but
sometimes death punishment is given to one of his family members. Punishments are not same
for the same crime.The same crime may be differently punished according to who have been
wronged. Imposing of fine is common among the primitive societies. They are paid in a way of
compensation to the aggrieved party. Compensation is in the form of animals,material goods etc.
The custom of pay compensation is wergild.

Meaning, scope and relevance of economic anthropology

1. Definition

a. It is a comparative cross cultural study of economic systems

b. It involves study of economic systems in socio cultural context

2. It uses ethnographic methods of study which involves in depth holistic study of a society. This approach to study of economy sets economic anthropology apart from economy

3. Scope

a. Describe various economic arrangements in different times and places

b. Understand socio cultural context in which systems of production , distribution and exchange operate. Ex- Kula ring

c. Study economic aspects of social relationship

d. Study both primitive and modern societies

4. Relevance

a. Helps understand relation between culture and economy

b. Helps understand decision making process in primitive societies

c. Economic anthropology is more important todayto analyse impact of new phenomenon like transnational capitalism, globalization on indigenous people

EVOLUTION OF POLITICAL SYSTEMS

1. Band Organization:
   i. Societies composed of fairly small and usually nomadic groups of people that are politically autonomous.
   ii. In Band organization, the local group or community is the largest group that acts as a political unit.
   iii. Bands are typically small, with less than 100 people. Each small band occupies a large territory so population density is low.
   iv. Political decision making within the band is usually informal i.e. the formal, permanent office of leader does not exist. Decisions are taken by the community as a whole or made by the best-qualified member.
   v. An informal headman may be a proficient hunter, or a person most accomplished in rituals. Leadership stems not from power but from influence, not from office but from admired personal qualities.
   vi. Egalitarian.
   vii. Usually hunter-gatherers.

2. Tribal Organization:
   i. When local communities mostly act autonomously but there are kinship groups (such as clans or lineages) or associations (such as age-sets) that can potentially integrate several local groups into a larger unit i.e. Tribe
   ii. All the communities in a tribe may be linked only occasionally for some political/military purpose.
   iii. Multilocal but not society wide integration. It is not permanent - integration comes into play only when outsider threat arises; when the threat disappears, the communities revert to self-sufficiency. It is informal - not headed by political officials.
   iv. Societies with tribal organization are generally food producers.
   v. Population density is higher, local groups are larger and the way of life is more sedentary than in bands.

vi. Largely Egalitarian.

3. Chiefdom Organization

i. Is a formal structure that integrates more than one community into a political unit.

ii. The formal structure could consist of a council with or without a chief, but most commonly there is a chief.

iii. Most societies at the chiefdom level of Organization contain more than one multicommunity political unit or chiefdom, each headed by a district chief or a council.

iv. Densely populated. Communities are more permanent because of their greater economic productivity.

v. The position of chief, which is sometimes hereditary and permanent, bestows high status on the holder. Have social ranking and accord the chief and his family greater prestige.

vi. The chief may redistribute goods, plan and direct the use of public labor, supervise religious ceremonies and direct military activities.

4. State Organization:

i. An autonomous political unit, encompassing many communities within its territory and having a centralized government.

ii. States include a wide range of permanent institutions with legislative, executive and judiciary functions and a large bureaucracy.

iii. Both internally and externally, legitimacy is the central basis for power.

iv. Government tries to maintain a monopoly on the use of physical force through formal and specialized instruments of social control - police, militia, standing army.

v. Emergence of cities, high degree of economic and other kinds of specialization, and market or commercial exchange.

vi. High level of social stratification.

ANTHROPOLOGICAL APPROACHES TO STUDY RELIGION

· Evolutionary Approaches

- Early anthropologists used the data from the studies of primitive societies to speculate about the genesis and functions of religion.

- Evolutionists believed that religion is a problem solving phenomenon.

- John Lubbock made an early attempt to combine archaeological evidence of prehistoric people and anthropological evidence of primitive people. He outlined an evolutionary scheme, Atheism > Fetishism > Nature Worship > Totemism > Shamanism > Anthropomorphism > Monotheism > Ethical Monotheism.

- E B Tylor in his book Primitive Culture, proposed that Animism is the earliest and most basic religious form, and from that evolved Fetishism > Belief in demons > Polytheism > Monotheism.

- Herbert Spencer also considered a system similar to Tylor, but felt that Ancestor Worship preceded Animism.

- James Frazer in his book The Golden Bough, believes that religion is the result of evolution from the magic stage of human culture.

· Psychological Approach

- Religion is a profound emotional response to various aspects of life and various emotive factors were given to explain the basis of religion.

- Wilhelm Wundt considered religion as a projection of fear into the environment.

- William James viewed that religion has a strong emotional base, but not associated with any particular emotion.

· Functional Approach

- It explains the functional significance of religion, and the role it plays in the life of an individual and the society.

- Malinowski considers religion as a device to secure mental and psychological stability in an individual's life.

- Radcliffe Brown felt that religion is to assure a social solidarity and homogeneity.

- According to Emile Durkheim, religion forms a media through which a society understands the universe, and also people seek justification of the existing social order through religion.

SACRED AND PROFANE

- It was proposed as the central characteristic of religion by Emile Durkheim in his book, 'The Elementary Forms of Religious Life', and said that it has a universal validity.

- The sacred includes everything that is regarded as extraordinary and associated with sentiments of awe, respect, mystery, and reverence by the believers.

- Sacred things may include objects, living organisms, elements of nature, places, holy days, ceremonies and other activities like pilgrimages.

- The profane is everything that is not considered sacred, and includes all the mundane things and activities.

- Sacred entities are kept apart isolated, and are never to be intermingled with the profane.

- Durkheim described the characteristics of the sacred as non-utilitarian, non-empirical, ambiguous, strength giving, and does not involve knowledge but involves power.

- Sacredness is not intrinsic to the object, but is a result of the collective conscience of the society.

- He further examined this concept based on his study of totemism in the Arunta tribe of Central Australia.

- Many anthropologists criticized that it was a product of European religious thought rather than a universally applicable criterion. Some eastern religions like Budhism disapprove any dualism, even between sacred and profane.

Origin of languages in human society

ORIGIN OF LANGUAGES

There are two main hypothesis concerning the origin of language:
1. Divine Creation Hypothesis
   i. Many societies throughout history believed that language is the gift of the gods to humans. This belief predicates that humans were created from the start with an innate capacity to use language.
   ii. It is impossible to prove that the first anatomically modern humans possessed creative language. It is also impossible to disprove the hypothesis that primitive

languages might have existed at some point in the distant past of the Homo sapiens development.

2. Natural Evolution Hypothesis

i. According to this, at some point in their evolutionary development, humans acquired a more sophisticated brain which made language invention and learning possible.

ii. The simple vocalizations and gestures inherited from our primate ancestors then gave way to a creative system of language.

There are several hypotheses as to how language might have been consciously invented by humans, which are divided into two sets:

I. The IMITATION HYPOTHESES - believe that language began through some sort of human mimicry of natural occurring sounds or movements. Some of them are:

a. The DING-DONG HYPOTHESIS - says that language began when humans started naming objects, actions and phenomena after a recognizable sound associated with it in real life. eg. boom for explosions, crash for thunder.

b. The POOH-POOH HYPOTHESIS - holds that the first words came from involuntary exclamations of dislike, hunger, pain or pleasure, eventually leading to the expression of more developed ideas and emotions. eg. ha-ha-ha, wa-wa-wa

c. The BOW-BOW HYPOTHESIS - holds that vocabulary developed from the imitations of animal noises such as Moo, hiss, meow, quack-quack etc

d. TA-TA HYPOTHESIS - speech may have developed from gestures that began to be imitated by the organs of speech i.e. the first words were lip icons of hand gestures

II. The NECESSITY HYPOTHESES - believe that language began as a response to some acute necessity in the community. Some of them are:

a. WARNING HYPOTHESIS - Language may have evolved from warning signals such as those used by animals. Such as look out, run, help etc to alert members of the tribe when some beast was approaching.

b. YO-HE-HO HYPOTHESIS - Language developed on the basis of human cooperative efforts. The earliest language was chanting to simulate collective effort like moving great stones to block off cave entrances, repeating warlike phrases to inflame the fighting spirit etc.

c. THE LYING HYPOTHESIS - Since all real intentions or emotions get involuntarily expressed by gesture, look or sound, voluntary communication must have been invented for the purpose of lying or deceiving.

Social Context Of Language Use-:

Language is much more than external expression &communication of internal thoughts formulated independently of their verbalization. Society &Language are mutually indispensible.
Language can be develop in a social setting & human society can be maintained only among people speaking & understanding a common language. Every individual language is acquired by man a members of society &along with other aspects of society's culture in which he is bought up.
If language is transmitted as part of culture, culture as a whole is transmitted through language.
Social Linguistics is the study of the effort of all aspects of society, including cultural norms, expectations &context, on the way language is used. As the usage of language varies from place to places and also varies among social classes &it is these sociolects that sociolinguistic studies.

Some fundamental concept of Sociolinguistics are explained here- :
a) Speech Community- : It describes more or less discrete groups of people who use language in unique & mutually accepted way among themselves. The members can be of Profession, students, Family friends & friends. The members will often develop jargon to serve the groups special purposes & priorities.
b) Prestige-: It is crucial for Socio-Linguistic analysis, certain speech habits are assigned positive(or) negative &these are automatically assigned to the speaker. I t can be realized on individual sound or phenomenon level on pronunciation. On a macro scale, prestige values extend to Language choice.
c) Social Networks-: Understanding language in society means one also has to understand the social networks. A social network is another way of describing a particular community in terms of relations between individual members in a community. A network could be tight or loose depending on how members interact with each other. The loosens/tightness of a social network may affect speech patterns adopted by a speaker. A social network may apply to a macro- level of a country or city, inter-personnel level of neighbourhood or a single family.
d) Class Differences-: Class &occupation are among the most important linguistic markers found in society. Class &Language variety are related. Members of working class tends to speak less standard language, while the lower, middle & upper class will in turn speak closer to the standard language. The upper class, even members of upper middle class may often speak less standard
language than middle class. This is because not only class, Class aspiration must be important.
e) Class Aspirations-:William Labov in 1960's, Social aspirations influence speech patterns. This is true for class aspirations with certain class also. In process of wishing to be associated with certain class(upper class &Upper middle class)

people moving in that direction socioeconomically will adjust their speech patterns to adjust like them, they often hypercorrect, which involves overcorrecting their speech to the point of introducing new errors.

f) Social Language codes- : Bernstein in his book " Elaborated &restricted codes their social origins & some consequences",which he used to classify the various patterns for different social issues.

ü Restricted Code-: I t is an example of speech code used by working class. He stated that this type of code allows strong bonds between group members, who tend to behave largely on the basis of distinctions such as male, female, older &younger. The usage of language in away which brings unity between people &members often do not explicit about meaning, as they share knowledge & common understanding often bring them together. The difference with the restricted code is they emphasis on "we" as a social group than "I".

ü Elaborated Code-: Middle & Upper class use this language to gain access to education &career advancement. Bonds within this social group are not as well defined & people achieve their social identity largely on the basis of individual disposition & temperament. It emphasis more on "I"with this social group rather than working class.

Classical evolutionalism (difference with neo evolution)

Question No.
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UPSC

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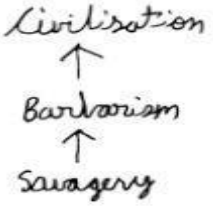
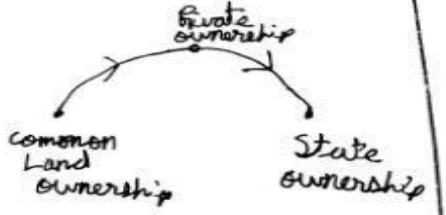
Distinguish between classical and neo-evolutionism

1. Classical evolution was proposed by scholars like E B Tylor and L H Morgan while Neo evolutionism was proposed by Leslie White, Julian Steward and Gordon Childe
2. Classical evolutionists proposed that culture everywhere evolves in same direction. Hence all cultures progress through stages of savagery, barbarism and civilisation. Neo evolutionism on other hand proposed a parabolic path of evolution. In this a social institution is born in a particular form, later evolves into a different form and later returns back to original form with some modifications

Unilineal model



Neo evolutionary model



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3. Classical evolutionists proposed unilinear model - Neoevolutions proposed different models like Leslie white's universal evolution and Julian steward's multilinear evolution

4. While classical evolutionists dealt with particular cultures, Neoevolutionists like Gordon Childe studied culture as a whole.

5. Classical evolutionists explained cultural similarities on basis of psychic unity of mankind i.e. people respond similarly in similar environment ex:- Emergence of agriculture in same period in different cultures. Neoevolutionists while accepting role of psychic unity of mankind also gave importance to independent innovations and inventions

6. Classical evolutionists used comparative and historical methods of study Neo evolutionists relied on archeological data and ethnographic differences.

Cultural Materialism -:

Leslie white approach of Cultural Materialism is primarly a mechanism of harnessing energy & of putting it to work in service of man. Culture is also a mechanism of challenging & regulating human behavior. Social systems are determined by the technological terms.

White approach to cultural materialism is given as follows

1. Cultural system can be divided into 3 sub systems-:

a) Technology constitutes most basic system, which includes tools,weapons, knowledge of use. This is a means for capturing & utilizing energy.
b) Social structural includes kinship,marriage,family etc.
c) Ideological includes morals & beliefs.

All 3 subsystems influemce each other mutually. Technology sub system influences other two. Hence, Social & ideological are influenced by technology.

2.Culture is a syatem in itself & depends upon man for its survival

3.Fundamental function of culture is capturing & utilizing free energy.

4. Amount of energy captured and utilized is determined by the technological sub systems. The more efficient the technology, more is the energy utilized and captured, which leads to the development of culture as a whole. This is expressed by White as the " Law of Cultural Development" which states," Cultural advances as the amount of energy harnessed per capita per year increases ro as the efficiency of the economy of the means of controlling energy is increased or both".

The law is expressed by the formula C= E* T, where E is the energy, T is technlogy and C is cultural development.

Criticism-:

Cultural materialism has been termed "vulgar materialism" by Marxists such as J. Friedman because opponents believe that the cultural materialists empirical approach to culture change is too simple and straightforward (Friedman 1974).

Marxists believe that cultural materialists rely too heavily on the one-directional infrastructure-superstructure relationship to explain culture

change, and that the relationship between the "base" (a distinct level of a sociocultural system, underlying the structure, in Marxist terminology) and the superstructure must be dialectically viewed (Friedman 1974). They argue that a cultural materialist approach can disregard the superstructure to such an extent that the effect of superstructure on shaping structural elements can be overlooked.

Symbolic and interpretive theories

1. Symbolic anthropology studies the way people understand their surroundings, as well as the actions and utterances of the other members of their society. interpretations form a shared cultural system of meaning

2. Symbolic anthropology studies symbols and the processes,such as myth and ritual, by which humans assign meanings to these symbols to address fundamental questions about human social life

   Turner

3. Turner states that symbols initiate social action. According to Clifford Geertz, man is in need of symbolic "sources of illumination" to orient himself with respect to the system of meaning that is any particular culture

4. Geertz's position illustrates the **interpretive approach** to symbolic anthropology, while Turner's illustrates the **symbolic approach.**

5. Symbolic anthropology views culture as an independent system of meaning deciphered by interpreting key symbols and rituals

6. two major premises

   - beliefs, however unintelligible, become comprehensible when understood as part of a cultural system of meaning

   - second major premise is that actions are guided by interpretation

7. Traditionally, symbolic anthropology has focused on religion, cosmology, ritual activity, and expressive customs such as mythology and the performing arts

8. They study role of symbols in the everyday life of a group of people

9. Turner was much more interested in investigating whether symbols actually functioned within the social process

10. Geertz focused much more on the ways in which symbols operate within culture, like how individuals "see, feel, and think about the world
    - He believed that an analysis of culture should "not [be] an experimental science in search of law but an interpretive one in search of meaning"
    - defined culture as "an historically transmitted pattern of meanings embodied in symbols
    - symbols are "vehicles of 'culture'"
    - symbols should not be studied in and of themselves, but for what they can reveal about culture
    - Geertz characterized culture as a social phenomenonand a shared system of intersubjective symbols and meanings
11. Victor Witter Turner
    - Turner was not interested in symbols as vehicles of "culture" as Geertz was but instead investigated symbols as "operators in the social process"
    - Turner felt that these "operators," by their arrangement and context, produce "social transformations" which tie the people in a society to the society's norms, resolve conflict, and aid in changing the status of the actors
12. Schneider defined culture as a system of symbols and meanings
    - Schneider was interested in the connections between the cultural symbols and observable events
    - He defined a cultural system as "a series of symbols" where a symbol is "something which stands for something else
13. Criticisms:
    - Marxists charge that symbolic anthropology, while describing social conduct and symbolic systems, does not attempt to explain these systems, instead focusing too much on the individual symbols themselves
    - symbolic anthropology did not attempt to carry out their research in a manner so that other researchers could reproduce their results.

Cognitive anthropology

1. Cognitive anthropology addresses the ways in which people conceive of and think about events and objects in the world.
2. provides a link between human thought processes and the physical and ideational aspects of culture
3. culture is composed of logical rules that are based on ideas that can be accessed in the mind
4. every culture embodies its own unique organizational system for understanding things

Tyler

1. Culture is cognitive organisation of material phenomenon like events, behaviour and emotions
2. Culture can be grasped only in non-empirical terms. Real culture exists in mind of culture bearers

3. Cognitive Anthropologists believe that the world itself is chaotic and humans understand it through classification.

4. each culture has its own system of classification

    a. For example, although the Americans distinguish between dew, fog, ice and snow, the Koyas of India do not. They call all these forms mancu and do not think the differences among them are significant.

    b. On the other hand, the Koyas distinguish seven different kinds of bamboo by giving them different names while the Americans call all of them simply bamboo.

5. This shows that people in different cultures may perceive the same phenomenon differently because of their own cultural system

6. It is an approach that stresses how people make sense of reality according to their own indigenous cognitive categories[Emic approach], not those of the anthropologist[Etic]
7. Culture isn't unitary phenomenon as they cant be described one set of organisational principles.. Each member has unique model of culture
8. He favoured ethnosemantic approach for studying people's views on their culture

Conklin

1. Studied hanunoo community in phillipines

2. Culture is a system of knowledge that shows how people organise their experience conceptually so that I can transmit person to person and generation to generation
3. People in society contruct their world in terms of their culture. With help of culture people segregate what is significant and insignificant, anticipate events, take a course of action
4. Conklin demonstrates that Hanunóo color terms do not segment the color spectrum in the same manner as western color terms, and in fact incorporate additional sensory information, such as wetness and dryness.
5. Each culture has an unique set of concepts , categories and rules. However there is also underlying commonality
6. Culture as a cognitive system can be understood by examining interrelationship between language and culture
    a. Just as language is conceptual code underlying speech, culture is conceptual code for social behaviour
    b. Linguistic variability is a guide to study cultural variability

Criticism

1. It has been criticised as an abstract theory
2. There is Lack of consensus on how to study culture in mind

Tools

57.1 Case Study-:

Case study is exploring and analysing the life of a social unit, can be a person, a family, an institution, a culture group, or an entire community. Its aim is to determien the factors that account for the complex behavior patterns of the unit. Case-data may be gathered on the entire life-cycle or on a definte sections of the cycle of a unit, but with a view to ascertaining the natural history of the social unit, and its relationships to the social factors and forces involved in the environment. Through the case-method the social researcher attempts to see the variety of factors within a social unit as an integrated whole.

In order to preserve the wholeness of cases the following methods can be followed.

- Breadth of data

- Levels of data
- Formation of indices and types
- Interaction in a time dimension

Case Study Materials-:

A variety of case-study materials are utilised in social research , personal documets,diaries, autobiographies and so on. All these materials to be evaluated in terms of

1. The writer's motives in providing the record
2. His oppurtunities to know the facts recorded
3. The bases and prejudices of respondent and recorder
4. The writer's insight into his intimate personal experiences and his ability to describe them

Personal documents are regarded as very valuable research data since they are self-revealing records which intentionally or unintentionally yield direct information regarding structure,dynamics and functioning of the author's mental life.

Life-History is a detailed voluntary account of person's own view of the events of his life as revealed under sympathetic questioning of a skilled enquirer and aims to reveal not only the objective facts of such a story, but their meanings to the informant.

Autrobiographers are also useful in that they reveal causal relationships between early experiences and l;ater dispositions.

Advantages-:

1) Allows the study of deviant cases
2) Case – study materials are used to relate the abstractions of ethnographic descriptions to the lives of the individuals
3) Life-History materials remain the source of information about social behavior
4) Materials are useful for examining the patterning of general values, foci of cultural interests, and perceptions of social and natural relationships.
5) Represent a more enlightening and fundamentally more real record of personal experiences with a wealth of concrete detail, multifarious reactions to social situations which escape the attention of most skilled investigators using other techniques

Disadvantages-:

1) It costs much in time and money

2) Response of researcher, because he likely to feel a sense of certainity about his conclusions, ignoring to test reliability
3) Generalisation based on only a few cases are dangerous
4) Subjective data gathered do not lend themselves to quantitative methods
5) Lack of standardised and objectified procedured permitting corroboration of both data and generations
6) Records are open to errors of perception,memory,judgement and unconscious bias with a special tendency to over emphasize unusual events.