CHONDRODYSTROPHY IN THE CHICK EMBRYO PRODUCED BY A MINERAL DEFICIENCY IN THE DIET OF THE HEN

THE report of Wilgus and coworkers[1] on the preventive action of manganese, aluminum, zinc and iron on the occurrence of slipped tendon (perosis) in young growing chicks, together with our observations of a number of chicks hatched with slipped tendon, led us to study the effects on embryonic development and hatchability of feeding a slipped-tendon-producing ration to laying hens.

Eggs from hens that had been fed such a ration for two months gave a hatchability of less than 10 per cent. Those embryos that were sufficiently developed before death for observation showed, without exception, very short legs and wings and "parrot beak." The few chicks that hatched, although having short legs, did not have slipped tendon. Another group of hens fed the same ration plus 40 ppm each of manganese and zinc, as the respective sulfates, and 100 ppm of iron, as ferrous ammonium sulfate, produced eggs giving good hatchability and all normal chicks. Embryos that died showed normal development of appendages and mandibles.

The eggs from the hens fed the slipped-tendon-producing ration contained much less manganese than those from the hens fed the same ration plus the mineral supplements indicated above. As a result of these analyses and of our studies[2] on slipped tendon, we were inclined to attribute this condition to a manganese deficiency. This was proved to be correct by the injection of 0.03 mgs of manganese directly into the albumen of such eggs just prior to incubation, which resulted in normal development of the embryos and in an increase in hatchability.

The metatarsi, tibiae and humeri of the chicks and 20–21-day embryos from the injected eggs were 52, 44 and 40 per cent. longer, respectively, than the same bones of those from the eggs which were not injected with manganese. The injection of .03 mgs of zinc into the albumen of the egg had no appreciable preventive effect on this disorder.

These findings may offer some insight into the mechanism which produces slipped tendon in the growing chick. Further studies on this problem are in progress. This work will be published in detail elsewhere.

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[1] H. S. Wilgus, L. C. Norris and G. F. Heuser, SCIENCE, 84: 252, 1936.
[2] Unpublished data, Kentucky Agricultural Experiment Station.

HEAD MOVEMENTS IN BIRDS

IN a recent issue of SCIENCE[1] Austin H. Clark has advanced a theory as to the visual value of avian head movements which, to the writer's mind, appears quite untenable. Clark suggests that stereopsis results from the fusion of images perceived at the extremes of a vertical or horizontal movement, the image being "blotted out" (*i.e.*, centrally suppressed?) during the movement.

That suppression does occur during human ocular movements is well known to any one who has ever tried to see his eyes move in a mirror; but it is quite unsafe to assume that such suppression occurs in any animal during *head* movements as such.

Again, if the images at the extremes of a movement could be fused stereoptically, we should long since have had "stereomovies" made by printing alternately the frames from two films exposed simultaneously through lenses separated by the inter-pupillary distance. Many workers in visual phenomena get the notion of such "movies" and a few take the trouble to try it out; but few if any have bothered to mention their failure in print.

The vertical and horizontal head movements of birds, and probably also the nodding movements of certain lizards, can aid in the judgment of distance only by the principle of parallax, as does the process of "rapid peering" to which Clark alludes. *All* the advantages of binocular vision are afforded only by binocular vision.

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DRIFT BOTTLES RELEASED OFF COAST OF SOUTHERN CALIFORNIA

SIX thousand drift bottles have been released off the coast of southern California from the research vessel *Bluefin* by the State Fisheries Laboratory of the California Division of Fish and Game in an effort to trace the drift of the pelagic eggs and larvae of the California sardine. A cooperative program was undertaken by the laboratory and the Scripps Institution of Oceanography to make a study of surface currents during the spring of 1937 in the waters between Point Conception and San Diego, the major spawning region of the sardine. The drift bottles were prepared and released by the Fisheries Laboratory, and water samples and the subsequent dynamic computations were made by the Scripps Institution.

The bottles were twelve-ounce wine bottles, corked, sealed and ballasted with sand. Each bottle contained the usual "break the bottle" label, a sheet of instructions and a return post-card. Although most of these

[1] A. H. Clark, SCIENCE, 86: 223–224, 1937.