

which they are enclosed constituting the lacunæ. As the osteogenetic fibers grow out to the periphery they continue to calcify, and give rise to fresh bone spicules. Thus a network of bone is formed, the meshes of which contain the bloodvessels and a delicate connective tissue crowded with osteoblasts. The bony trabeculæ thicken by the addition of fresh layers of bone formed by the osteoblasts on their surface, and the meshes are correspondingly encroached upon. Subsequently successive layers of bony tissue are deposited under the periosteum and around the larger vascular channels which become the Haversian canals, so that the bone increases much in thickness.

INTERCARTILAGINOUS OSSIFICATION.—Just before ossification begins the mass is entirely cartilaginous, and in a long bone, which may be taken as an example, the process commences in the center and proceeds toward the extremities, which for some time remain cartilaginous. Subsequently a similar process commences in one or more places in those extremities and gradually extends through them. The extremities do not, however, become joined to the body of the bone by bony tissue until growth has ceased; between the body and either extremity a layer of cartilaginous tissue termed the **epiphysial cartilage** persists for a definite period.

The first step in the ossification of the cartilage is that the cartilage cells, at the point where ossification is commencing and which is termed a **center of ossification**, enlarge and arrange themselves in rows (Fig. 79). The matrix in which they are imbedded increases in quantity, so that the cells become further separated from each other. A deposit of calcareous material now takes place in this matrix, between the rows of cells, so that they become separated from each other by longitudinal columns of calcified matrix, presenting a granular and opaque appearance. Here and there the matrix between two cells of the same row also becomes calcified, and transverse bars of calcified substance stretch across from one calcareous column to another. Thus there are longitudinal groups of the cartilage cells enclosed in oblong cavities, the walls of which are formed of calcified matrix which cuts off all nutrition from the cells; the cells, in consequence, atrophy, leaving spaces called the **primary areolæ**.

At the same time that this process is going on in the center of the solid bar of cartilage, certain changes are taking place on its surface. This is covered by a very vascular membrane, the **perichondrium**, entirely similar to the embryonic connective tissue already described as constituting the basis of membrane bone; on the inner surface of this—that is to say, on the surface in contact with the cartilage—are gathered the formative cells, the **osteoblasts**. By the agency of these cells a thin layer of bony tissue is formed between the peri-

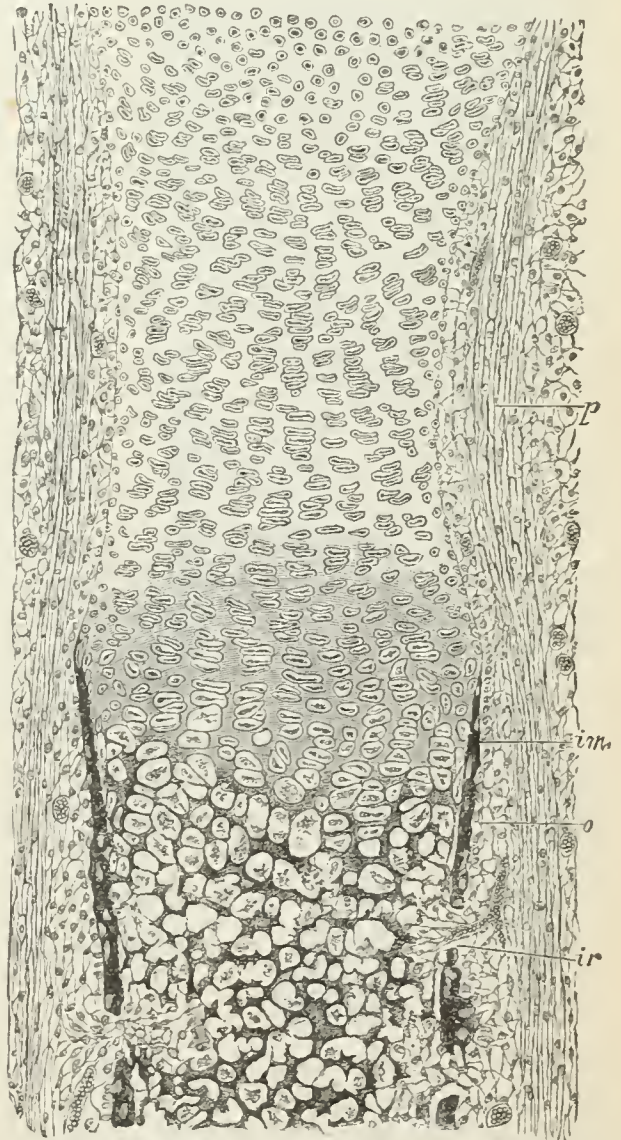


FIG. 79.—Section of fetal bone of cat. *ir*. Irruption of the subperiosteal tissue. *p*. Fibrous layer of the periosteum. *o*. Layer of osteoblasts. *im*. Subperiosteal bony deposit. (From Quain's "Anatomy," E. A. Schäfer.)