EVOLUTION

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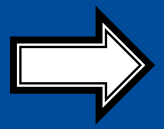
By: M.Saidi

Click the Link:  https://youtu.be/Sx2pBsmbLm8?t=37

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- **INTRODUCTION (CONTENT OF THIS SLIDES)**

- Definition of biological evolution
- Difference between a hypothesis and a theory
- **Evidence for Evolution**
- Role of the following as evidence for evolution:
- Fossil record – Link to Grade 10
- Biogeography – Link to Grade 10
- Modification by descent (homologous structures)
- Genetics
- Embryology

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Variation

- Definition of a biological species and a population
- **Causes of variation**
  - Meiosis
    1. Crossing-over
    2. Random arrangement of chromosomes
  - Mutations
  - Random fertilization
  - Random mating
- Continuous and discontinuous variation

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CONTENT : CLASS TIME

- **Evolution** is the **processes** of ***change*** in the **genes** that have transformed life on earth from its **earliest forms** to the vast **diversity** that characterizes life on earth today.
- Or **evolution** is the change in the characteristics of a species over several generations and relies on the process of natural selection.

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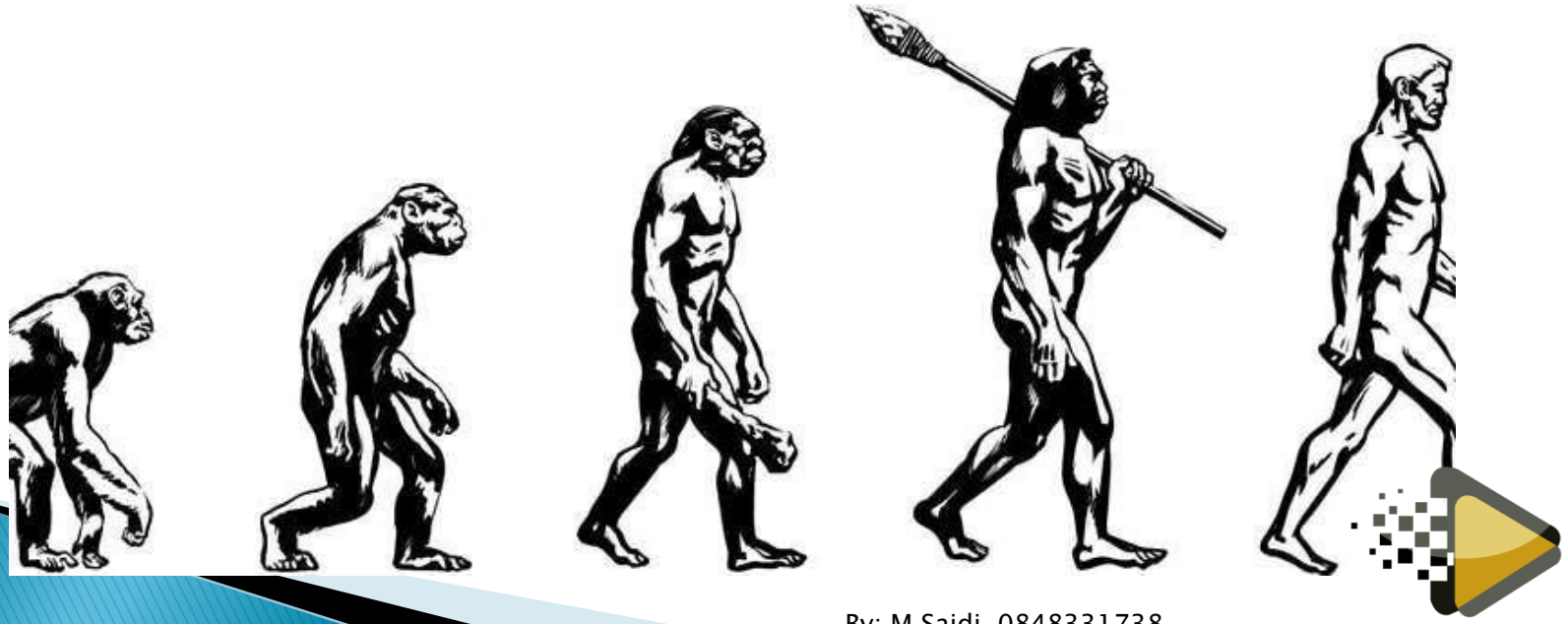
- **Biological Evolution** means **ALL** present-day forms of life
  - have **descended from**, and are **related *to***, those that lived in the past
  - **Difference** may be because they became ***modified*** from one generation to another



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HYPOTHESIS & THEORY

- **HYPOTHESIS** Is a tentative explanation for phenomena, facts, or a scientific inquiry that may be tested, verified or answered by further investigation
- You must be able to test your **hypothesis**, and it must be possible to prove your **hypothesis** true or false.

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- For **example**, Michael observes that maple trees lose their leaves in the fall.
- He might then propose a possible explanation for this observation:
- "cold weather causes maple trees to lose their leaves in the fall." This statement is testable.

THEORY

- A scientific **theory** is a broad explanation for events that is widely accepted as true.
- To become a **theory**, a hypothesis must be tested over and over again, and it must be supported by a great deal of evidence. eg
- the **theory** of evolution by natural selection. Charles Darwin
- People commonly use the word **theory** to describe a guess about how or why something happens

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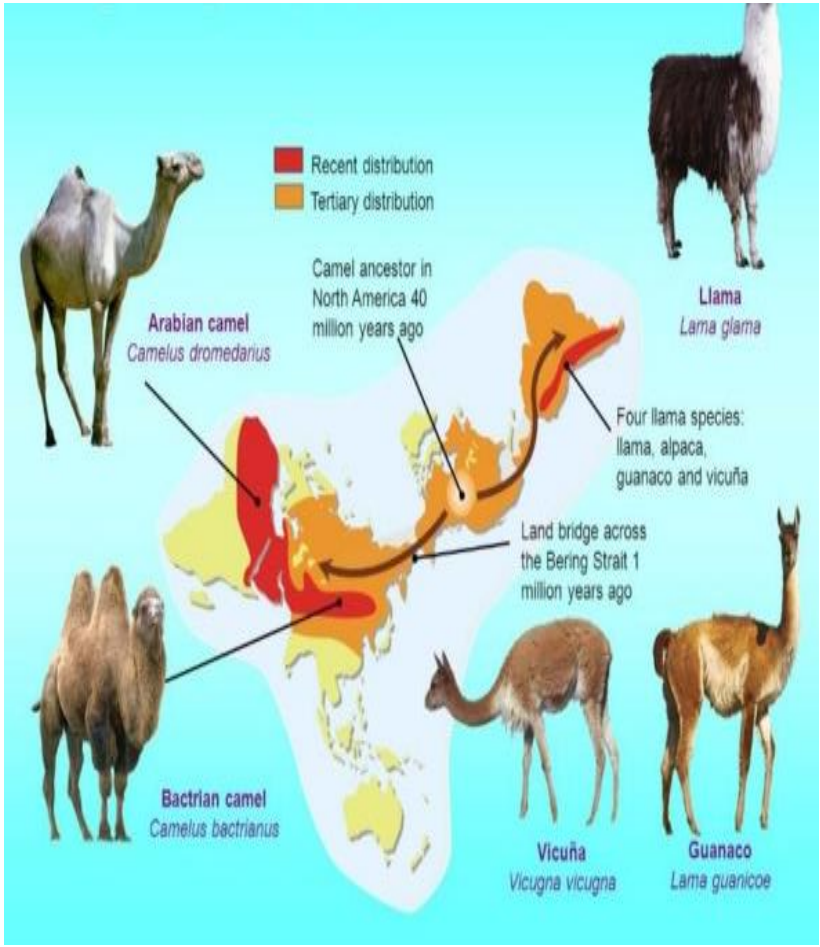
EVIDENCE OF EVOLUTION

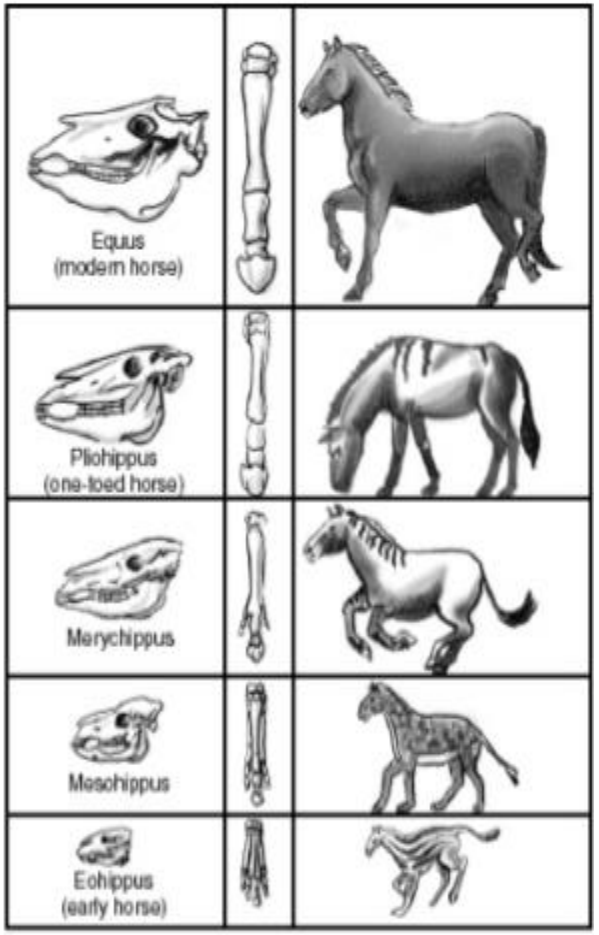
- **1.Biogeography**
- is the study of the distribution of species and ecosystems in geographic space and through geological time.

provides information about how and when species may have **evolved**..



2. Fossil record

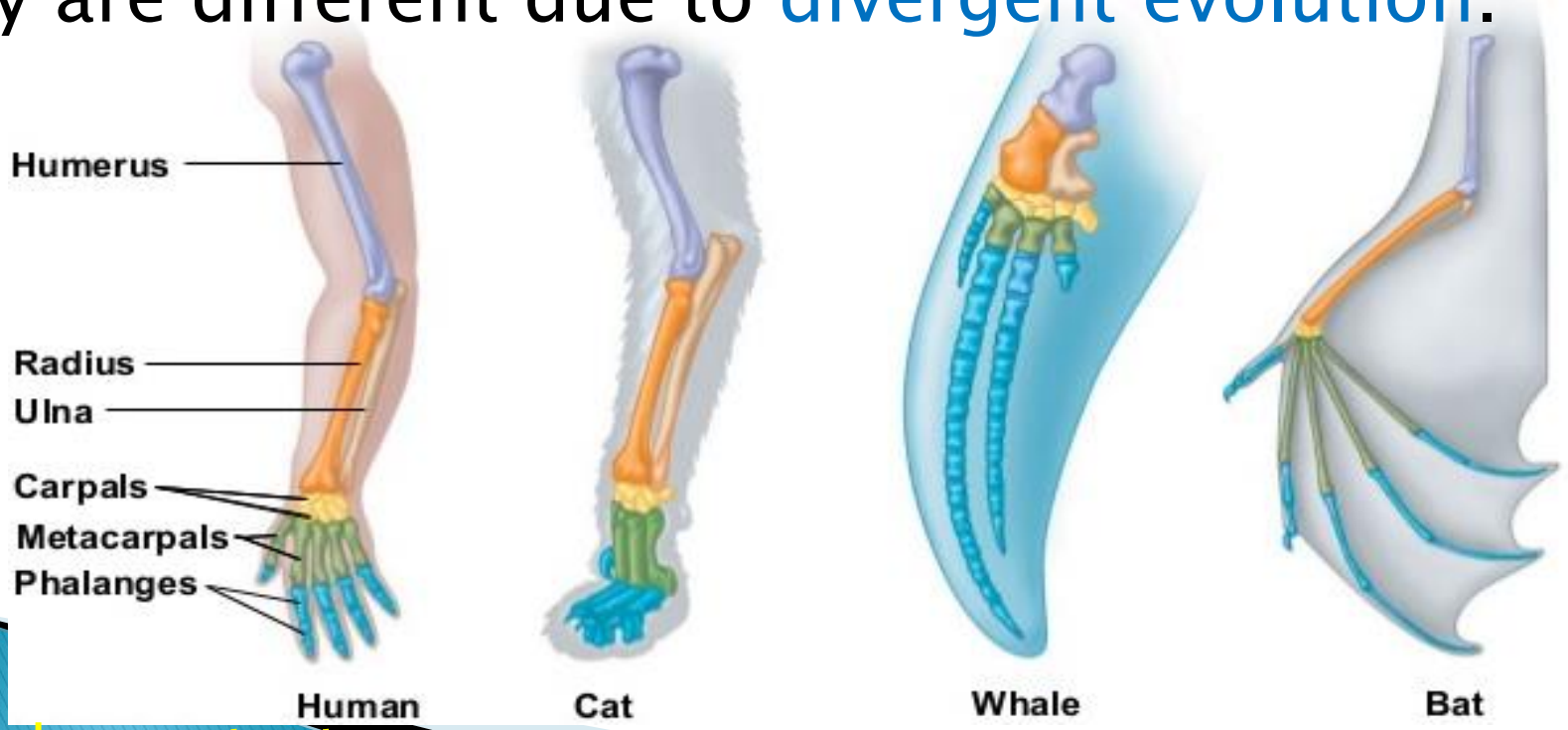
- **Fossil** remains have been found in rocks of all ages.
- **Fossils** of the simplest organisms are found in the oldest rocks, and **fossils** of more complex organisms in the newest rocks.
- This supports **Darwin's theory** of **evolution**, which states that simple life forms gradually **evolved** into more complex ones.



The diagram above shows the changes over time in the horse. Evidence for these changes *most likely* came from –

3.Comparative anatomy (modification by descent)

- Deals with similarities and differences in the anatomy of different species
- Organisms with the same ancestor have the same anatomical plan (pentdactyl limbs). But they are different due to divergent evolution.



Homologous structures

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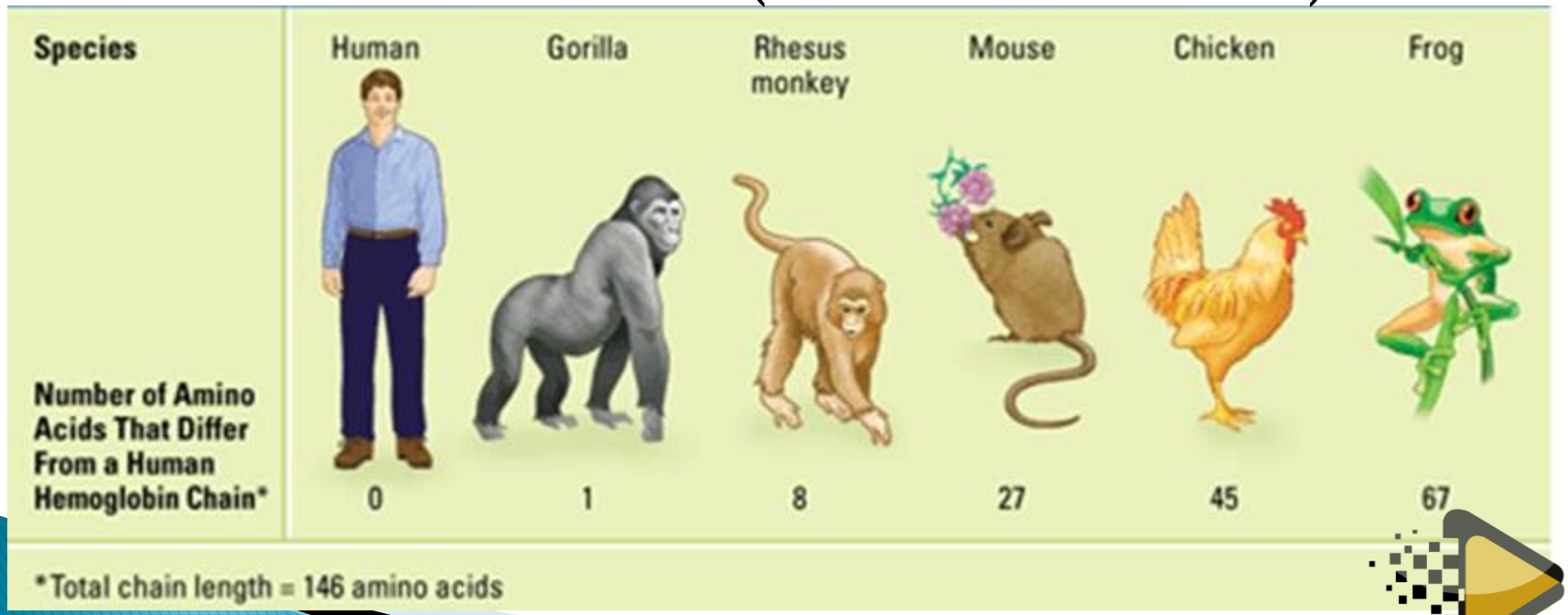
4.Genetic evidence

- One of the strongest evidences for common descent comes from gene sequences.
- Organism likely to have a **common ancestor** if they have:
- – Identical DNA structure – Similar sequence of genes – Similar portions of DNA with no functions and – Similar mutations (mitochondrial DNA).



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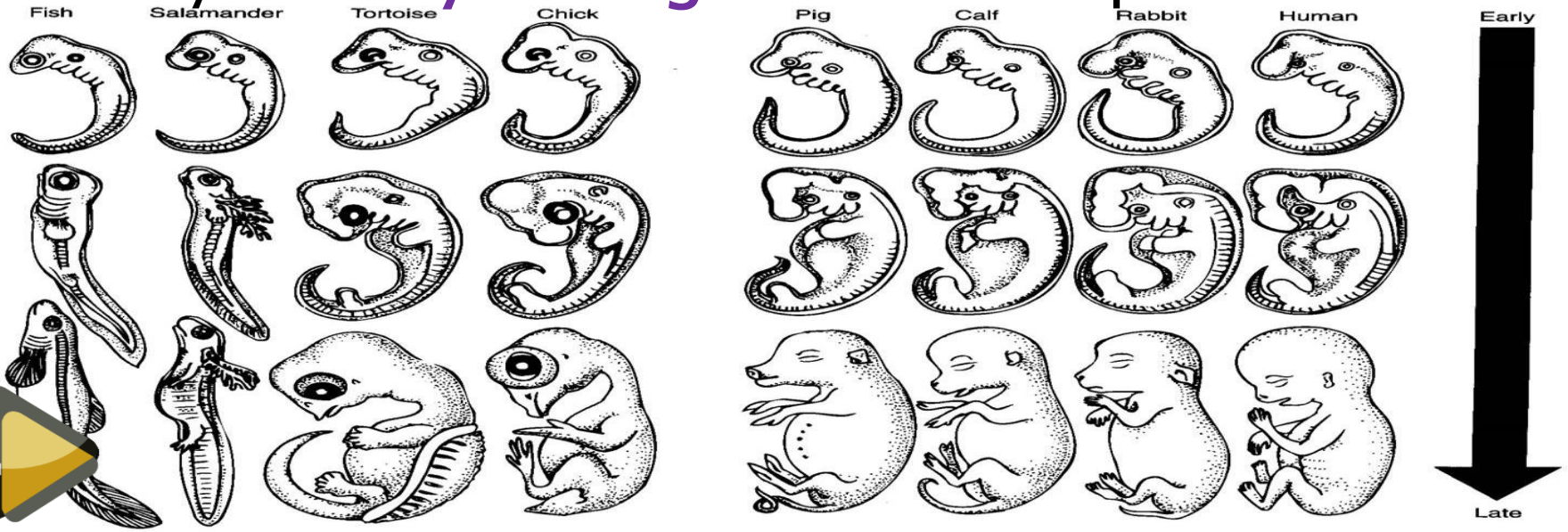
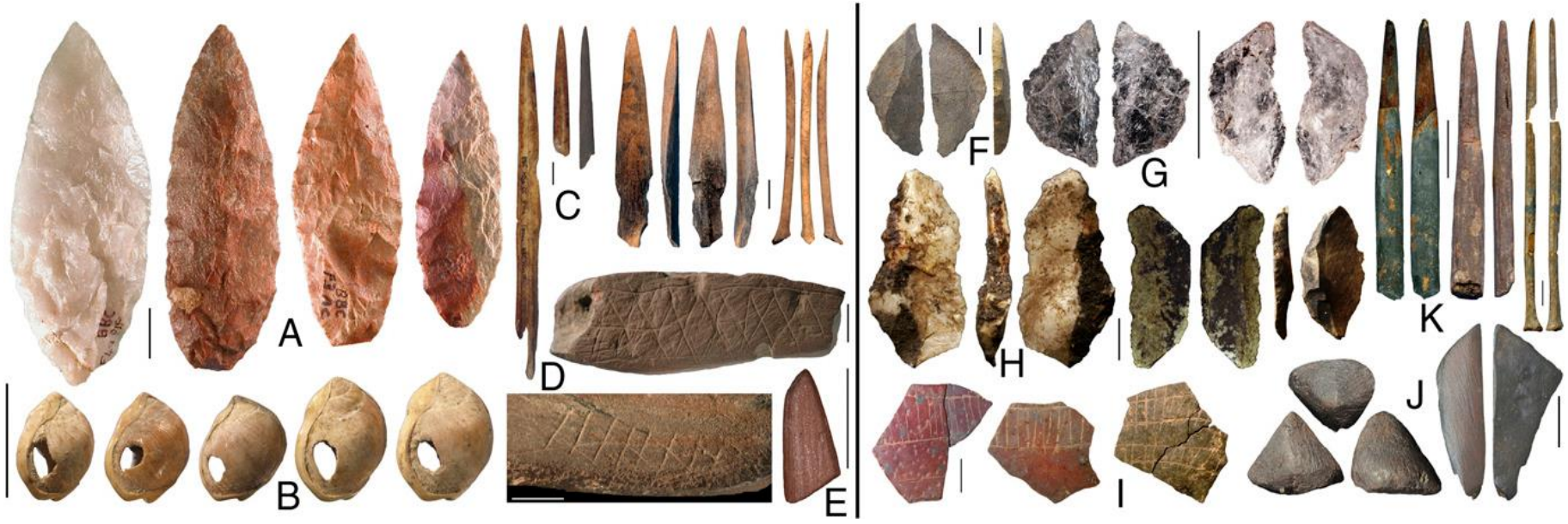
5.COMPARATIVE EMBRYOLOGY

- the study of the development of the anatomy of an organism to its adult form, provides evidence for **evolution** as embryo formation in widely-divergent groups of organisms tends to be conserved
- For **example**, vestigial structures such as **tails** or **gills** in humans can be found in embryos **early during** their development



6.Cultural evidence:

- Cultural evidence from studies of **tools** and **weapons**, as well as language is also used to show similarities and differences between humans and African apes. This is linked to human



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Variation

- Is the differences between organisms of the same species. It may be due to genetic factors or environmental factors.
- **A species** : is a group of living organisms consisting of similar individuals capable of interbreeding to produce a fertile/ viable offspring.
- **A population:** organisms of the same species living in a particular geographical area and are capable of interbreeding.

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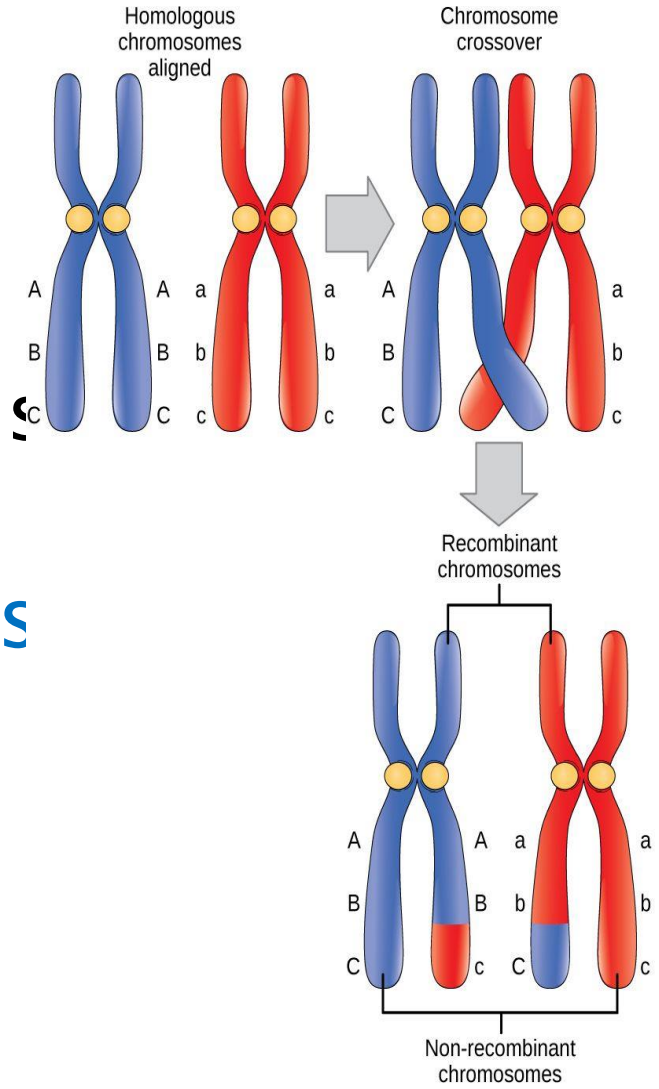
CAUSES OF VARIATION

- 1.CROSSING-OVER
- When homologous chromosomes form pairs during prophase I of meiosis I, crossing-over can occur.
- leads to new combinations of maternal and paternal genetic material in each new cell



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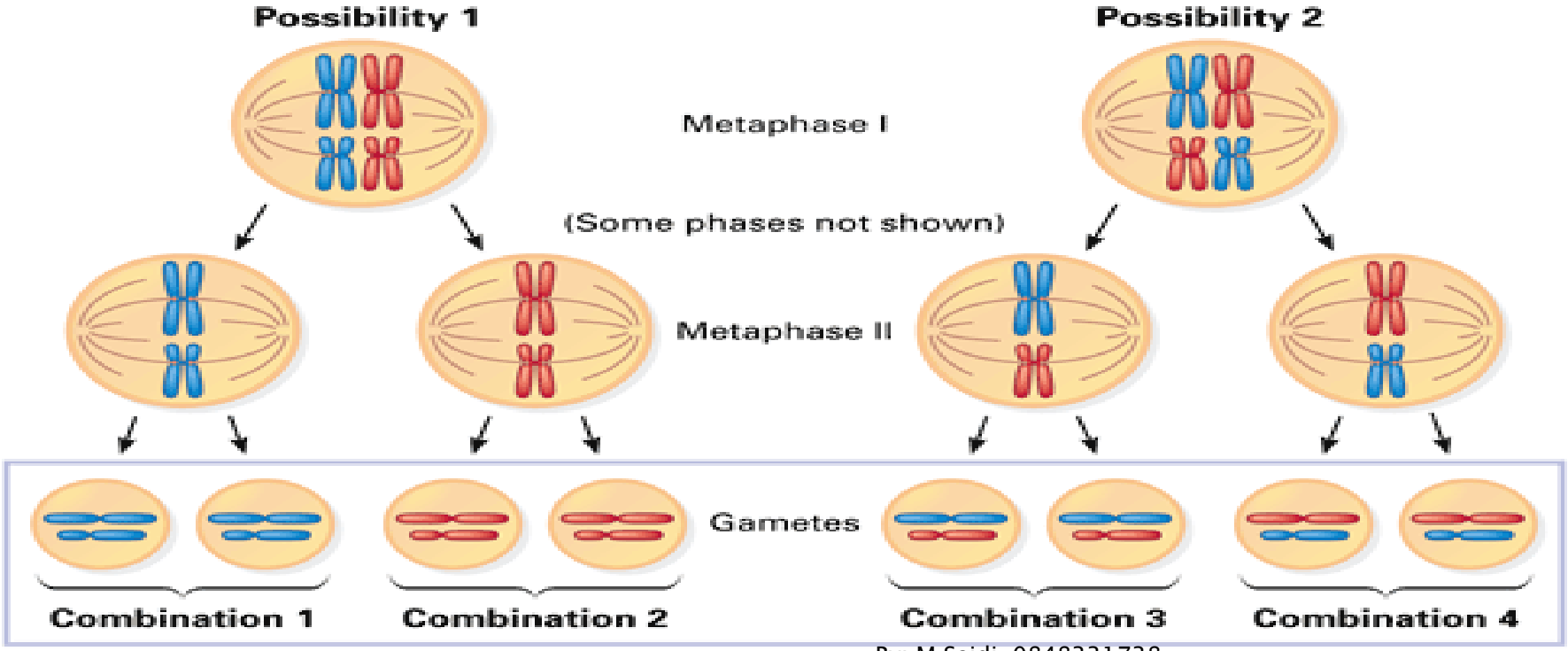
2.Random arrangement of chromosomes

- The **random arrangement** of **chromosomes** during **metaphase** results in gametes with a unique combinations of alleles.
- at the equator during metaphase allows different combinations of chromosomes/chromatids to go into each new cell resulting from meiosis, making them different.



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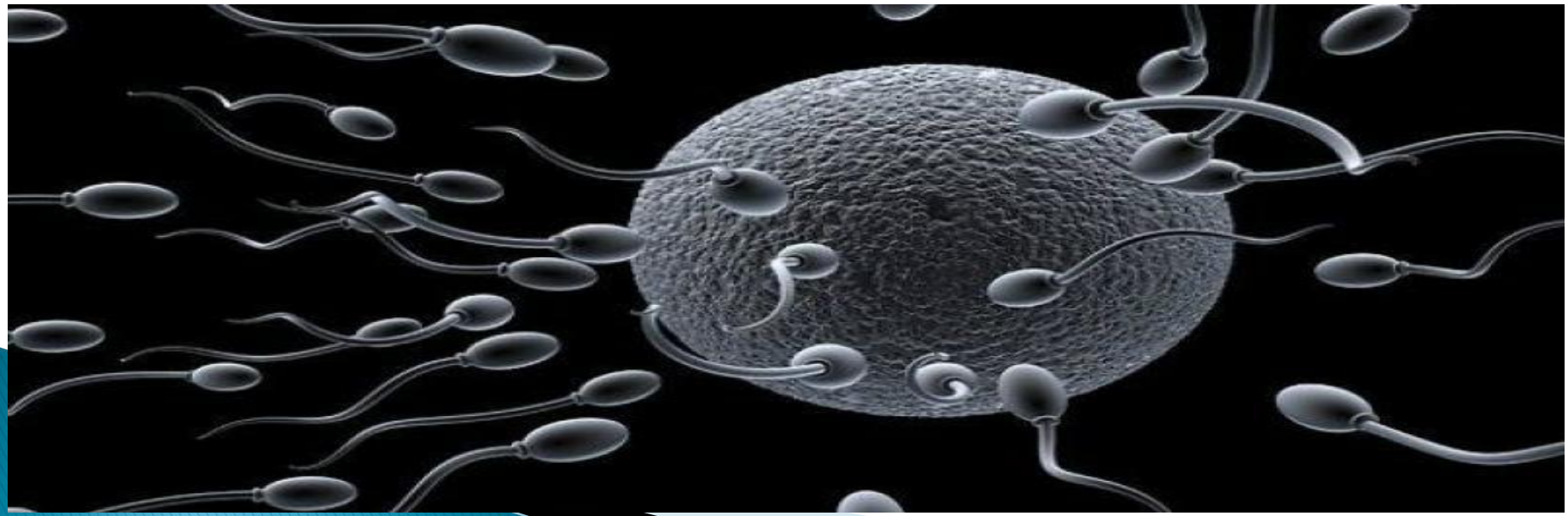
3.Random fertilization

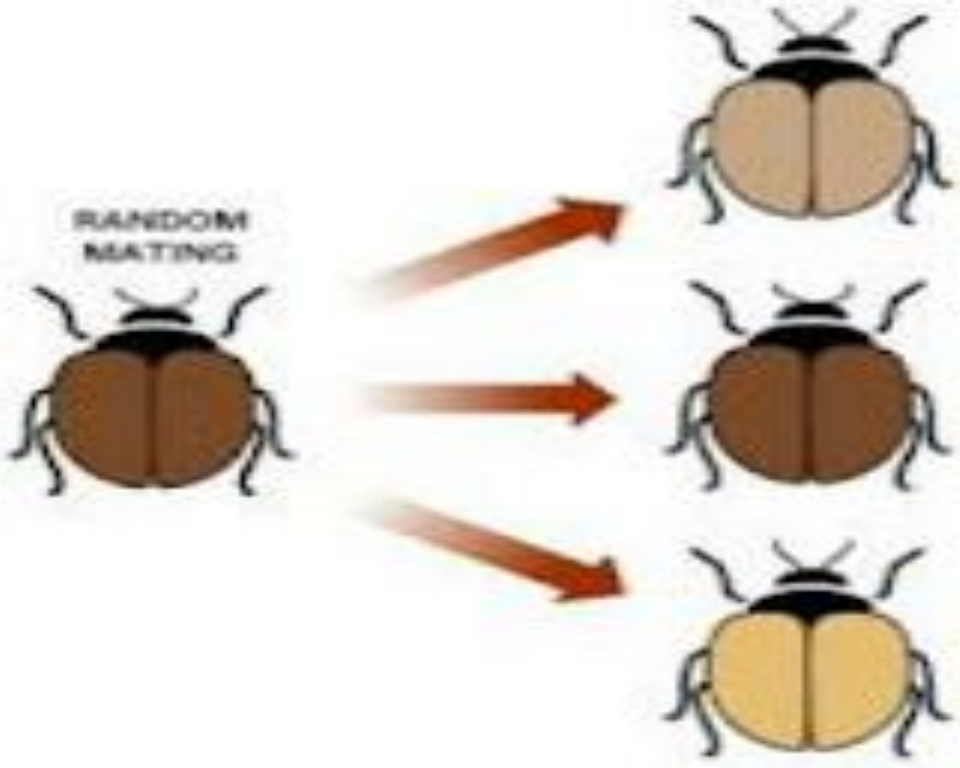
Any sperm cell stand a chance of fertilising any **egg cell/ovum.**between different ovum and different sperm cells formed by meiosis result in offspring that are different from each other.

Note: each individual is capable of producing over **8million** potential gametes, the **random** chance of any one sperm and egg coming together is a product of these two probabilities – some 70 trillion different combinations of chromosomes in a potential offspring.



4.Random mating

- Mating takes place within species randomly
- between organisms within a species leads to a different set of offspring from each mating pair.



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5.Mutation

- changes the structure of a gene or chromosome and therefore the organism's genotype changes too.
- Since the genotype influences the phenotype, it creates organisms with new, different characteristics from one generation to the next.
- **Mutations could be**
- Harmless mutation
- Harmful mutation
- Beneficial mutation

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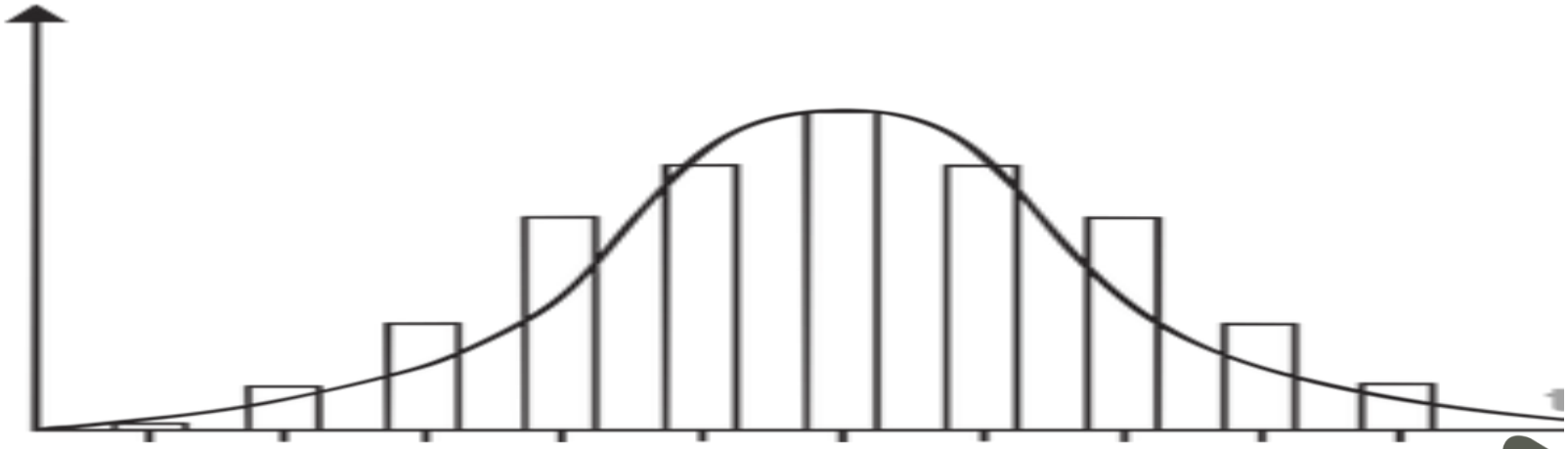
Continuous and discontinuous variation

- CONTINUOUS VARIATION this is the type of variation where there is arrange of characteristic.ie there is **intermediate values**.
- Phenotype could be affected by **environment**.
- e.g. height and weight



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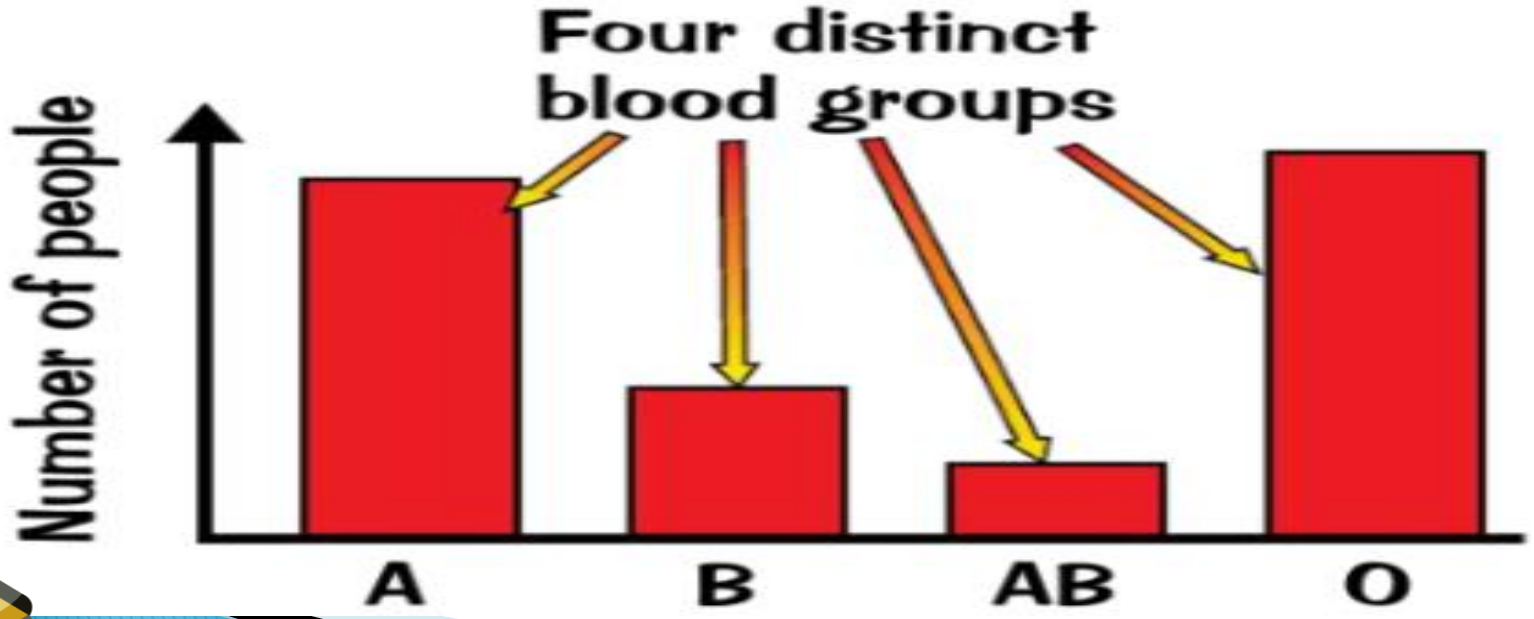
DISCONTINUOUS VARIATION

- Clearly **defined** differences in a characteristic that can be observed in a population. There is no **intermediate values**
- Eg. In the ABO blood group system, only four blood groups are possible (A, B, AB or O).
- Environment has **no effect on the phenotype.**



NEXT CLASS

THEORIES OF EVOLUTION

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