

Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (First Year)

Subject: Zoology

Course Code: ZOC 101

Course Title: Diversity of Non-chordates and Cell biology

Unit: 06- Phylum Annelida

Module Name: Metamerism in Annelida

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Metamerism in Annelida:

Definition: When the segmentation in bilateral animals involves a longitudinal division of the body into a linear series of similar sections or parts, it is termed metameric segmentation or metamerism.

Metamerism encountered for the first time in annelids. The primary segmental divisions are body wall musculature and coelom. Longitudinal structures like gut, main blood vessels and nerves extend through entire length of the body. While structures like gonads are repeated in all or few segments.

Characteristics of metamerism:

Each metamere typically repeats some or all of the various organ units.

Metamerism is always limited to the trunk region of the body.

The head, represented by the prostomium and bearing the brain and sense organs and the pygidium, represents by the terminal part of the body which carries the anus, are not metameres.

New segment arise just in front of the pygidium.

Each metamere represents a mirror image of the other.

All the segments of body work in coordination.

Types of metamerism:

1) External and internal metamerism:

In annelids e.g. earthworm, metamerism is both external as well as internal. All the body organs such as musculature, blood vessels, nerves, ganglia, gonads etc. are repeated segmentally. Even the coelom is divided into segmental compartments by septa.

In arthropods, metamerism is chiefly external, while man and other vertebrates show an internal metamerism of body muscles, nerves, certain blood vessels, vertebrae and ribs.

2) Complete and incomplete metamerism:

In annelid worms, metamerism is complete, affecting all the systems. The metameres are essentially alike or homonomous each having segmental blood vessels, nerves, nephridia and coelomoducts.

Arthropods and vertebrates show incomplete metamerism in which segmentation is not seen in all the organs. They are heteronomous animals.

Origin and evolution of metamerism:

Various hypotheses have been proposed to explain the origin of metamerism, but none is acceptable in the absence of convincing evidence. The main theories concerning the origin of metamerism are

- 1) Pseudometamerism theory
- 2) Cyclomerism theory
- 3) Corm or fission theory
- 4) Embryological theory
- 5) Locomotory theory

1) Pseudometamerism theory: This theory was supported by Hyman (1951) and Goodrich. This theory stresses that metamerism developed secondarily as a result of repetition of body parts, such as muscles, nerves, nephridia, coelom, blood vessels etc., in a single individual.

2) Cyclomerism theory: This theory was proposed by Sedgwick (1884). This theory assumes that coelom originated in some ancestral actinozoan coelenterate, through the separation of four gastric or enterocoelic pouches from the central digestive cavity or gut.

3) Corm or fission theory: This theory was proposed by Perrier (1882). According to this theory, metameric segmentation resulted when some non-segmented ancestor divided by transverse fission repeatedly or by asexual budding producing a chain of sub- individuals or zooids, united end to end due to their incomplete separation.

4) Embryological theory: It suggests that mechanical stresses in the mesoderm of the elongating embryo or larva resulted in its fragmentation leading to segmental repetition of mesodermal derivatives in the adult.

5) Locomotory theory: This theory was suggested by R. B. Clark (1964). It postulates that metamerism evolved as an adaptation to locomotion of different kinds. Annelid metamerism probably evolved as an adaptation for burrowing.

Significance of metamerism:

It has provided effective locomotory mechanism as the coordinated contraction along body generates efficient body undulating movement.

Fluid filled coelomic compartments provide hydro static skeletons for burrowing.

Different segments can be specialized for different functions leading to the development of high grade of organization.