ZOOLOGY

DEFINITION OF ZOOLOGY

- According to *Chanco in 1995*, "***zoology***" is science that deals with the study of animal life. It came from the Greek words "*zoon*" which means animals and "*logos*" which means science or study according to *Storer et al. (1979).*

ELEMENTS FOUND IN THE DEFINITION OF ZOOLOGY

1. ***SCIENCE.*** *Storer et al.* In 1979 states that the word Science comes from the Latin word "*scientia*" which means exact knowledge, tested and verified human experience. ***Facts*** are raw materials of science. ***Accumulated facts or data*** are records of science. ***Qualitative data*** deals with different kind of things, subjective estimates of degree while ***quantitative data*** deal with dimensions, weights or other facts that can be expressed in numerical terms.

A ***scientist*** is a person of inquiring mind, curious about natural phenomena, who asks questions and seeks answers supported by dependable evidence using ***scientific method***: the making of careful observations and experiments, then using the data obtained to formulate *theory* which explains the observed facts and *general principles*-the restated or repeated proof as to cause and effect (storer et al., 1979).

2. ***ANIMALS***. An organism of the Kingdom *Animalia* being characterized by a requirement for complex organic nutrients including proteins or their constituents which are usually digested in an internal cavity before assimilation into the body proper, by cells that lack cellulose walls, and usually by greater mobility with some degree of voluntary locomotors ability, by greater irritability commonly indicated through a more or less centralized nervous system, and by the frequent presence of discrete complex sense organs (Webster's Third New International Dictionary, 1986).

3. ***Life.*** The term refers to the activities in the cells of animals (Storer et al., 1979).

SUBDIVISIONS OF ZOOLOGY

1. ***Biosystematics*** – deals with the identification, naming and classification of organisms. This is the modern term for *taxonomy*. It can be subdivided into plant, animal and microbial systematics. Specific fields of subdivisions are:

- Entomology – the study of insects.
- Ornithology – the study of birds.
- Herpetology – the study of reptiles and amphibians.
- Cnidarology – the study of corals.
- Ichthyology – the study of fishes.
- Bryology – the study of mosses and liverworts.

- Pteridology – the study of ferns.
- Mycology – the study of fungi.
- Phycology – the study of algae.
- Bacteriology – the study of bacteria.
- Malacology – the study of mollusks.
- Carcinology – the study of crustaceans.
- Helminthology – the study of worms.
- Virology – the study of viruses.
- Parasitology – the study of parasites.
- Mammalogy – the study of mammals.
- Protozoology – the study of protozoans.

2. ***Biogeography*** - the study of geographical distribution of organisms. This branch of biology is subdivided into *phytogeography* (plant geography) and *zoogeography* (animal geography).

3. ***Molecular biology or biochemistry*** - the study of chemistry of living things. Molecular biology includes *gene biology* and aspects of *organic chemistry.*

4. ***Cell biology or cytology*** - the study of cells.

5. ***Histology*** - the study of tissues.

6. ***Organismic biology*** - the study of organ systems.

7. ***Ecology*** - the study of the relationships of organisms and their environment.
8. ***Morphoanatomy*** - the study of the structure (gross) of living organisms.
9. ***Physiology*** - the study of biological functions.
10. ***Genetics*** - the study of heredity and variation.
11. ***Reproductive biology*** - the study of various aspects of reproduction.
12. ***Developmental biology (embryology)*** - the study of development of organisms from gamete formation to birth and other developmental processes.
13. ***Paleontology*** - the study of fossil records.

14. ***Pathology*** - the study of diseases.
15. ***Ethology*** - the study of the behavior of organisms.
16. ***Ontogeny*** **–** the study of developmental history of an individual.
17. ***Phylogeny*** – the study of ancestral history of organism.
18. ***Limnology*** – the study of fresh water habitats.
19. ***Oceanography*** –the study of marine water habitats.

CHARACTERISTICS OF LIFE

Living things have the following characteristics that differentiate them from nonliving things according to ching in 2007; reyes et al. In 1983; chanco in 1995 and storer et al.In 1979.

Metabolism

- Refers to the sum total of all chemical processes that occur in cells as they carry out life's processes
- Could be digestion (taking in and digesting food); assimilating (absorption of digested food into the body); respiration (process of releasing the energy of assimilated food); excretion (removal of waste materials produced during the release of energy)
- A must in order to maintain their organization, and to grow and reproduce

Growth and development

- Refers to an increase in size
- Development which involves change in shape and form
- Accomplished through a complex series of chemical processes known as intussusceptions (the assimilation of new materials in the body)

Irritability

- Refers to the ability to react to any environmental change or stimulus that often results in movement
- The response where living things find energy and nutrients by interacting with their surroundings and capable of moving from one place to place for survival
- Plants respond to the direction of sunlight
- migration of some birds is a response to change of seasons

Reproduction

- necessary for the perpetuation of the species
- in order for life to continue, living things must be able to reproduce other living things of their kind (reproduction)
- Reproduction could be sexual.

Adaptation

- refers to the modifications that promote the likelihood or survival of living things to their environment
- Living things not suited to the new conditions either move to a better environment for change (evolution)

Definite form and size

- Living things produce offspring similar to themselves
- All organisms belonging to the same species are alike with certain degree of variations or differences

Definite chemical composition

- All organisms are basically made up of similar inorganic (water, salts, minerals, gases) and organic molecules (carbohydrates, lipids, proteins, nucleic acids)

Nutrition

- Animals generally feed on organic matter (heterotrophic nutrition)

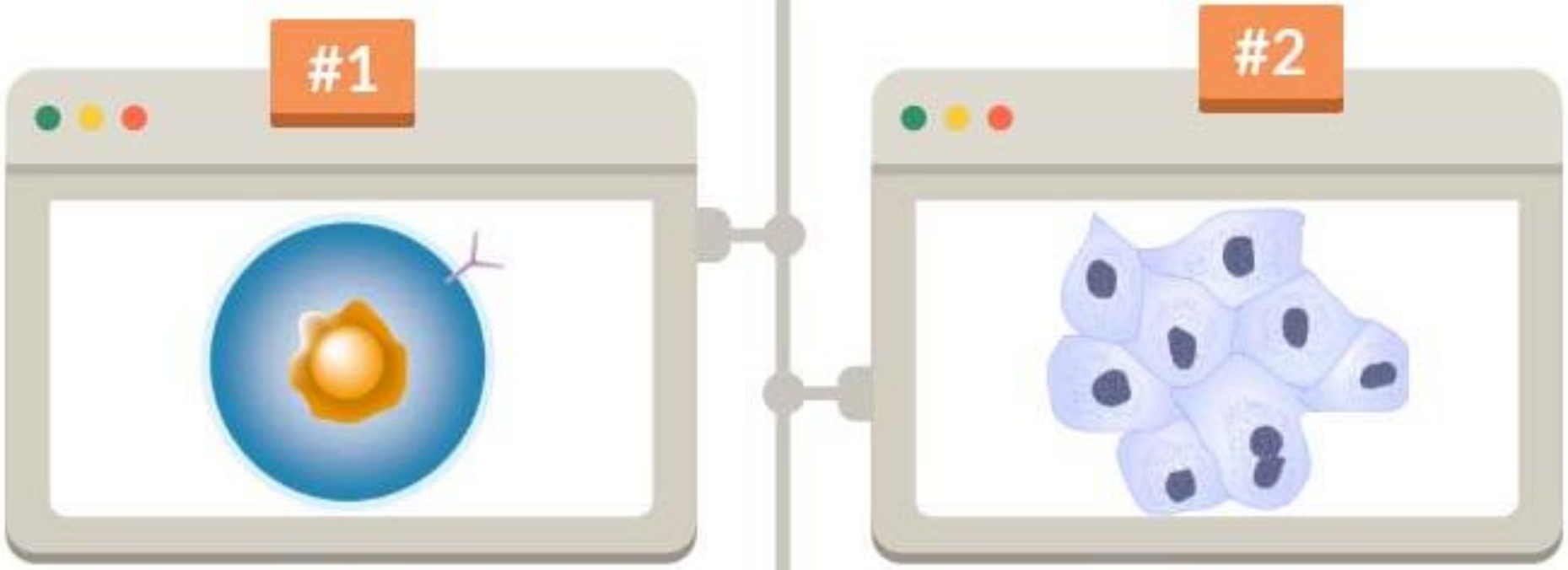
Chemical composition

- Composed mainly of four chemical elements: carbon (C), hydrogen (H), oxygen (O) and nitrogen (N) in various but definite proportions in lesser amounts of other elements
- Make the living substance or protoplasm of the plant or animal

Organization

- Bodies of living things are organized in a very orderly fashion
- Cells are organized into tissues, tissues into organs, and organs into systems. All these make up the organismic body functional
- There are levels of biological organization – biochemical, structural, physiological and ecological organization

LEVEL OF ORGANIZATION



LEVEL OF ORGANIZATION

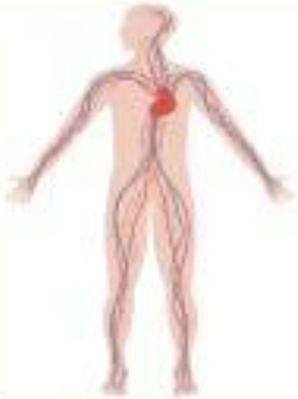
#3

Heart

Organ

An **organ** is a collection of tissues and similar structures that all function as one.

#4



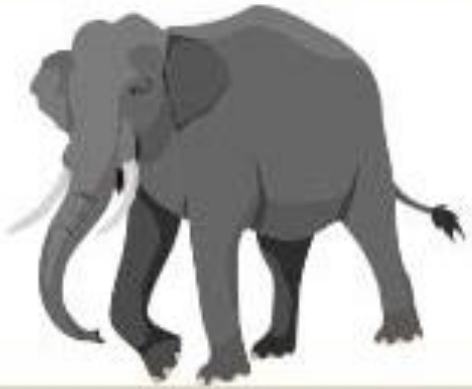
Circulatory System

Organ System

An **organ system** is an association of different organs and other anatomical structures that perform a certain physiological process.

LEVEL OF ORGANIZATION

#5



Organism

An **organism** can be simply defined as any living thing that is composed of various organ systems that function altogether.

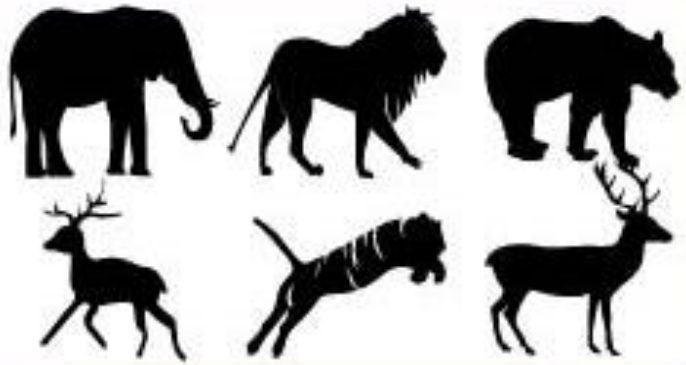
#6

Population

A **population** is formed when such individuals reside a common environment at a given time.

LEVEL OF ORGANIZATION

#7



Community

A **community** is defined as the interactions of different populations with each other.

#8

Ecosystem

An **ecosystem** is the interaction of (organisms, population, and community) to their abiotic or non-living environment.

LEVEL OF ORGANIZATION

#9

Biome

A **biome** is a very huge geographic area where various ecosystems exist and different organisms adapt to it.

#10

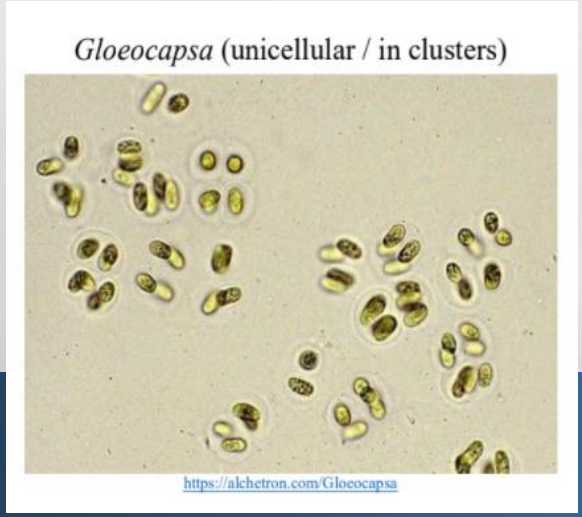
Biosphere

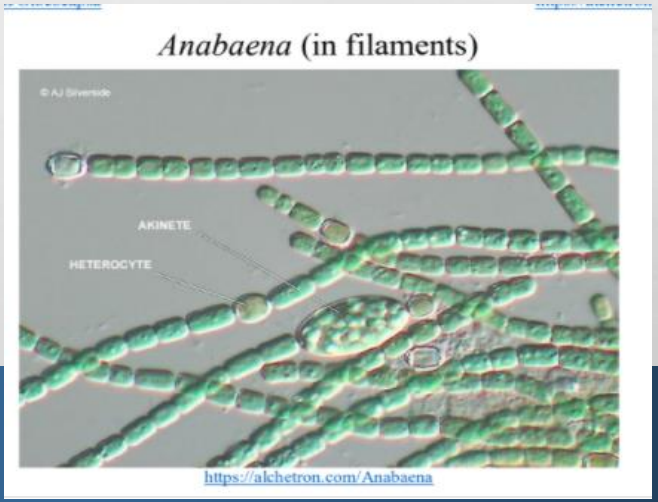
A **biosphere** is a global system that generally comprises everything where life exist and the abiotic environments they reside in, all blending with each other.

THE VARIETY OF ORGANISMS

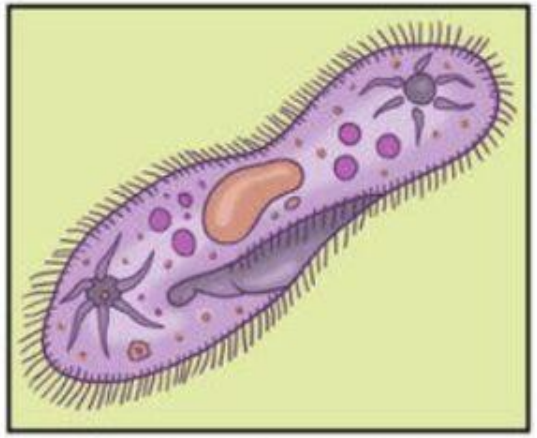
Chanco in 1995 states that living things are classified on the basis of evolutionary relationships that exist among them. The most recent classification recognizes five groups or kingdoms of organisms: *monera, protista, plantae, fungi and animalia.*

- ***Kingdom Monera*** – the most primitive organisms (bacteria and cyanobacteria)

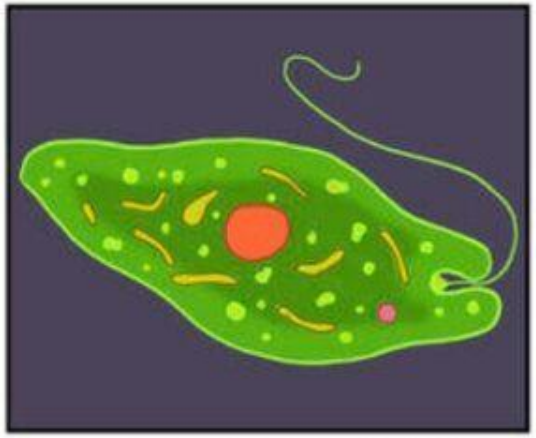




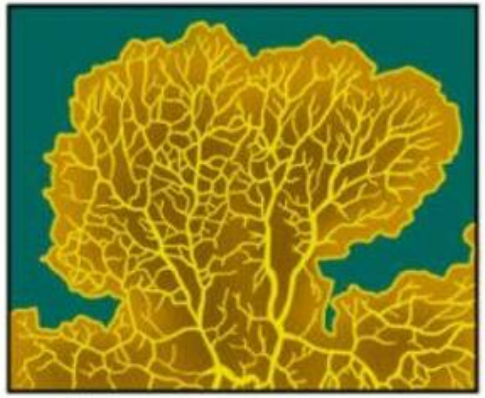
Kingdom Protista – predominantly unicellular eukaryotes which include the plantlike protists and the animal like protist.



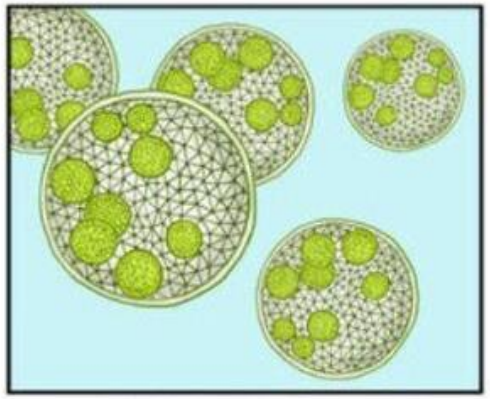
"Animal-like" *Chaos diffluens*



"Plant-like" *Eupodiscus radiatus*

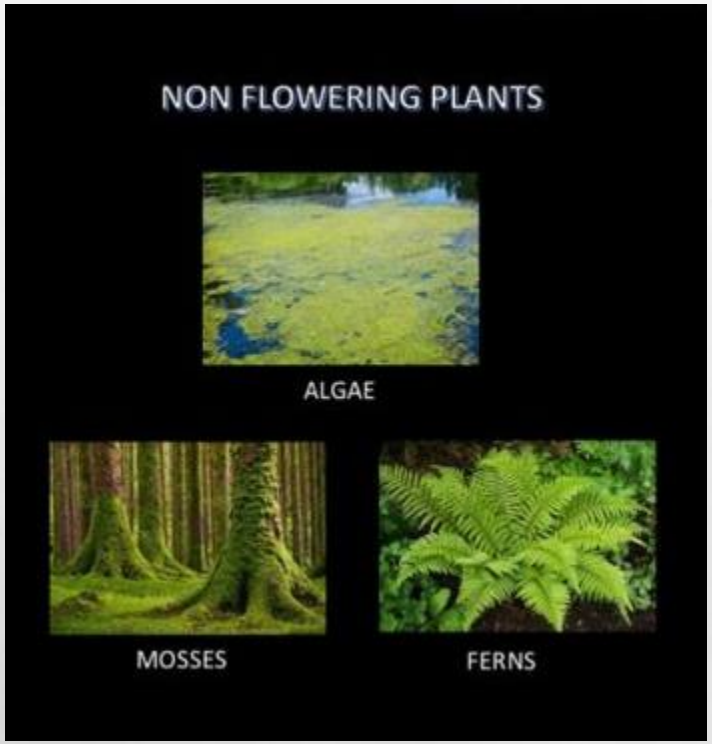


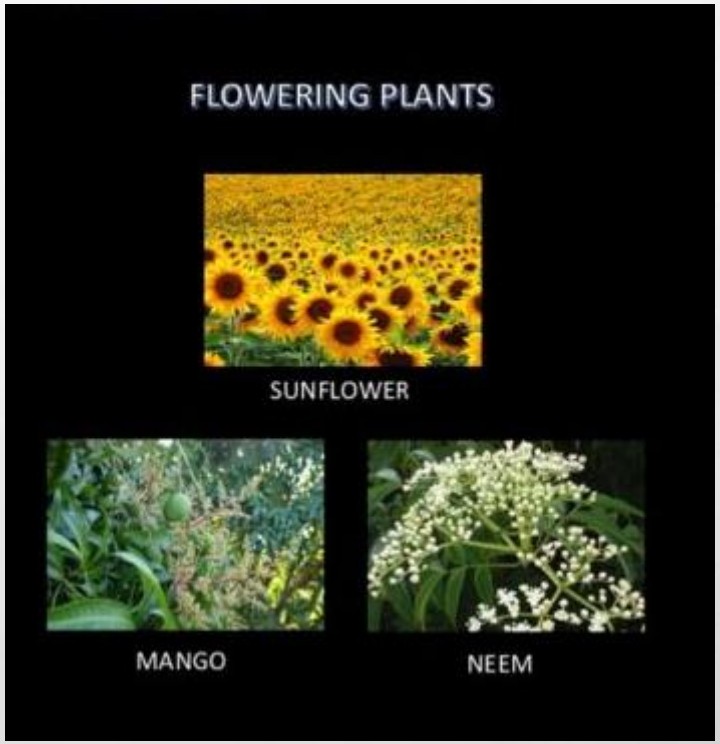
"Fungus-like" *Fuligo septica*



Multi-cellular Seaweed
Fucus vesiculosus

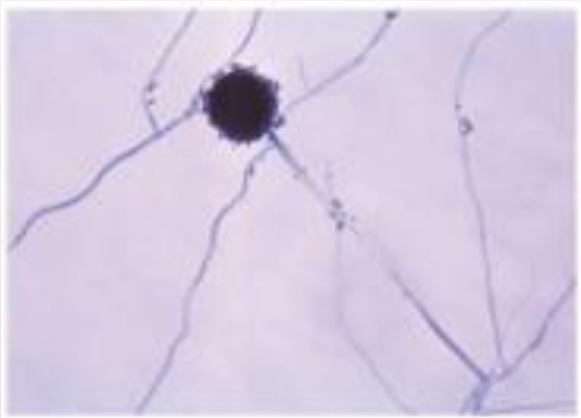
Kingdom Plantae – include all plants with rigid walls and with chlorophyll bearing cells that can synthesize their own food



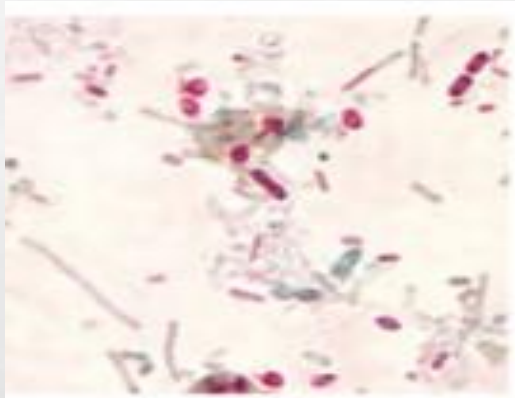


Kingdom Fungi – lack chlorophyll and therefore cannot manufacture their own food.

Amanita phalloides



Aspergillus niger



Microsporidia (unidentified)

Kingdom Animalia

Characteristic of kingdom Animalia

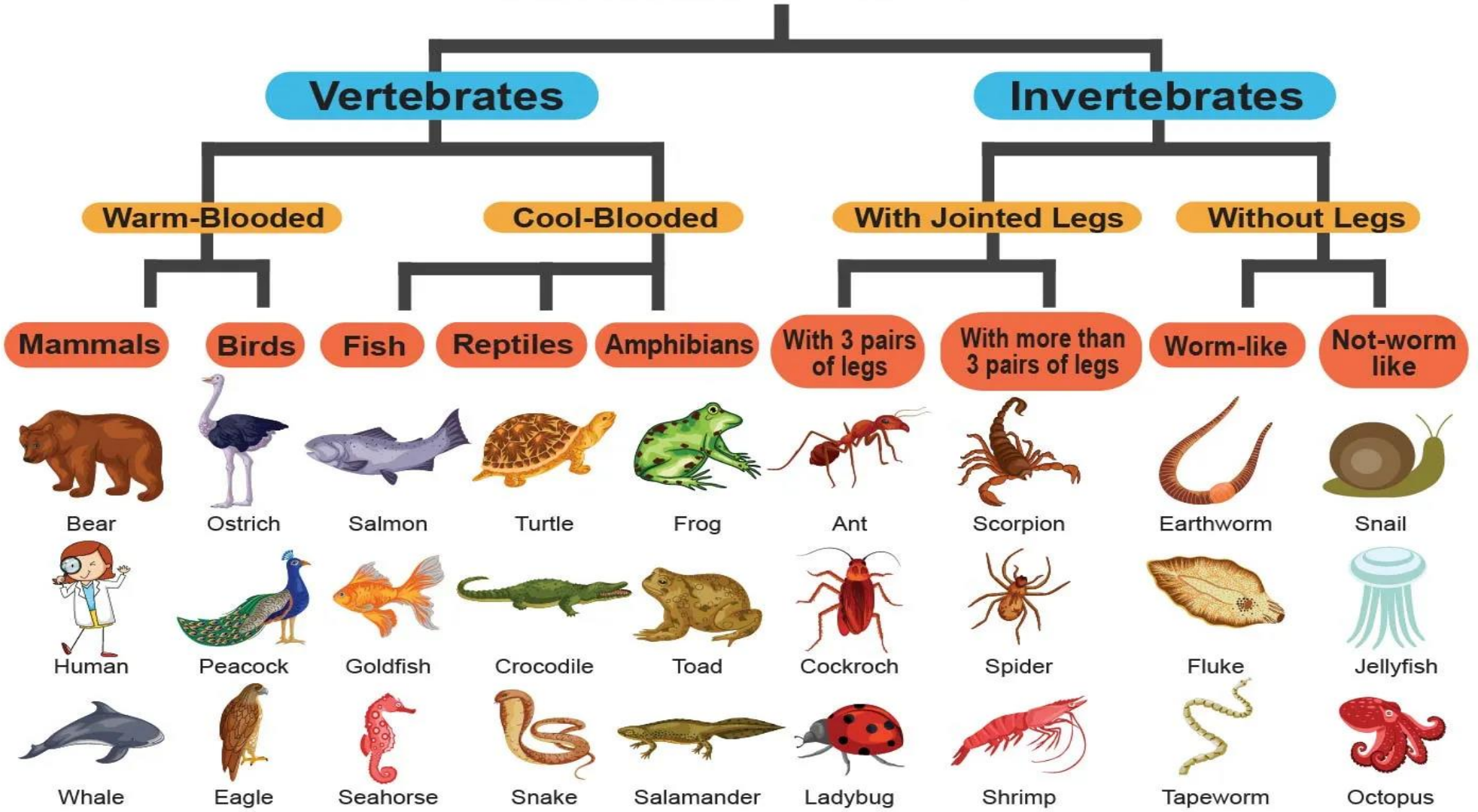
1) Eukaryotes, which have true nuclei in animal cells. Eukaryote cells are more complex than the simpler prokaryote cells found in bacteria.

(2) Multicellular, which means that they are made up of more than one cell.

(3) Heterotrophic, which means they can't produce their own food. Members of the Animalia kingdom must ingest, or eat other organisms.

(4) No cell wall: plants, fungi, and prokaryote cells have a cell wall, which is a rigid outer layer that gives cells structure. Animal cells do not have this structure. As a result, animal cells are more flexible to change their shapes and movements.

Classification of Animals



METHODS IN SCIENCE

Chanco in 2002 stated that there are methods involved in the study of science. These are the following:

Observing and questioning. A scientific investigation begins with an observation that raises a question. Example: honey bee visit the yellow, sweet scented flowers on one bush more often than the blue flowers without scent on a nearby bush. The question may rise: why honey bees are attracted by the color, scent and shape of the petals or the exact location of the bush?

Hypothesis testing. This explains an observation. It is a guess about the unseen cause of what can be seen. The hypothesis about the bees and the flowers might be that the bees are attracted to the color and scent of the flowers.

Designing an experiment. Experiments are used by the scientists to answer questions. Designing an experiment to test a hypothesis is a creative process with variables. A variable is any factor that can influence the outcome of the experiment. An experiment is deigned to investigate the effects of only one variable. That special variable is called the experimental variable.

An experiment has two parts:

- The experimental set up with the experimental variable present and
- The control set up with the control variable (the experimental variable is missing)

Collecting and analyzing data. Careful records of all experimental observations and measurement are kept, analyzed and interpreted. If the results are consistent with the hypothesis, a conclusion is made. A hypothesis may be tested many times and in the different ways to gain confidence in it.

Communicating conclusions. Formal communications of results are made through scientific journals. A published report must explain enough detail of the procedure, results and interpretations so that another scientist may repeat the same experiment for confirmation of results.

Finding out more. More information can be gained not only by performing the experiment, but also by interviews and reading scientific journals and magazine articles in libraries.

TOOLS OF ZOOLOGY

What are the tools used in the study of zoology? Chanco in 2002 identified two important tools used in zoology:

1. **Microscopes** – used to study organisms that are too small to be seen by the naked eye. Kinds of microscopes are:

a. *Light microscope* – kind of microscope which focuses light onto a specimen using a mirror or a light bulb. Light microscopes can magnify images up to1500 times.

b. *Electron microscopes* – uses beams of electrons to create an image that is about 1000 times better than a light microscope.

2. **Computers** – revolutionized the work of biologists by its ability to store and use large amounts of information and analyze data. Computer models are also used to study biological structures and a variety of events including population growth and global warming. Some models have reduced the need for animals in some types of research.