



U. S. TURTLE MEETS GIANT COUSIN

The Galapagos turtle model looms gigantically over its small quite close relative, a live Texas gopher turtle, gently restrained by June Buchwald of the Museum staff.

gifts of specimens from travelers, and at second hand from zoos. It is true that the feral dogs and cats are such potent enemies that it may well be justifiable to preserve the last remaining specimens of some of the declining species in zoological gardens.

The scientific importance of these island turtles lies perhaps mainly in their contribution to the very problem of the origin of species that so much impressed Charles Darwin. Darwin suspected, as has subsequently been confirmed, that there were several species of the turtles. As specimens were studied with accurately known origin, it became evident that each of the islands is inhabited by a recognizably distinct form of turtle, and that on the large island of Albemarle, which has been formed by the

confluence of five distinct volcanic centers, there were, indeed, five races of the turtles. Since the marine turtles that are abundant in Galapagos waters exhibit no trace of such island differentiation, the lesson as to the importance of geographic isolation in the basic evolutionary process is impressive.

LONGEVITY OF TURTLES

A great and quite justifiable popular interest attaches to these large reptiles for their longevity. Even the smaller species of turtles tend to be long lived; the great land turtles of the Galapagos (with the corresponding forms on islands in the Indian Ocean) have a life expectancy of much more than a hundred years, perhaps of two hundred years.

The most reliable actual report of great age in one of these creatures refers to an individual Indian Ocean turtle known as "Marion's Tortoise." A large turtle with four others was taken alive to the Island of Mauritius in the year 1766 by the French explorer, Marion de Fresne. One of these specimens was mentioned on the occasion of the capture of Mauritius by the British in 1810; and all records indicate that this turtle lived on at the Artillery Barracks until 1918, when, apparently blind from age, it fell into a gun emplacement and was killed. The remains are preserved in the British Museum in London. Thus this turtle was known for 152 years,

and its estimated age at death is between 200 and 250 years.

EXPEDITION RESCUES TWO

The Crane Pacific Expedition of Chicago Natural History Museum, in 1929, was happy in any case to rescue two small living specimens, weighing respectively 28 and 30 pounds, from the Norwegian fishermen settled at Academy Bay on Indefatigable Island. We exchanged flour and canned vegetables for the turtles, and the settlers seemed most pleased with their bargain. Had we arrived a few weeks earlier we might have obtained the gigantic turtle of which only the soles of the feet remained!

The two turtles sailed with us to Tahiti. There we boxed them and shipped them alive to Chicago, hopefully remembering their reputation for traveling for months without food or water in the holds of the whaling ships. They survived the journey and became acclimated in the new reptile house of the Brookfield Zoo. There they flourished, one of them growing in 18 years to a weight of 360 pounds, and still surviving. One specimen died in 1941 and was returned to the Museum. It served as model for the celluloid replica now placed on exhibition in Hall 18. The model in cellulose acetate is the work of Staff Taxidermists Julius Friesser and Leon L. Walters.

NEW GRAVEYARD OF FOSSIL VERTEBRATES IN WYOMING

By RAINER ZANGERL
CURATOR OF FOSSIL REPTILES

Once in a great while a veritable graveyard of fossil vertebrates is found. Many sites have become world famous in the course of time. A visitor to a paleontological museum collection in the United States could hardly fail to see the impressive rhinoceros slabs that are now exhibited in nearly every museum. These slabs show large numbers of disarticulated rhinoceros skeletons with the bones mixed up and tightly crowded together.

Recently another vertebrate graveyard was discovered by a Chicago Natural History Museum expedition in the Washakie

formation of late Eocene age in southern Wyoming. In this case, the burial ground contains probably countless thousands of swamp and river turtles, a few crocodiles, and fishes similar to the living gar pikes. The turtle remains are preserved in all stages of disarticulation, belong to individuals of all sizes, and represent at least three species.

The specimens are so tightly packed together in the one level in which they occur that more than forty individuals were counted in an area of about three square yards. The extent of the graveyard known at present is considerable; the fossil-bearing level could be traced over an area of at least one-quarter square mile. What were

the circumstances that led to the aggregation of such vast numbers of animals in relatively small areas? What killed them all at once?

STUDIES OF FOSSILIZATION

Answers to these questions, naturally, vary with each specific case. The circumstances responsible for the destruction and subsequent burial of the turtles and crocodiles in Wyoming were certainly very different from those that brought about death and final deposition of the rhino herd in Nebraska. Much has been written about fossilization, and at least one author, Deecke, has made field observations on death and burial of animals at the present time, observations that are of immeasurable value in the interpretation of peculiarities of preservation in fossils.

On the other hand, there are very few accurate records on the occurrence of fossils in any given formation. As an outstanding exception to this, the careful records kept and subsequently published by Dr. Bernhard Hauff on the occurrence of fossils in the marine early Jurassic (so-called Lias) in the region of Holzmaden in southern Germany merit brief discussion. This formation (Fig. 1) has produced some of the most beautifully preserved fossil vertebrates exhibited in all major museums.

In the region east of the town of Holz-

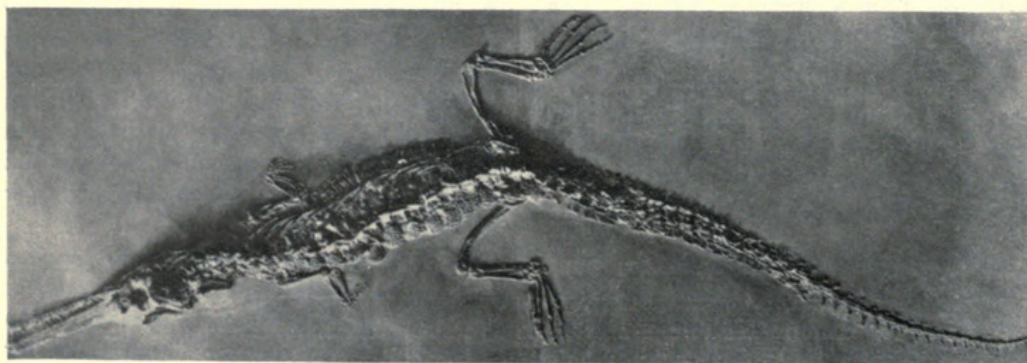


Fig. 1. *Mystriosaurus bollensis* (*Steneosaurus bollensis*), a superb specimen of a Liassic crocodilian from the region of Holzmaden, southern Germany. The specimen is on exhibition in Hall 38.

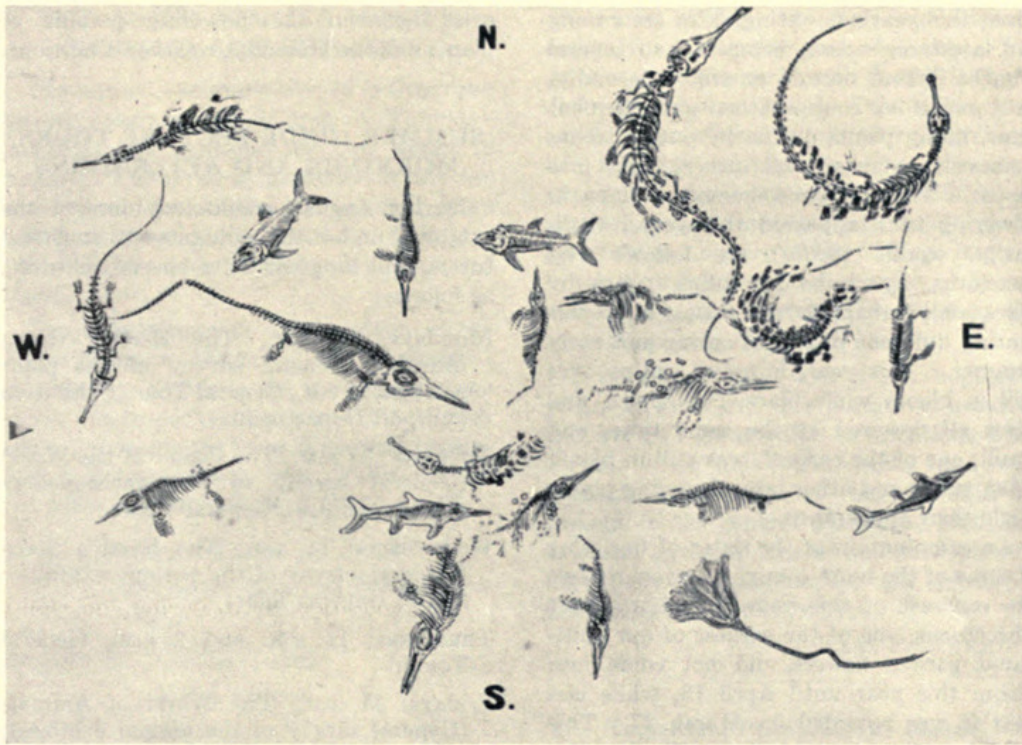


Fig. 2. Sketch showing the exact position of the good skeletons that were discovered in Pit No. 16, Lias formation near Holzmaden, Germany. From Hauff, 1921, *Palaeontographica*, vol. 64.

maden and south of the industrial town of Göppingen, the dark bituminous shales of the Lias formation are buried in horizontal position below the top soil and have been commercially mined for a long time. Hauff, a local resident of Holzmaden, became interested early in the mining activities and particularly in the rich fauna of fossils that occur in the formation, and while he collected, prepared, and sold his finds, his interests were, most fortunately for paleontology, scientific as well.

CAREFUL RECORDS MADE

Hauff studied the vertical extent of the shales accurately, classified them into groups and minute subdivisions of the latter, and labeled each level accordingly, so that each of his shale horizons could be determined in the thirty-odd pits that were dug in the area of Holzmaden. Whenever a fossil was found, the number of the pit and the exact designation of the level in which it lay was affixed to its label, and all this information, together with the identification of the specimen, was put down on record. Naturally, records were also kept for specimens that were not well-enough preserved to merit preparation or had otherwise no sale value. Hauff, furthermore, made maps of the region indicating the location of the various pits and, whenever a good vertebrate skeleton was discovered, he sketched its position and approximate state of preservation on these maps, projecting all the good skeletons of all the fossil-bearing levels onto one plane.

These skeletons were all found in an area of 1,782 square yards, in about 5,180 cubic yards of rock. Another sketch (Fig. 2) by Hauff gives the exact position of the good

skeletons in pits Nos. 3-31, in their relative location to one another. This shows the arrangement and state of preservation of the better specimens over about two square miles of formation. At the time of publication, 1921, data gathered over more than thirty years had accumulated. In appreciation of his merits in the careful collection of this highly valuable information, Hauff was given an honorary doctor's degree.

As a result of this effort, it is now possible to reconstruct rather accurately the general geographic and faunistic conditions that prevailed at the time when these strata were deposited. To mention just a few, it is possible to say with certainty that there were no major ground currents in the Lias sea in the region of Holzmaden, because the position of the skeletons to the compass directions is totally irregular. Furthermore, the depth of the water must have been considerable, since there is no evidence of wave ground action. The preservation of the skeletons suggests a bottom mud, in which only anaerobic bacteria could live and decompose the carcasses. On the other hand, this ocean pocket was not too far away from land, since the fossils include such land animals as flying reptiles and forms that almost certainly frequented fresh-water pools and streams.

The general conditions at Holzmaden are rather complex and formations of this kind are not very common. Thus the data and conclusions reached from them are of little use in different types of formations, such as lake, swamp, or land deposits. Our knowledge of conditions of fossilization in formations such as these is, in spite of many observations, far less systematic and much

needs yet to be learned. Graveyards of vertebrates such as the one discovered in Wyoming hold a wealth of information that can rarely be obtained otherwise. The deposits there are largely stream borne; to a somewhat lesser degree they accumulated as swamp bottoms. The rock in which the turtles are buried is a fine sandy clay of fairly uniform character throughout the fossil-bearing level. The condition of the fossils themselves, in different phases of disarticulation, suggests that the animals were dead when buried, but not for too long a time. Obviously the carcasses were transported to the present burial site, most likely by a spring flood. What killed the animals is difficult to determine, but it is known that present-day turtles sometimes die in large numbers when caught by a severe premature freeze, before they have time to protect themselves in a suitable manner.

ORE PROCESSING EXHIBITS

Two exhibits of models, one representing the evolution of the blast furnace for smelting iron ore, the other showing the interior of an Arizona gold mine and a stamp mill for the extraction of free gold from crude ore, have recently been reinstalled in the Hall of Economic Geology (Hall 36).

The blast furnace exhibit includes three models representing the hot blast furnace of today, the cold blast furnace of seventy years ago, and the Catalan forge in which iron was smelted 150 years ago. They are arranged side by side in one case and labeled to enable the visitor to compare readily the great advances made in smelting of iron and to comprehend the steps involved in the extraction of iron from crude ores.

The models of the Arizona gold mine and of the stamp mill, installed in a single case, illustrate the common features present in the great majority of metal mines and the manner by which many ores are extracted and processed.

Library Notes

The Museum Library recently has received shipments from the Preussische Akademie der Wissenschaften, the Senckenbergisches Museum, the Deutsche Morgenländische Gesellschaft, and the Museum für Völkerkunde. It is remarkable that learned societies and institutions were able to carry on their activities in the midst of war to the extent they did. Publication in Germany seems not to have been seriously interrupted until well into 1944, and earlier shipments of material from France, Holland, and Belgium indicate that scientific activity continued even during the darkest crises.

For the conservationist, the acquisition by the Library of a complete set of the *Journal of Wildlife Management* to date is an event of some importance.



Zangerl, Rainer. 1947. "New Graveyard of Fossil Vertebrates in Wyoming." *Bulletin* 18(8), 4-5.

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