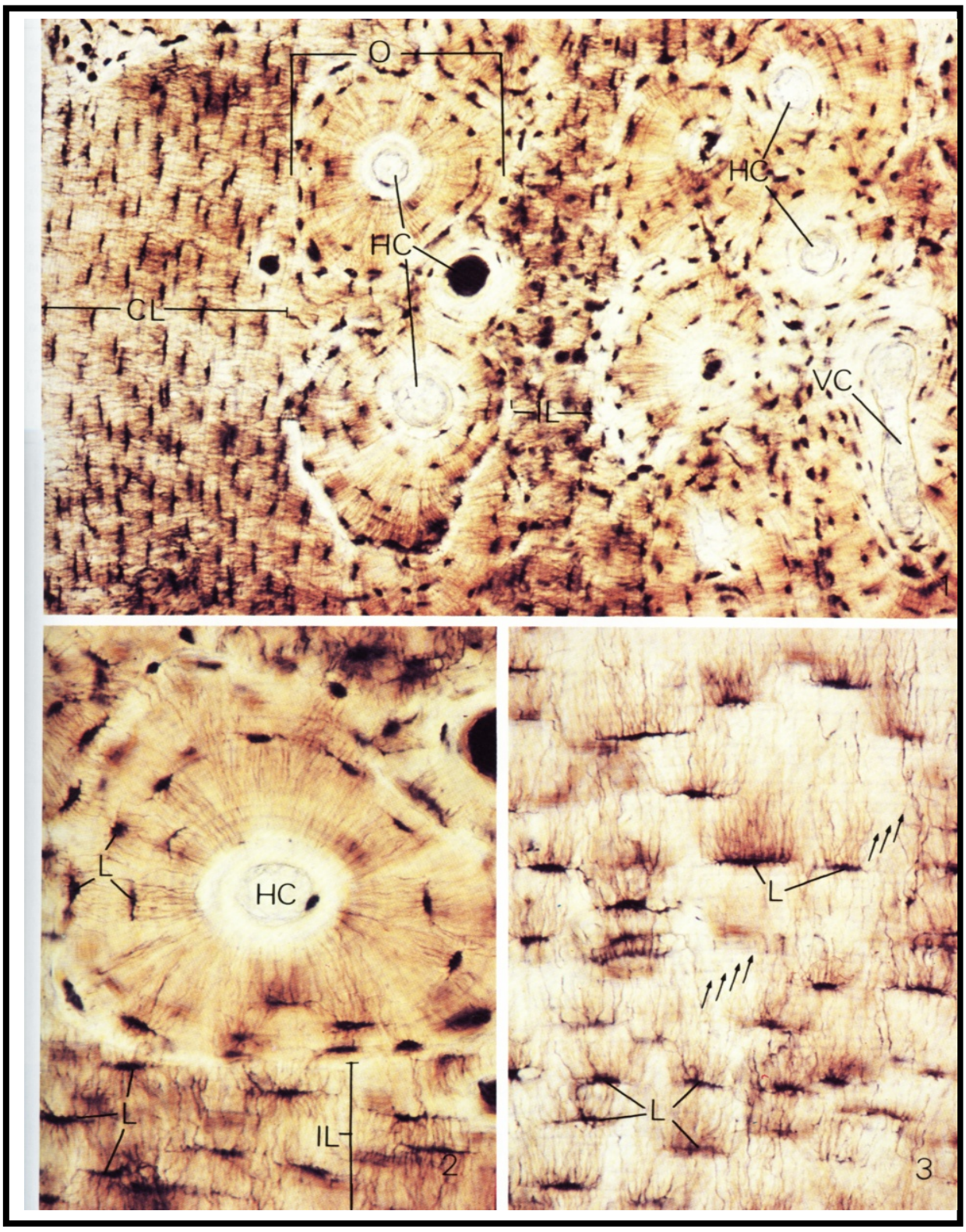
II- Bone.

Bone is one of the hardest tissue of the body, is a specialized connective tissue composed of intercellular calcified material, the bone matrix, two types of bones, they are:

(a)- Compact bone

Is largely composed of cylindrical units of bone structure called **Haversian systems,** each consists of a concentric lamellae of bone matrix surrounding acentral canal called **Haversian canal, Osteoblasts** or **osteocytes,** lying each in a **lacunae.** The lacunas are connected together by fine **Canaliculi**.

Note that other bone lamellae and some lacunae are present a mong the Haversian systems, and are not arranged around Haversian canals such as these are called **Non-Haversian systems .**



(b)-Spongy bone

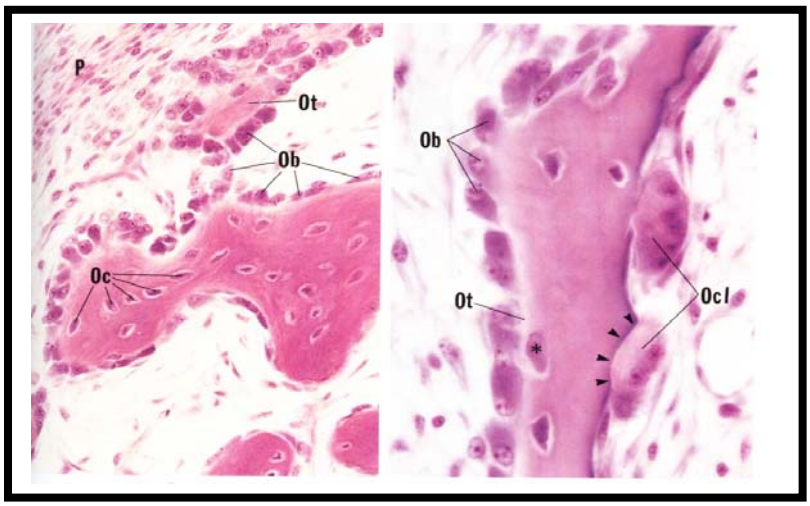
Is very similar to compact bone except that the tissue is arranged as trabeculae or spicules; numerous interconnecting marrow spaces of various size are present between the bone tissue the matrix of the bone is lamellated .There are three designated cell areassociated with this tissue :

1-Osteoblasts, are recognized by their cuboidal or polygonal shape and their aggregationas single layer of cells.

2-Osteocytes, are differentiated osteoblasts,occupies spaces or lacuna.

3-Osteoclast, rest directly on the surface of the bone where resorption is take place as a result of its activity a shallow bay called Howships lacunae is formed.

Ob: osteoblast
Oc: osteocyte
OcI: osteoclast

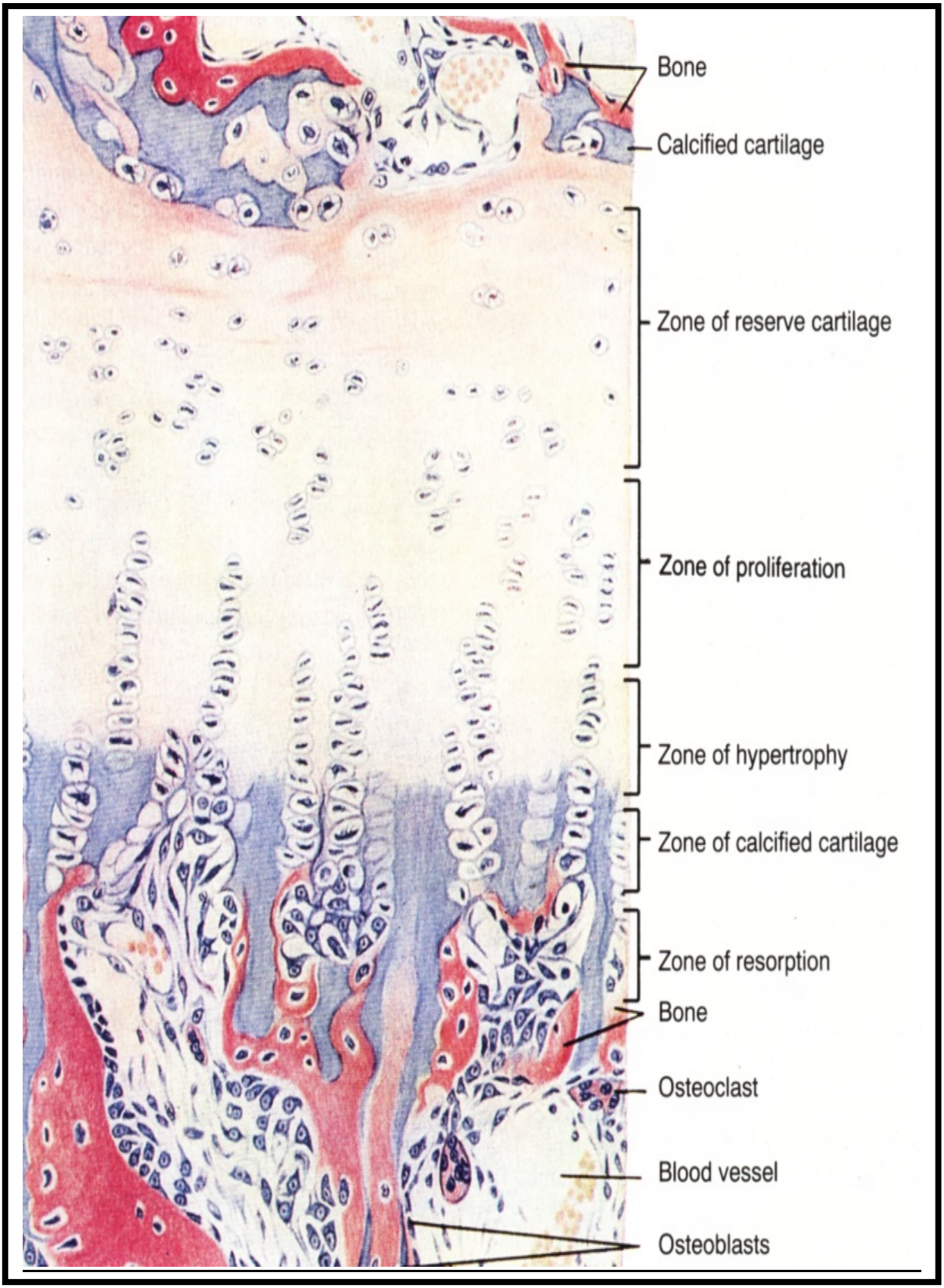


Bone formation or development.

It is a complex process in which cartilage model serves as the precursor of the bone (endochondral ossification) that is mean, the continued growth of long bones is dependent on the presence of Epiphyseal cartilage through out the growth period.

As the diaphyseal marrow cavity enlarges, a distal zonation can be recognized in the cartilage at either end of the cavity.,they are (beginning with that most distal to the diaphyseal center of ossification and proceeding toward that center):-

- ***Zona of reserve cartilage,*** which exhibits no cellular proliferation or active matrix production.
- ***Zona of proliferation,*** which is adjacent to the zona of reserve cartilage in the direction of the diaphysis ,where the cartilage cells undergo division and are organized into distinct colums, these cells are larger than those in the reserve zona and are actively producing matrix.
- ***Zona of hypertrophy,*** which contains cartilage cells that are greatly enlarged ,their cytoplasm is clear,the glycogen normally accomulates in.
- ***Zona of calcified cartilage,*** in which the enlarged cells begin to degenerate and the matrix becomes calcified
- ***Zona of resorption ,*** which is the zona nearest the diaphysis ,here a small blood vessels and connective tissue invade the region occupied by the dying chondrocytes and therefor whole region appear as a honeycomb .


Bone
Calcified cartilage
Zone of reserve cartilage
Zone of proliferation
Zone of hypertrophy
Zone of calcified cartilage
Zone of resorption
Bone
Osteoclast
Blood vessel
Osteoblasts

3- The Vascular Tissues.

These comprise the **Blood** and **lymph** only . They are liquid tissues and flow in vessels . they are nearest to the connective tissues in structure

I . The Blood

Is afluid connective tissue that circulates through the cardiovascular system,consisting of cells and an extracellular matrix.The cells include :-

(a)-Red blood cells, are also called the **Erythrocytes** they constitute the largest number of cells in the blood and these round and enucleated (non-nucleated),and they biconcave discs.

(b)-White blood cells ,also called the **Leucocytes** are colourless, nucleated , there are two types of leucocytes:

I - Granulocytes, whose cytoplasm contains granules . According to the affinity of these granules towards stains, three different categories of granulocytes are recognized:

- Neutrophils**:** Are the most numerous of the WBCs as well as the most common of the granulocytes , they larger than erythrocytes ,have granules stain well with most dyes . The nucleus of a neutrophil divided into a number of segments (3 – 5) connected with one another.

- Acidophils (or eosinophils), whose granules stain with the acid dyes, their nucleus bilobed .
- Basophils**.** Have the same size of neutrophils,their granules stain with the basic dyes and the nucleus is **S** shaped.

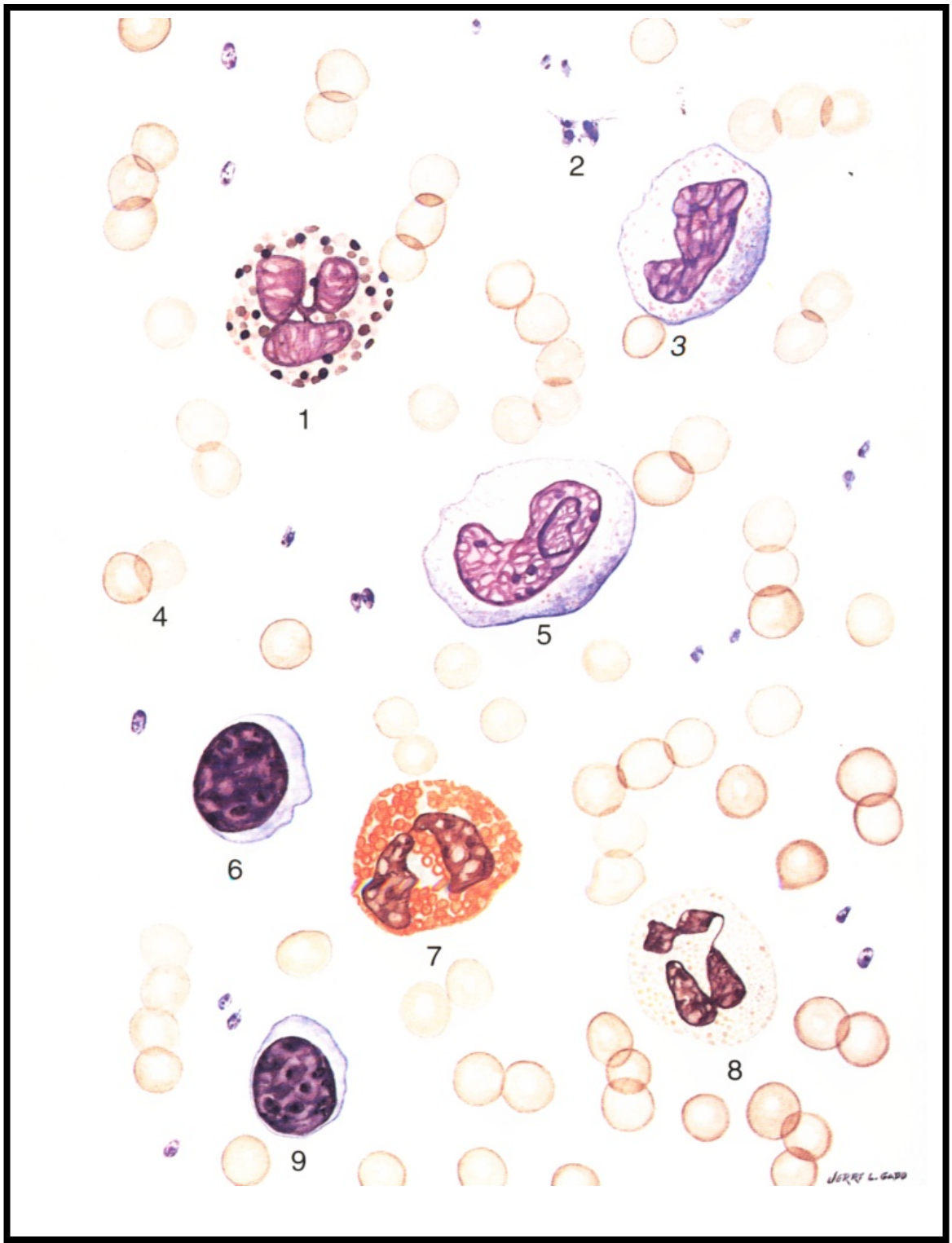
2- Agranulocytes, whose cytoplasm is free of granules. Two categories are recognized:

- Lymphocytes , are small, with a large nucleus and little cytoplasm.
- Monocytes**,** are the largest leukocytes. They possess a horse – shoe- shaped nucleus.

(c)- ***Platelets***, they are small in their size and have a biconvex shape, appear in the peripheral blood smear either singly or in clusters.

Nada M . AL – Khafaji Zuhairy
M . Sc physiology

Rihab G. AL –
M . Sc physiology



Nada M . AL – Khafaji Zuhairy
M . Sc physiology physiology

Rihab G. AL –
M . Sc

1: Basophil
2: Platelets
3: Monocyte
4: Erythrocyte
5: Monocyte
6: Lymphocyte
7:Eosinophil
8: Neutrophil
9: Lymphocyte