primary spicules goes on *pari passu* with the formation of permanent bone by the periosteum, and in this way the medullary cavity of the body of the bone is formed.

This series of changes has been gradually proceeding toward the end of the body of the bone, so that in the ossifying bone all the changes described above may be seen in different parts, from the true bone at the center of the body to the hyaline cartilage at the extremities.

While the ossification of the cartilaginous body is extending toward the articular ends, the cartilage immediately in advance of the osseous tissue continues to grow until the length of the adult bone is reached.

During the period of growth the articular end, or epiphysis, remains for some time entirely cartilaginous, then a bony center appears, and initiates in it the process of intracartilaginous ossification; but this process never extends to any great distance. The epiphysis remains separated from the body by a narrow cartilaginous layer for a definite time. This layer ultimately ossifies, the distinction between body and epiphysis is obliterated, and the bone assumes its completed form and shape. The same remarks also apply to such processes of bone as are separately ossified, *e. g.*, the trochanters of the femur. The bones therefore continue to grow until the body has acquired its full stature. They increase in length by ossification continuing to extend behind the epiphysial cartilage, which goes on growing in advance of the ossifying process. They increase in circumference by deposition of new bone, from the deeper layer of the periosteum, on their external surface, and at the same time an absorption takes place from within, by which the medullary cavities are increased.

The permanent bone formed by the periosteum when first laid down is cancellous in structure. Later the osteoblasts contained in its spaces become arranged in the concentric layers characteristic of the Haversian systems, and are included as bone corpuscles.

The number of ossific centers varies in different bones. In most of the short bones ossification commences at a single point near the center, and proceeds toward the surface. In the long bones there is a central point of ossification for the body or diaphysis: and one or more for each extremity, the epiphysis. That for the body is the first to appear. The times of union of the epiphyses with the body vary inversely with the dates at which their ossifications began (with the exception of the fibula) and regulate the direction of the nutrient arteries of the bones. Thus, the nutrient arteries of the bones of the arm and forearm are directed toward the elbow, since the epiphyses at this joint become united to the bodies before those at the opposite extremities. In the lower limb, on the other hand, the nutrient arteries are directed away from the knee: that is, upward in the femur, downward in the tibia and fibula; and in them it is observed that the upper epiphysis of the femur, and the lower epiphyses of the tibia and fibula, unite first with the bodies. Where there is only one epiphysis, the nutrient artery is directed toward the other end of the bone; as toward the acromial end of the clavicle, toward the distal ends of the metacarpal bone of the thumb and the metatarsal bone of the great toe, and toward the proximal ends of the other metacarpal and metatarsal bones.

Parsons[1] groups epiphyses under three headings, viz.: (1) **pressure epiphyses,** appearing at the articular ends of the bones and transmitting "the weight of the body from bone to bone;" (2) **traction epiphyses,** associated with the insertion of muscles and "originally sesamoid structures though not necessarily sesamoid bones;" and (3) **atavistic epiphyses,** representing parts of the skeleton, which at one time formed separate bones, but which have lost their function, "and only appear as separate ossifications in early life."

[1] Jour. of Anat. and Phys., vols. xxxviii, xxxix, and xlii.