

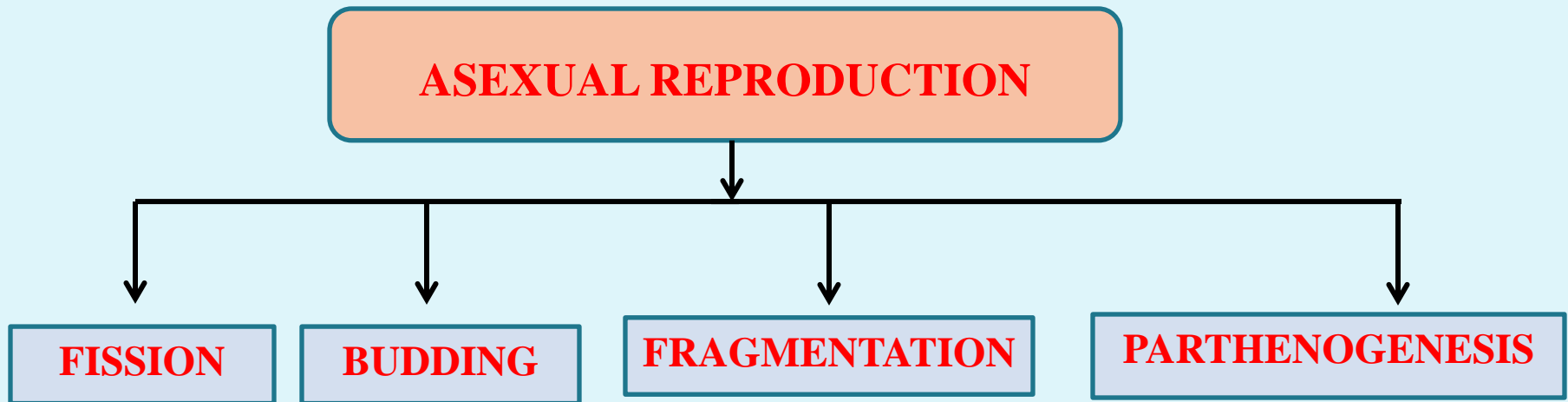
# **Course: Animal form and function**

## **Chapter: REPRODUCTION AND DEVELOPMENT**

- ❑ **ASEXUAL REPRODUCTION IN INVERTEBRATES**
- ❑ **SEXUAL REPRODUCTION IN INVERTEBRATES**
- ❑ **SOME BASIC VERTEBRATE REPRODUCTIVE STRATEGIES**
- ❑ **EXAMPLES OF REPRODUCTION AMONG VARIOUS VERTEBRATE CLASSES**

# ASEXUAL REPRODUCTION IN INVERTEBRATES

❖ Reproduction without the union of gametes or sex cells.



## FISSION

- Division of one cell, body, or body part into two.
- Cell pinches in two by an inward furrowing of the plasma membrane.
- Binary fission occurs when the division is equal; each offspring contains approximately equal amounts of protoplasm and associated structures.
- Plane of division may be asymmetrical, transverse, or longitudinal, depending on the species.
- In multiple fission numerous constrictions along the length of the body; form a chain of daughter individuals results. i.e., in flatworms and annelids

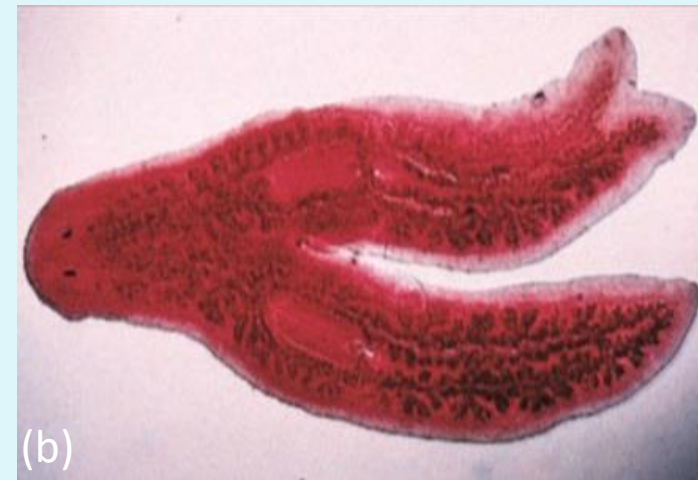
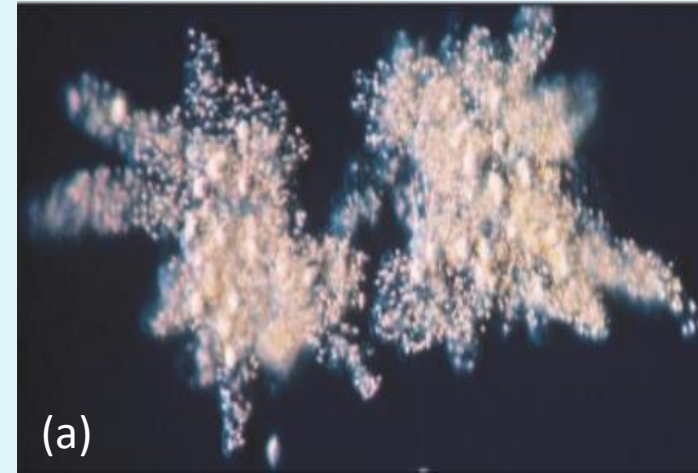


Fig: (a) An amoeba (a protist) undergoes fission to form two individual organisms. (b) Planarian worms undergoing longitudinal fission.



**Fig: The annelid, Autolysis, undergoing various constrictions.**

## BUDDING

- Cells divide rapidly and develop on the body surface to form an external bud. i.e., **Hydra and many species of sponges.**
- The bud cells proliferate to form a cylindrical structure, which develops into a new animal, usually breaking away from the parent.
- If the buds remain attached to the parent, they form a **colony.**
- Internal budding produces **gemmules**, which are collections of many cells surrounded by a body wall.
- When the body of the parent dies and degenerates, each gemmule gives rise to a new individual.



Fig: A Hydra with developing buds

## FRAGMENTATION

- Fragmentation is a type of asexual reproduction whereby a body part is lost and then regenerates into a new organism.
- Fragmentation occurs in some cnidarians, platyhelminths, rhynchocoels, and echinoderms.
- For example, in sea anemones, as the organism moves, small pieces break off from the adult and develop into new individuals.



Fig: Small sea anemones produced by fragmentation.

## **PARTHENOGENESIS**

- **Parthenogenesis is a spontaneous activation of a mature egg, followed by normal egg divisions and subsequent embryonic development.**
- **Parthenogenetic eggs are not fertilized, they do not receive male chromosomes. The offspring would thus be expected to have only a haploid set of chromosomes.**
- **Animals that reproduce parthenogenetically have substantially less genetic variability and may have less flexibility in meeting the challenges of a changing environment.**
- **Relatively uncommon.**
- **Plays an important role in social organization in colonies of certain bees, wasps, and ants.**

# SEXUAL REPRODUCTION IN INVERTEBRATES

- **In sexual reproduction, the offspring have unique combinations of genes inherited from the two parents.**
- **Offspring are somewhat different from their parents and siblings—they have genetic diversity.**
- **Each new individual represents a combination of traits derived from two parents because syngamy, or fertilization, unites one gamete from each parent.**
- **External fertilization or Internal fertilization**



## **EXTERNAL FERTILIZATION**

- **Many invertebrates (e.g., sponges and corals) simply release their gametes into the water in which they live (broadcast spawning), allowing external fertilization to occur.**
- **In these invertebrates, the gonads are usually simple, often transient structures.**
- **The gametes releases from the body through various arrangements of coelomic ducts, metanephridia, sperm ducts, or oviducts.**

# INTERNAL FERTILIZATION

## ➤ Male Reproductive Systems in Invertebrates

- In the male, sperm are produced in the testes and transported via a sperm duct to a storage area called the seminal vesicle.
- Prior to mating, some invertebrates incorporate many sperm into packets termed spermatophores.
- Sperm or the spermatophores are then passed into an ejaculatory duct to a copulatory organ (e.g., penis, cirrus, gonopore).
- Various accessory glands (e.g., seminal vesicle) may be present in males that produce seminal fluid or spermatophores

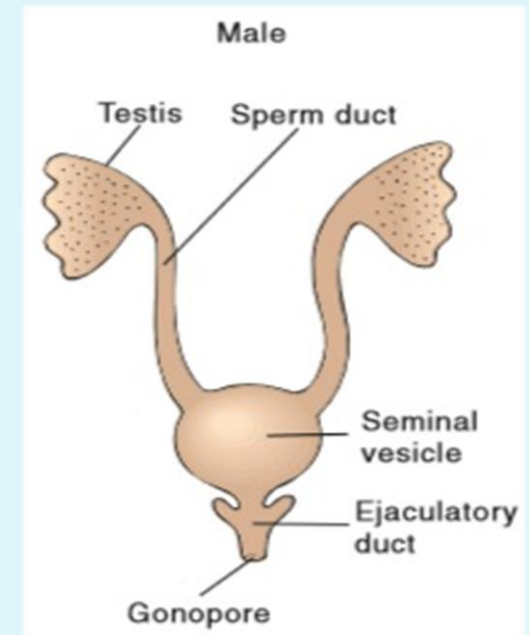


Fig: Male Reproductive Systems in Invertebrates

## ➤ Female Reproductive Systems in Invertebrates

- In the female, ova (eggs) are produced in the ovaries and transported to the oviduct.
- Sperm move up the oviduct, where they encounter the ova and fertilize them.
- Accessory glands may also be present in females.
- However, some sexually reproducing animals occasionally depart from this basic reproductive mode and exhibit variant forms of sexual reproduction.

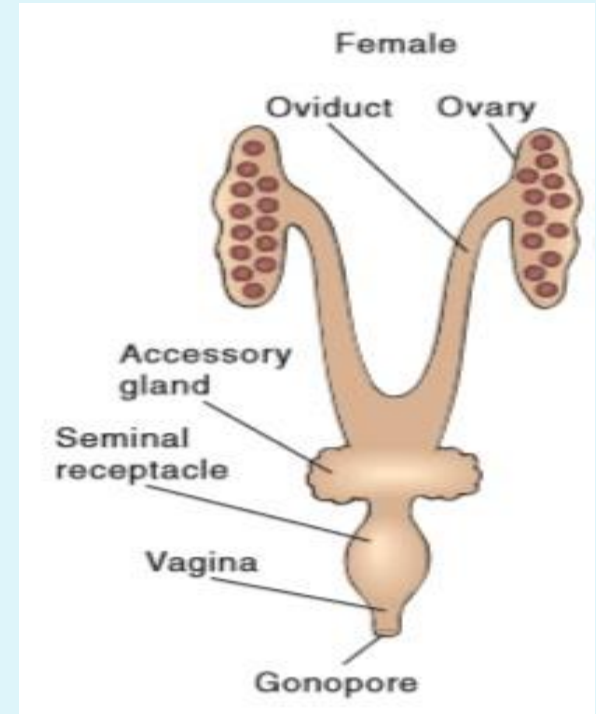


Fig: Female Reproductive Systems in Invertebrates

## **Hermaphroditism**

- **Hermaphroditism occurs when an animal has both functional male and female reproductive systems.**
- **This dual sexuality is sometimes called the monoecious condition.**
- **Some hermaphrodites fertilize themselves, most also mate with another member of the same species (e.g., earthworms and sea slugs).**
- **Each animal serves as both male and female—donating and receiving sperm.**
- **Especially beneficial to sessile (attached) animals (e.g., barnacles) that may only occasionally encounter the opposite sex.**

## ➤ Sequential hermaphroditism

- Occurs when an animal is one sex during one phase of its life cycle and the opposite sex during another phase.
- Hermaphrodites are either **protogynous** or **protandrous**.
- In protandry, an animal is a male during its early life history and a female later in the life history. The reverse is true for protogynous animals.
- A change in the sex ratio of a population is one factor that can induce sequential hermaphroditism, which is common in oysters.

# **SOME BASIC VERTEBRATE REPRODUCTIVE STRATEGIES**

## **Reproductive strategies in fishes**

- **high potential fecundity.**
- **reproductive methods**
- **structures**
- **an attendant physiology**

## **Reproductive strategies in Amphibians**

- **Trends toward terrestriality in each of the three living orders of Amphibia (caecilians, salamanders, anurans)**
- **Direct development of terrestrial eggs**
- **Ovoviviparity**
- **Viviparity**

## **Reproductive strategies in Reptiles**

- shelled, desiccation-resistant eggs.
- These eggs had the three basic embryonic membranes that still characterize the mammalian embryo, as well as a flat embryo that developed and underwent gastrulation atop a huge yolk mass.

## **Reproductive strategies in Birds**

- shelled eggs but much thicker than those of reptiles.

## **Reproductive strategies in Mammals**

- maintaining the developing embryo within the female for long periods of time.
- During gestation the embryo is nourished with nutrients and oxygen, yet it is protected from attack by the female's immune system.
- After birth, the first mammals nourished their young with milk from the mammary glands,
- Female apes and monkeys are asynchronous breeders.
- Females mate only when in estrus, increasing the probability of fertilization.
- Human females show a less distinctive estrus phase and can reproduce throughout the year.