RAMA UNIVERSITY

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FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

PRE MENDELIAN CONCEPTS OF HEREDITY

GENETICS is the science of inheritance and variation. Genetics deals with the principles that explain the similarities between parents and their progeny and the differences among individuals of a single species.

Ex. Why should a human being give birth to a human being and not to any other organism.

Children resemble their parents is due to **Heredity** and they also differ from their parents to some extent in because of **variation**.

Heredity may be defined as the potential of an individual to transmit its characters to the offspring while variations are the differences that the individual acquires due to the interaction with the environment. The main aim of genetics is the study of Heredity and variation, while heredity tries to maintain uniformity, variation brings in plasticity.

The term genetics was first coined by Bateson in 1905.

EARLIER CONCEPTS OF HEREDITY- it made their beginning first with the discovery of sexuality in organisms, both plants and animals. The invention of the microscope gave a great impetus to probe into the world of microcosm and get a visual knowledge about the link between one generation and the other bringing about heredity transmission of characters.

Reproductive organs in plants were reported for the first time by Grew in 1682. It was Cameratious however who for the first time described sexual reproduction in plants. In 1717 Fairchild produced a hybrid having characters of both the parents. The hybrid was called 'Fairchild's mule'

PREFORMATION THEORY- the discovery of sexuality revealed the physical link between one generation and another, thus providing a physical basis for the transmission of heredity from parents to progeny.

The humunculus theory of Swammerdam suggested that the development of an organism is a simple enlargement of a minute but completely preformed individual. The preformed individual or homunculus could be present either in the sperm or in the ovum. Subsequent studies, later clearly showed that the Preformation was wrong, a figment of imagination.

EPIGINESIS THEORY- Wolf (1738-1794) who opposed the Pre-formation concept, opined that, neither the egg nor the sperm had a preformed organism, but both of them have undifferentiated mass of living substance which developed into the organisms after fertilization. According to this theory called epigenesist, where new

organs and tissues are formed *de novo* (from the mass of living substances in the gametes) due to vital forces.

PANGENESIS THEORY- Hippocrates (400 BC) believed that reproductive material is produced from all parts of the body so that all the characters are represented in the progeny.

Charles Darwin (1809-1882) was also a Votary for this type of inheritance. He modified the view of Hippocrates slightly and called it the theory of progenies. According to this all parts of the body produce invisible gemmules or pangenes which are carried into sex organs via blood stream. There the pangenes are assembled into gametes. During fertilization, pangenes of mother and father combine to produce the character of the offspring.

LAMARCKIAN THEORY - (J.B. Hamarck 1744-1829) of inheritance, often called inheritance of acquired characters opines that, any new character acquired during the life time of an individual inherited. It will be seen from the above that Charles Darwin's pangene theory in nothing but a version of Lamarckian theory.

GERMPLASM THEORY OF WEISMANN- August Weinmann (1834-1914) disproved the pangene theory with his experiments on rats. He cut the tails of rats and observed the progeny for 22 generations. In every generation the rat progeny continued to have tails in spite of the fact that the parents were tailless.

Weismann proposed his 'germplasm theory' which is essentially correct even today. According to his theory, the body of an organism can be divided into two somatoplasm and germplasm. Somatoplasm constitutes the vegetative body of the organism, while the germplasm constitutes the reproductive part. Somatoplasm develops newly in every individual and there is no continuity while the germplasm is continuous and links the generations. With the information present in germplasm, every individual develops its own somatoplasm. Hence any change or variation occurring in somatoplasm cannot the transmitted to the next generation, while those of germplasm can be inherited.