

I could not secure the journal containing his original article but Ballantyne ('04) in his text book and Schenk ('07) in an article on a case of defect of the ulna agree in their accounts of Küm-mel's cases which can be taken as correct. He found 80 instances of defect in the bones of the forearm of which 67 were of the radius, 13 of the ulna. In the case of the ulna it was defective in 5, totally absent in 8 instances. In some of these cases there was associated absence of the ulnar side of the carpus and one or more fingers on the ulnar side of the hand.

The muscles of the limb definitely appear first proximally and differentiation proceeds distally. It might be expected that the muscles of the shoulder girdle and upper arm, being the first to appear after the skeletal deformities were produced, might show some anomalies. They do exhibit anomalies, but peculiarly not anomalies of defect, but of excess, such as supernumary heads and increased insertions. Of course, in the forearm and hand grave defects are associated with the loss of the skeletal structures.

The question naturally arises as to whether the muscle anomalies are a consequence of the skeletal defects or were independently produced by the same vice of development or nutrition to which the absence of the bones is due. In this connection it is to be noted that the suppression of muscles in the forearm is not confined to the ulnar border of the arm but affects also the radial side, so that more than mere absence of the skeleton underlies the anomalies. This can be proved by the fact that muscle is independent and self-differentiating. Muscles develop independently of functional activity as shown here by the two humeral heads of the triceps, inserted also on the humerus, incapable of movement, yet well developed. Harrison ('04) also proved that muscles develop independently of the nervous system, for he removed the spinal cord in early frog embryos, before the muscles had differentiated or received any nervous connection and yet the normal process of muscle development and grouping occurred. This power of self-differentiation goes right back to the ovum where Conklin ('05) has