

## Zoology Part

### PART I: INTRODUCTION

The Greek philosopher **Aristotle** (384-322 BC) devotes many treaties to the animal world. Thus, his book [*History of Animals*] is a defense of his method of investigating zoology.

**Aristotle** investigates four (4) types of differences between animals: Differences in particular body parts<sup>1</sup> (Books I to IV); differences in ways of life<sup>2</sup> and types of activity<sup>3</sup> (Books V, VI, VII and IX); and differences in specific characters<sup>4</sup> (Book VIII).



**Al-Jāhiz** (full name Abū‘Uthman‘Amr ibn Baḥr al-Kinānī al-Baṣrī) born in Basra 776, was an Arabic prose, writer and author of works of literature.

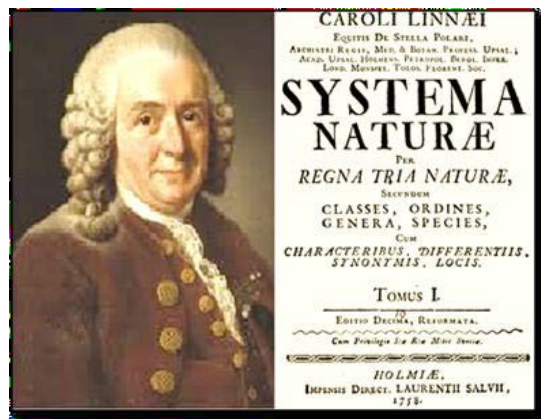


He sold fish along one of the canals in Basra in order to help his poor family. Financial difficulties, however, did not stop Al-Jāhiz from continuously seeking knowledge. He continued his studies. Over a span twenty-five years, he would acquire considerable knowledge on Arabic poetry, Arabic philology, and pre-Islamic Arab and Persian history. He also studied the Qur'an and the Hadiths. Additionally, **Al-Jāhiz** read translated books on Greek sciences, especially that of Greek philosopher **Aristotle**. [*Kitāb al-Hayawān*], Book of Animals is one of his most important books. It is an encyclopedia of seven volume of

anecdotes, poetic descriptions and proverbs describing over 350 varieties of animals. He died in Basra in January 869 at the age of 93, in his private library.

**Carl Linnaeus** (23 May 1707- 10 January 1778), also known as Carl von Linn, was a Swedish botanist, physician, and zoologist, who laid the foundations for the modern biological naming system of binomial nomenclature. He is known as the father of modern taxonomy and is considered one of the fathers of modern ecology.

Many of his writings were in Latin, and his name in Latin is *Carolus Linnæus*. He published *Species Plantarum*, the work that is now internationally accepted as the starting point of modern botanical nomenclature, in 1753. *Systema Naturae* [System of nature] was one of the major works of *Carolus Linnaeus* and introduced the Linnaean taxonomy.



The 1<sup>st</sup> Edition was published in 1735. The 10<sup>th</sup> Edition of this book (1758) was considered the starting point of zoological nomenclature. It was also officially regarded by the International Commission on Zoological Nomenclature as the 13th edition of *Systema Naturae*.

## 1. WHAT IS ZOOLOGY?

**Zoology** (zō-ōl'ə-jē) or animal biology is the scientific study of .Organisms.. in the kingdom .Animalia..., including their .growth!....., structure, evolution, habitat and behavior.

## 2. WHY STUDY ZOOLOGY?

We know that zoology is the black sheep.... of most students.... in second-year biology (L2/SNV). But, please note that study Zoology is good at all levels. Look, briefly there are three reasons that show the importance of Zoology:

- If you study Zoology, you will get to work on to the animals themselves. Moreover, working with animals.. can be extremely challenging and rewarding.
- Zoology is important to us to understand the urgency of preserving the animals. This science... would help us learn the needs that animals lack and we can respond by thinking of solutions we can give to the different...species of animals.
- Studying zoology would help people achieve clarity over the common myths we have on different types of.... animals. In this course....,we can be able to learn the natural behavior as well as their habitats so we would completely understand why they would behave in a defensive manner when they seem threatened...

## 3. CELLS AS UNITS OF LIFE

The body of all living organisms is made up of one or more cells which carry out certain basic functions. Thus, cells are called “Basic structural and functional units of living organisms”. The branch of biology that deals with the study of structure, function and life history of a cell is called “Cell Biology”.

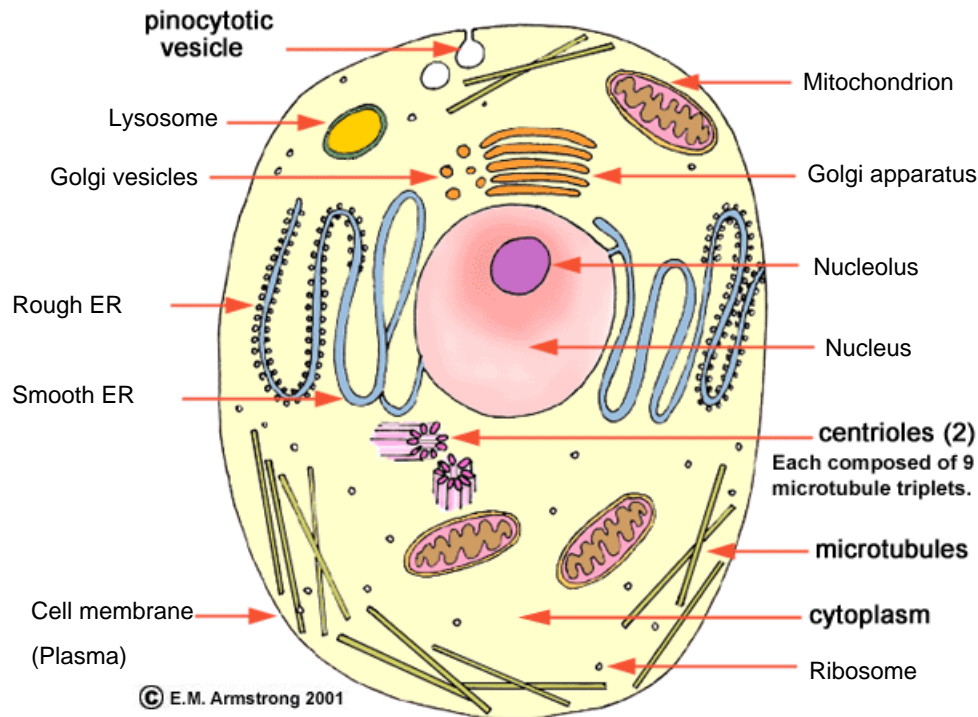
### 3.1. Kinds of cells

There are two basic kinds of cells: Prokaryotic cells and Eukaryotic cells.

**Prokaryotes**, bacteria and archaea, are simple.... cells that have no nucleus. However, **Eukaryotes** are complex cells with many organelles and other structures in the cell. They store their genetic information (*DNA*) on chromosome... in the nucleus.

### 3.2. Kinds of Eukaryotic cells

There are two types of eukaryotic cells: plants..... (for more comprehension of plant cell, form and function, please refer to the chapter Botany) and animal.... cells (Fig.1: Please, give a title to the figure).



**Fig.1.** Animal cell and its organelles.....

### 3.3. Organisms show variety in cell number

The organisms made up of a single cell are called *Unicellular*..... organisms. Eg: Protozoa as *Amoeba*, *Paramecium* etc... However, others made up of more than one cell are called *Multicellular*.....organisms.

## 4. BINOMIAL NOMENCLATURE

In biology, we traditionally classify animals by the structure of their *Anatomy*....., in a descending hierarchy of *taxons*.....: kingdom, phylum, class, order, family, genus, and species.

For example, human beings are classified as belonging to the:

Kingdom...	Animal
Phylum	Chordates
Class.....	Mammals
Order	Primates..
Family.....	Hominidae
Genus	Homo.....
Species...	<i>Sapiens</i>

The Swedish scientist LINNEAUS...developed a system of naming living things in the eighteenth century. He invented the binomial nomenclature (2 Latin names: Genus-species).

**Ex.** Scientific name of humans is *Homo sapiens* L., 1758. Thus, Homo is the .....<sup>genus</sup> name and sapiens is the .....<sup>species</sup> name.

### **-Rules for writing scientific names**

The Latin scientific name of a species, whether it is a plant, animal, bacterium, fungus, etc., is a two-part..... name consisting of the genus name first (by the way: one genus, two genera) and the species name second. For example, the domestic cat is known as *Felis catus*. Although the genus name can be used on its own but the species name never appears on its own.

For writing a scientific name, we must

Use both genus... and species... name: *Felis catus*.

Italicize the whole.... name.

Capitalize only the genus... name.

## **5. CLASSIFICATION OF ANIMALS**

Classification is a way of listing..... living things. According to the presence/ absence of the spine....., scientists have divided the Animal Kingdom into two main groups:

1/ Invertebrates. are animals without a backbone

2/ Vertebrates.... are animals with a backbone

Based on the number.... of cells.....forming the body, the Animal Kingdom is generally divided into two Sub-Kingdoms:

1/ Protozoa..... (First animals): unicellular, microscopic animals, no tissues.

2/ Metazoa....: Multi cellular animals. Cells arranged in tissues

## 6. SYMMETRY IN ANIMALS

Symmetry means an arrangement of body parts into a *geometrical*..... design. It refers to the division of body into *equal*..... parts by lines or planes. A plane of symmetry is a straight line that divides organisms into corresponding *halves*.....

An animal is called *symmetrical* when a plane passing through its center will divide it into similar halves. When an animal cannot be divided into like parts by a plan, it is called *asymmetrical*.....(Fig.2: Please fill the legend by following the course).

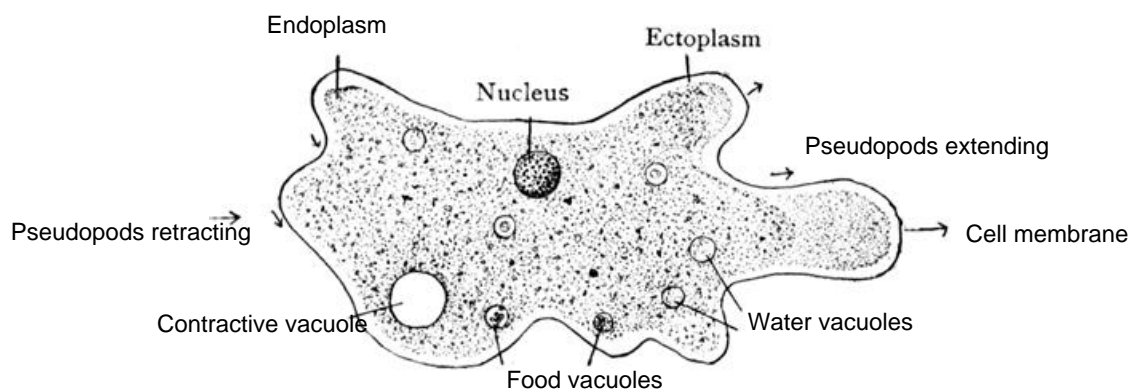


Fig. 2. Structure of an Amoeba

Other *types*.....of symmetry are also recognized.....(Please follow the course in the amphitheater).

## PART II: Invertebrates Zoology

### 1. THE ROLE OF FRESHWATER INVERTEBRATES IN THE FOOD WEB

Invertebrates are a cornerstone (base) of our ecosystems, providing vital services such as *pollination*....and acting as important environmental *indicators*..... (for instance of water quality in rivers). These animals do not possess a *vertebral column*.....; they are an important link in the food web (Fig.3) as they convert the energy in plant and other organic matter into protein (their own bodies). This allows larger predators such as fish to live in fresh water as they feed on the *invertebrates*

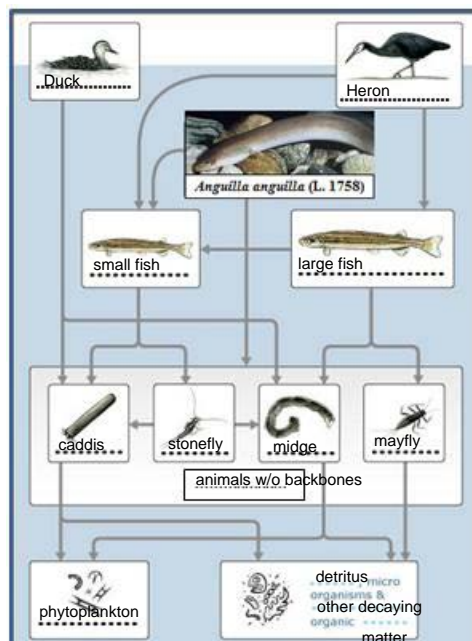


Fig. 3. The role of freshwater invertebrates in the food web

Over 95% of all animals on the earth are invertebrates. Invertebrates are found everywhere in both soil, water and air, and include animals ranging from sponges, corals and seastars to insects, crabs and worm.

## 2. PORIFERA



Sponges are aquatic animals (Follow the water circulation in the course). Most of them are marine. They live attached to sand or rocks. The body is perforated by pores and supported by small needles called spicules. They have an internal cavity with an upper hole called osculum and can reproduce sexually or asexually. They are filtering animals.



### 3. CNIDARIA

Most of Cnidaria are marine animals. They have two body forms:

- Sessile polyps (Fig. 4A).- Swimming medusae (Fig. 4B).

They have a mouth with tentacles with stinging cells called cnidocytes and a gastrovascular cavity. Cnidaria are carnivores. They can reproduce sexually or asexually.

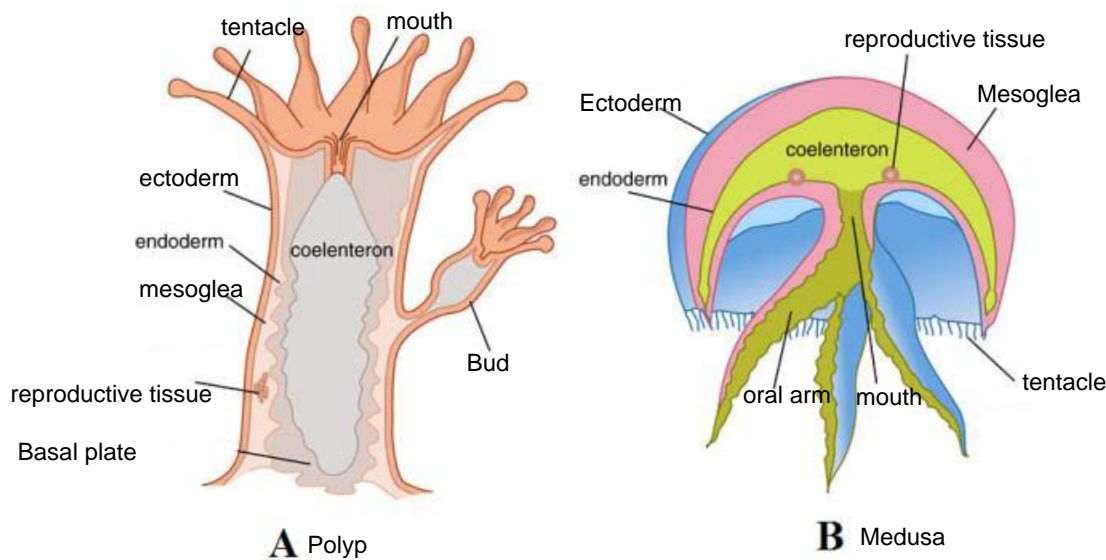


Fig.4: 2 types of Cnidaria .....

### 4. PLATYLMINTHES



Photo A



Photo B

This phylum has three common names: Flat worms, tapeworms..... and Flukes. There are over 20,000 species of flatworms. Most Platy helminthes organisms are hermaphrodites and reproduce sexually. Asexual reproduction (fission) is also common. Flatworms can be free



(photo A) or parasites (photo B). Follow the explanation of the parasite *Ligula intestinalis* (in the course).

## 5. MOLLUSKS

They are aquatic and terrestrial animals (snails, slugs). Their body comprises three parts: - The head: contains the sense organs -The visceral mass: contains the internal organs -The muscular foot: to move around, excavate or catch the prey. They reproduce sexually. Main groups are: Gastropods (snail, slugs), Bivalves (mussels, clams), Cephalopods (squid, octopus, nautilus).

## 6. ARTHROPODS

They are terrestrial (spiders) or aquatic animals. The body is segmented. They have hard appendages (antennas, legs, palps). The body is covered by a rigid and articulated exoskeleton. They breathe by gills (aquatic) or tracheas (terrestrials). They reproduce sexually and some of them have complete (Follow the life cycle of the lady beetle -photo C- in the course) or incomplete metamorphosis.



Photo C

## 7. ECHINODERMS

They are marine animals (starfish, sea urchins, sea cucumber, brittle star (Photo D)). Generally with spines... and a hard skeleton.... They have an ambulacral.. system to move around. They reproduce sexually.... or by fragmentation like starfish.

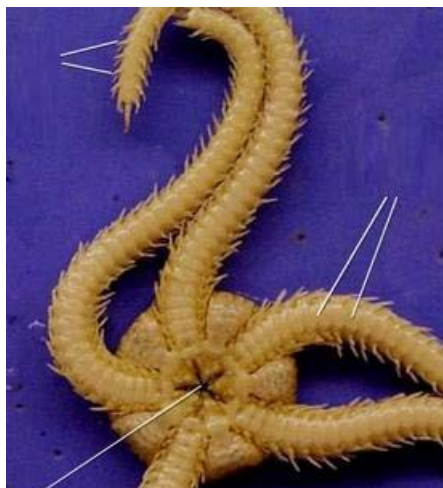


Photo D

## 8. THE MAIN CHARACTERISTICS OF ANIMALS

Animals are the most complex living things.

They usually have organs and systems.

They can perform the three vital functions: ~~nutrition~~....., interaction and reproduction.

They can ~~move~~..... and ~~interact~~.. with other living things.

Animal reproduction can be: Asexual (Budding) and fragmentation or sexual.

Animals can be:

- viviparous: develop the embryo ~~inside~~... the mother's body.
- Oviparous: lay eggs ~~outside~~.....the body.
- Ovoviviparous: develop ~~inside~~ eggs that remain inside the mother's body.

## PART III: Vertebrate Zoology...

(Follow the course in the amphitheater)

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