polishing seen in them will be of some interest in this connection—bearing in mind, of course, that the dinosaurs exhibit such a wide range of skeletal structure that it has been more than once seriously proposed that they can scarcely be all included in the same reptilian order. Nevertheless, if the doubts recently expressed by Dr. Eastman as to any possibility of inferring stomach structure from the presence of gastroliths,[4] find some justification, it is certainly a fact of singular and widening interest that the dinosaurs swallowed and retained and polished far more highly than seen anywhere else in nature, the hardest quartz. The stronger inference by far is that their stomach structure was different from and more complicated than in existing reptiles. And naturally a stomach especially suited to grinding action analogous to that of birds first calls itself to mind.

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DEAFNESS IN WILD ANIMALS

TO THE EDITOR OF SCIENCE: An interesting case of deafness in wild animals came to my attention this season and the conditions seem so simple as to suggest that, possibly, the loss of the sense of hearing or of smell may be no uncommon thing. I should be glad of others' notes on the subject.

In the great semi-arid regions of the west the struggle for existence is so strenuous that the special senses are very highly perfected. Especially is this true of the sense of hearing as evidenced by the enlarged external ear in many forms. The coyote (*Canis ochropus*) is especially marked with this enlarged concha and undoubtedly has, under normal conditions, a very keen sense of hearing. Popular report endows him also with almost supernatural sense of smell. The individual of the species must then labor under a decided handicap if the hearing be destroyed or the sense of smell even slightly impaired. The instance which I cite suggests that such may be often the case.

In cleaning a pair of skulls of this species which I obtained in August last, I found in the case of the male that both ears were crowded full of the bearded seeds of the common fox-tail grass (*Hordeum murinum*) which is such a pestiferous weed in the southwest. The seeds were packed closely into the tympanic chamber and the beards were very much darkened by having remained in the ear some time subjected to the exudations from the inflamed surfaces. In the same individual a fully bearded seed was found in the left nostril worked well up among the folds of the turbinated bone.

The second specimen, a female, taken at the same time, had the grass seeds in both ears but none in the nostrils.

The ear bones showed no sign of necrosis, though the seeds were in direct contact with them. Hearing was undoubtedly destroyed and, in case of the male, the sense of smell must have been impaired.

The animals were taken by strychnine poisoning with a bait of watermelon, a crop the coyote injures extensively in the sparsely settled regions. The specimens came to my hands in the meat; they were in good flesh and pelage. There was no possibility of the seeds having gotten into the ears and nose after death.

The possibility of frequent occurrence of the condition is suggested (1) by the fact that both ears of both animals had been destroyed; (2) by the great abundance and wide range of the species of grass in the case; (3) by the extreme penetrating power of the seed. Each seed tuft is very sharp pointed and is armed with three stout, serrated awns an inch long which force the seed onward with great persistence at each motion of the surface with which it is in contact.

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INTERROGATORY LABELS FOR CERTAIN KINDS OF MUSEUMS

TO THE EDITOR OF SCIENCE: If teachers have learned that it is wise to 'exercise much self-restraint in regard to telling children what they' should 'discover for themselves,' may it not be a wise policy for workers in certain kinds of small museums, and in purely educa-

[4] SCIENCE, N. S., Vol. XXIII., p. 983, June 29, 1906.

tional departments of museums, to consider the same idea, at least in the labeling of certain exhibits for specific classes of society and for certain purposes?

I do not recall ever having seen an exhibit labeled in such a manner as to indicate that a study had been made of "the art of questioning, by which the children" and the public "are directed, inspired and attain the desired mental growth. Telling the wrong thing and at the wrong time deadens interest and stunts the child's powers. Whenever practicable, the material should be observed first in its natural environment." In such a museum department the labels might describe that environment, giving the locality, etc., but leave the visitor to make some discoveries. By a process of this kind he would be forcibly impressed.

I would not by any means suggest that specimens in museums are over-labeled or that the best forms of existing labels should be set aside, but rather that if a few interrogatory labels and exhibits were tried as an experiment in a case or two, it might open up a new line of possibilities to workers in certain departments of museums and in some kinds of museums.

The quotations above are from a syllabus on nature study for the primary grades for normal college students by William Hittell Sherzer, Ph.D.

Harlan I. Smith

American Museum of Natural History,
December 7, 1906

SPECIAL ARTICLES

NOTE ON THE COMPOSITION OF LIMULUS BLOOD ASH

Within recent years much attention has been given by physiologists and pharmacologists to the chemical condition of automatic tissues. It is generally conceded that a complete knowledge of the chemical reactions going on in the tissues would go far towards clearing up the mechanism of automatism. The rôle played by the inorganic constituents of the plasma has received particular attention. The principal organs used in the study of automatism have been the heart and ciliated epithelium. Little work has been done toward finding out to what extent the automatism of the ganglion cells depends on the chemical changes going on in cells or in the surrounding fluids during the activity of the cells. The respiratory center in vertebrates is not readily isolated for such study. Neither can most of the work done on the vertebrate heart be applied to the ganglion cells themselves, because in most of these experiments the results are complicated by the simultaneous action of the chemicals on the heart muscle.[1]

This may account in part for the existence of the two theories of the origin of the heart beat. It may be that a more exact knowledge of the chemical changes taking place in the heart muscle, the ganglion cells and their surrounding fluids, will explain the reason for the existence of these divergent views. The importance of data on the chemical reactions taking place in the ganglion cells, especially during activity, is obvious. Such data would lead either to important generalizations or to the refutation of generalizations already made.

On account of its unique anatomy, the Limulus heart offers the best organ known for the study of ganglion automatism. The heart may continue to beat rhythmically for days after its removal from the body. The optimum temperature for keeping up this activity is from 15° to 20° C. (Carlson). The ganglion is easily dissected from the heart without injuring its connections with the heart muscle through its numerous nerves. The heart thus serves as a delicate indicator for the activity of the ganglion.

Carlson[2] has made use of this preparation in the study of ganglion automatism. The chemical phase of this investigation requires a knowledge of the composition of the Limulus blood plasma, particularly the inorganic constituents. A qualitative and quantitative analysis of the plasma during both rest and activity, may give a better understanding of the mechanism of automatism. If we find that there are certain changes in the composition of the plasma during activity of the ganglion or heart muscle, we may conclude that

[1] Carlson. Personal communication.

[2] Carlson, A. J., *Am. Journal Physiol.*, 1906, XVI., p. 221; XVI., p. 378.