

FROZEN MAMMOTH IN SIBERIA.*

By O. F. HERZ.

[ABOUT the middle of April, 1901, the Imperial Academy of Sciences of St. Petersburg was informed by V. N. Skripitsin, governor of Yakutsk, of the discovery of a mammoth in an almost perfect state of preservation, frozen in the cliff along the river Beresovka, the right tributary of the river Kolyma, about 200 miles northeast of Sredne-Kolymsk, about 800 miles westward of Behring Strait, and some 60 miles within the Arctic Circle.

Thanks to the courtesy of Finance Minister Witte, 16,300 rubles were assigned for the prompt dispatch of an expedition to examine and secure this valuable find. O. F. Herz, a zoologist of the Imperial Academy of Sciences, was appointed chief of this expedition; E. V. Pfitzenmeyer, zoological preparator of the same institution; and O. P. Sevastianoff, a geological student of the Yuryevsk University, his assistants. The expedition started from St. Petersburg on May 3, 1901, and its chief reached the mammoth region on September 9.]

August 31-September 5.—After reaching Mysova we were unable to proceed directly to the mammoth region for three or four days because of the absence of the Cossack Yavlovski, who did not return until September 3. He informed us that serious illness had prevented him from visiting the mammoth region in the spring, and consequently the find had not been covered with earth and stones to prevent its injury by rain and beasts of prey. Unfortunately, the summer rains had washed a mass of earth down the slope in which the mammoth lies, and this had considerably damaged the hind part of the body. Wolves and bears had caused further injury to the head.

As I did not personally see the Lamut, S. Tarabykin, who discovered the mammoth, I can only give the story of the find as told me by Yavlovski. The Lamut, while deer hunting, was led to the discovery by finding a tusk a short distance above the real find. Upon the mammoth's head there was but one tusk, which the Lamut and two companions chopped out. As the latter afterward informed me, there was no trunk. At the end of August, 1900, all three repaired to Kolyma, where they sold the ivory to Yavlovski, telling him of the discovery. The Cossack, being an intelligent man, investigated the find personally, procured small portions of the body as evidence, and reported to the police commissioner, who in turn informed the governor of the matter.

September 11, 1901.—It was so warm to-day that the soil became loose and easily handled, and I was enabled to begin the work of excavation. The body lies in a cliff that faces east and extends for a mile in a semi-circle. The mammoth is about 67 yards back from the bank of the river. There is an upper stratum of earth, covered with moss. Beneath this is a mass of loam and earth mixed with stones, roots, pieces of wood, and lamellar plates of ice. Underneath this alluvial layer there is a vertical wall of ice, which stands free above the mammoth. Upon this supposed ice incline are huge shapeless masses of earth, evidently moved downward by the thawing of the ice as well as the water falling from the upper "tiaga" or marshy forest at the top of the cliff. Ac-

After taking some pictures, I began the excavation, and soon exposed the skull. To my great surprise I found well-preserved food fragments between the teeth, and this fact serves as proof that the ani-

the right hind-leg, which had become turned almost horizontally under the abdomen. Upon the left hind-leg I found portions of decayed flesh, in which the muscular bundles were easily discernible. The stench



LEFT FOREFOOT OF MAMMOTH.

mal died in this very position after a short death struggle. I found the marks made by the Lamuts in removing the left tusk, but I could find no traces of the right one.

At a depth of 27 inches we found the left fore-leg, still covered with hair up to the humerus, notwithstanding that the epidermis had completely rotted. In a frozen condition we may succeed in getting it to St. Petersburg. The hair appears to consist of a yellow-

emitted by this extremity was almost unbearable.

September 12.—After we removed the earth from under the left leg, the thick underwool was exposed. Part fell out, but the remainder will be saved by bandages. The color may be described as roan. Five hoof-shaped blunt nails could also be seen at the end of the digits.

Considerable ice was found in uncovering the right fore leg, from which most of the hair was missing.



SIDE VIEW OF THE MAMMOTH AFTER PARTIAL EXCAVATION.

ording to natives, the head of the mammoth was exposed two years ago by the breaking away of a mass of earth; the rest of the body in August, 1900.

* Extracts, translated for the Smithsonian Annual Report, from the diary of O. F. Herz, chief of the expedition of the Imperial Academy of Sciences of St. Petersburg to the River Beresovka for the excavation of the frozen mammoth.

ish-brown under-coat 10 to 12 inches long with a thick, bristle-like upper coat, rust-brown in color, about 4 to 5 inches long. The left fore-leg is bent, so that it is evident that the mammoth tried to crawl out of the pit or crevice into which he probably fell, but apparently he was so badly injured by the fall that he could not free himself. Further excavation exposed

The leg was so placed as to indicate that the mammoth after falling had supported himself on this leg while attempting to step forward with the left one. We concluded that he had died while in this position, and that he had by no means been washed there by water from elsewhere. The presence of the thick wool showed that the animal was well adapted to endure

cold. It is improbable that he died from hunger, for a large quantity of food was found in his stomach, which was similar to that found between his teeth.

September 14.—The mound was opened further south and southeastward, but no trace of the trunk was found. At a distance of about five inches from the upper edge of the sole of the right hind foot we found the tip of the tail. This tip is 9 inches long, with hairs 4 inches long, standing out in bunches around the end. The hair at the basal end is dirty yellow

shoulder, and removed the shoulder bone, which was broken, evidently when the animal fell. The well-preserved flesh and fat will be packed for shipment. I collected several dry and frozen bits of blood.

October 7.—To-day we packed up the right leg. I succeeded in removing a further portion of the stomach, which I will take with me, in a good state of preservation.

October 8.—The left side of the broken pelvis was removed. The flesh beneath this was found frozen

ers can be readily washed off and cleaned with water. To cover 10 square meters of surface, 1 liter of celluloid varnish is required.—Chemiker Zeitung.

[Continued from SUPPLEMENT No. 1515, page 24276.]

BREEDING AND HEREDITY.*

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SEGREGATION.

WHERE the proper precautions have been taken, the following phenomena have been proved to occur in a great range of cases, affecting many characters in some thirty plants and animals. The qualities or characters the transmission of which in heredity is examined are found to be distributed among the germ-cells, or gametes, as they are called, according to a definite system. This system is such that these characters are treated by the cell divisions (from which the gametes result) as existing in pairs, each member of a pair being alternative or *allelomorphic* to the other in the composition of the germ. Now, as every zygote—that is, any ordinary animal or plant—is formed by the union of two gametes, it may either be made by the union of two gametes bearing similar members of any pair, say two blacks or two whites, in which case we call it *homozygous* in respect of that pair, or the gametes from which it originates may be bearers of the dissimilar characters, say a black and a white, when we call the resulting zygote *heterozygous* in respect of that pair. If the zygote is homozygous, no matter what its parents or their pedigree may have been, it breeds true indefinitely unless some fresh variation occurs.

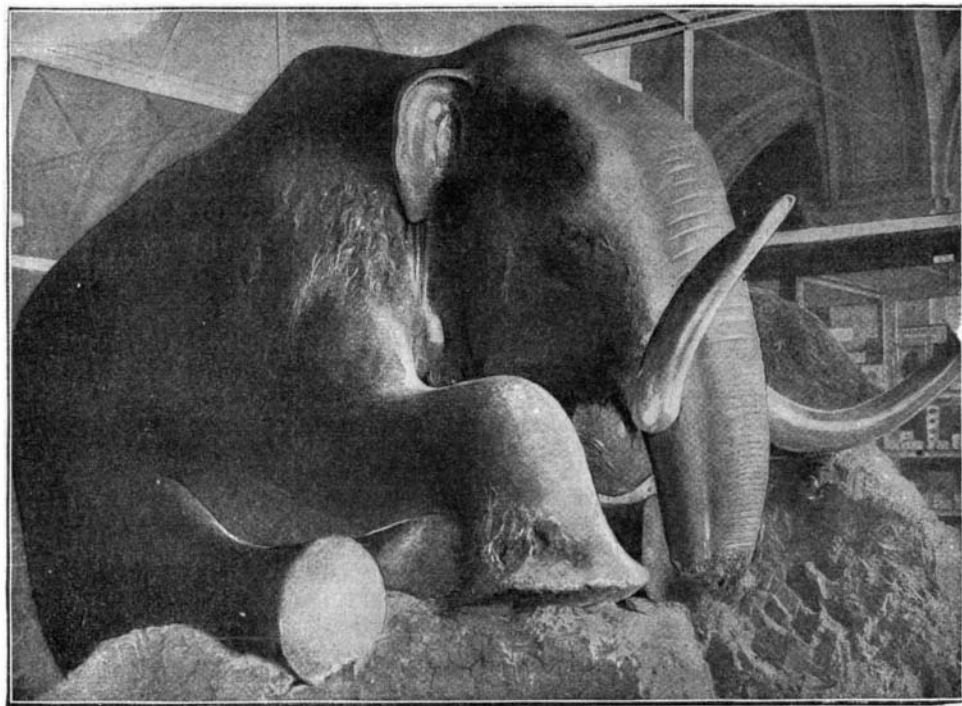
If, however, the zygote be heterozygous, or gametically cross-bred, its gametes in their formation separate the allelomorphs again, so that each gamete contains only one allelomorph character of each pair. At least one cell division in the process of gametogenesis is therefore a differentiating or segregating division, out of which each gamete comes sensibly pure in respect of the allelomorph it carries, exactly as if it had not been formed by a heterozygous body at all. That, translated into modern language, is the essential discovery that Mendel made. It has now been repeated and verified for numerous characters of numerous species, and, in face of heroic efforts to shake the evidence or to explain it away, the discovery of gametic segregation is, and will remain, one of the lasting triumphs of the human mind.

In extending our acquaintance of these phenomena of segregation we encounter several principal types of complication.

Segregation Absent or Incomplete.—From our general knowledge of breeding we feel fairly well satisfied that true absence of segregation is the rule in certain cases. It is difficult, for instance, to imagine any other account of the facts respecting the American Mulattos, though even here sporadic occurrence of segregation seems to be authenticated. Very few instances of genuine absence of segregation have been critically studied. The only one I can cite from my own experience is that of *Pararge egeria* and *egeriades*, "climatic" races of a butterfly. When crossed together, they give the common intermediate type of north-western France, which, though artificially formed, breeds in great measure true. This crossed back with either type has given, as a rule, simple blends between intermediate and type. My evidence is not, however, complete enough to warrant a positive statement as to the total absence of segregation, for in the few families raised from pairs of artificial intermediates some dubious indications of segregation have been seen.

The rarity of true failure of segregation when pure

* Read before the section of zoology of the British Association for the Advancement of Science.



MAMMOTH FROM BERESOVKA IN THE ZOOLOGICAL MUSEUM IN ST. PETERSBURG, RECONSTRUCTED IN THE POSITION IN WHICH IT WAS FOUND.

other in color, while further down it becomes much darker.

September 15.—I stopped further excavation until my companions, who were left behind, can arrive, and Mr. Sevastianoff can make the geological survey. In order to be able to dismember the mammoth after the severe cold weather sets in, I intend to build a structure over the animal that can be heated. Meanwhile I covered the body with tarpaulin to protect it from the weather.

September 17.—According to my opinion, the entire cliff rests upon a glacier which was disintegrating and in which there were deep crevices. The water that flowed down from the "tiaga" and from the neighboring hills, mixed with earth, stones, and pieces of wood, gradually filled these crevices. The whole was later covered with a layer of soil, upon which a rich flora doubtless developed, that served as excellent food for mammoths and other animals. Whether this flora is identical with the present flora will be known when the food fragments found in the mammoth can be examined.

September 19.—The timber for the building of a house over the mammoth is already cut and prepared.

Despite the fact that the carcass is in a frozen condition, the smell emitted is very disagreeable.

September 20.—At the exact hour of my prediction, Mr. Pfizenmeyer arrived with the rest of the transport equipment. Mr. Sevastianoff, however, was not with him.

September 30.—To-day we made the first experiments in heating the house, and the arrangement appears to be excellent.

October 2.—To-day in clearing away the earth from the occiput and back, we exposed several broken ribs and several lumbar vertebrae. Under the middle part of the abdomen we found yellowish-brown underwool 8 to 12 inches long.

October 3.—After removing the last layer of earth from the back, the remains of food in the stomach were exposed. The latter was badly decayed, while the other organs, exposed later, were practically destroyed.

October 4.—We removed the left shoulder blade and part of the ribs, and then cleaned part of the stomach, which contained an immense quantity of food remnants. In the afternoon we severed the left fore-leg.

October 5.—To-day we skinned the left side and exposed several ribs, mostly well preserved. Then we skinned the head, of which parts were preserved. In the afternoon we removed the left shoulder, upon which we allowed the tendons and muscular fibers to remain. The flesh from under the shoulder, which is fibrous and marbled with fat, is dark red in color and looks as fresh as well-frozen beef or horse meat. The dogs cleaned up whatever mammoth flesh was thrown to them. The skin on the left shoulder is three-quarters inch thick, and on the right side nine-tenths inch thick.

The longest hair found came from the shoulders. It is ashy or pale blond in color, and is probably what has been erroneously called the mammoth mane.

October 6.—We bandaged the left fore-leg, packed it in hay and then wrapped it in sackcloth. Later these things will all be sewed up in skins.

We then amputated the right fore-leg above the

hard as a stone and well preserved. The crossbone or sacrum was found intact.

October 9.—To-day we cut off the hind-legs, experiencing great difficulty with the thigh bones, so strongly were they joined with the tibia. The color of the hair of the right hind femur varies from rust-brown to black.

October 10.—After removing about 270 pounds of flesh, we started to raise the abdominal skin, which weighed about 470 pounds, when to our great joy we discovered the entire tail. This is short and consists evidently of 22 to 25 caudal vertebrae. The length, measured at the underside, is only 14½ inches, while the circumference at the base is 13 inches. It was covered with long, bristly hair, rust-brown in color. We could not decide to cut up the abdominal skin, and will attempt to take it with us intact.

October 11.—To-day we performed the last operations on the mammoth, after which all the parts were brought into the winter house, and securely packed away for transportation.

Preservation of Plaster Casts.—Upon complete drying, small objects are laid for a short while in celluloid varnish of 4 per cent, while large articles are painted with it, from the top downward, using a soft brush. Articles set up outside and exposed to the weather are not protected by this treatment, while oth-



SKULL OF THE MAMMOTH WITH FOOD REMNANTS (f) BETWEEN THE MOLAR TEETH.