

together to form the vane by interlocking barbules bearing hooks. These parts are readily seen by the aid of a good hand lens or microscope.

Why are the fluff-barbs not bound together like those of the vane?

Compare the larger contour-feathers of the wings and tail, which are commonly called quill-feathers, with those of the body, as to structure, size, arrangement and function. Scattered among the contour-feathers and covered by them, are down-feathers, but down is best exemplified in the covering of the newly hatched chick. How do down-feathers differ from contour-feathers?

The long hair-like feathers, tipped by only a few barbs, are filoplumes. They are most in evidence when the other feathers are removed, and are often called pin-feathers, a term which is more appropriately applied to developing contour-feathers.

In developing contours, pin-feathers we find the little vane with its rachis and barbs all packed closely together reminding one of a developing bud bearing its tiny leaves and flowers. The blood in the quill explains how it is being nourished.

Part the feathers on the body of the pigeon, and note their color just beneath the surface. Are both ends of the feathers colored alike? The change in the color of birds during the course of the summer is due to a change in the color of the outer (exposed) parts of the vanes. In looking for examples carefully note the colors of the male robin, and other birds.

The overlapping of feathers on birds is much like the arrangement of shingles on the roof of a house, and they serve to protect the bird from rain, snow, wind and cold, and also to keep in the heat of the body. The contour-feathers serve as heavy outer-clothing, while the down may be compared to under-clothing.

In many instances the feathers are oiled till they are quite water-proof, this is especially true of birds that frequent the water, and even our land birds oil their feathers to some extent. The oil gland is situated dorsally near the base of the tail. Watch hens oiling their feathers just before a shower. They seem to know that rain is coming.

Explain why the hen presents such a sorry appearance when exposed to a long rain. How would a duck look under similar conditions?

The color of feathers in some birds may serve as a protection from the observation of their enemies; in others the color, and often shape, seem especially designed for purpose of ornamentation. Select examples from among our native wild birds and domesticated forms.

The large contour-feathers of the wings and tail are of special use in flying. Expand the

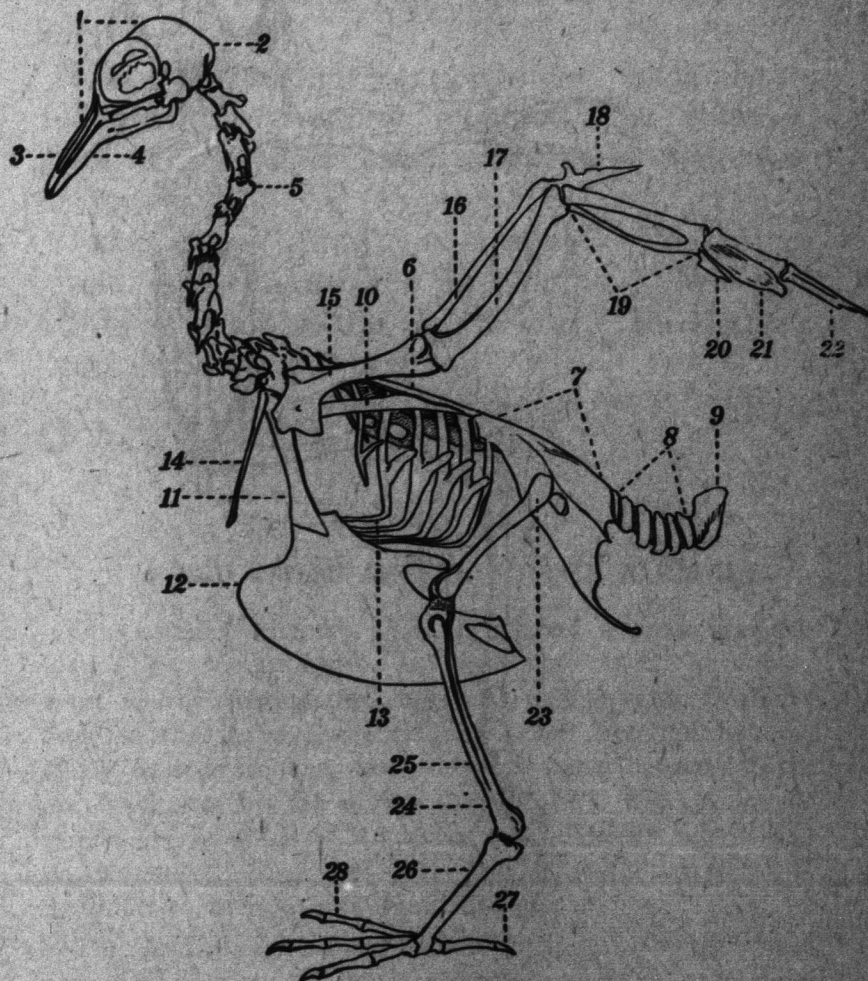


Fig. 2.—SKELETON OF PIGEON. (Reduced).

1, skull; 2, cranium; 3, upper mandible; 4, lower mandible; 4, cervicle (neck) vertebrae; 6, thoracic region; 7, pelvic region; 8, caudal region; 9, plowshare bone; 10, scapula; 11, coracoid; 12, keel of sternum; 13, ribs; 14, clavicles (wish-bone); 15, humerus; 16, radius; 17, ulna; 18, thumb; 19, wrist and hand bones; 20, bone of the third finger; 21, bone of the second finger; 22, end bone of second finger; 23, femur; 24, tibiolarisus; 25, fibula; 26, ankle and foot; 27, bone of first toe; 28, bone of second toe.

wings and note the nice arrangement of their feathers. Distinguish between primary and secondary wing-feathers. To which part of the wing is each kind attached?

Note that the feathers are so arranged that they present to the air a strong resistant surface in the down-stroke of the wing, and a minimum of resistance in the up-stroke.

In flying the wings are used chiefly as propellers, to force the bird through the air; but at times they seem to convert the whole animal into an aeroplane, as it either glides forward or