

Description of the exhibition “Paleontological Treasures from Russia” (84 specimens)

This exhibition is the largest and the most complete traveling exhibitions of the fossils in the world. It based on the very rich paleontological collections of the Paleontological Institute of the Russian Academy of Sciences (Moscow, Russia) and reflects the most important stages in the development of the invertebrates and vertebrates, including the time of the origin of the mammals and the time of dinosaurs.

Here are some figures. Among 84 specimens of the exhibit there are 28 complete and mounted skeletons ranging from 5 cm long *Oxypteriscus* to 8 m long *Tarbosaurus*. Geographic range of the specimens is from the northern part of European Russia to Mongolia. Many specimens are unique and one-of-the-kind, for instance, the skeleton of gliding reptile *Sharovipteryx*.

Here are some facts about the most interesting specimens.

The labyrinthodonts (amphibians), parareptiles and theromorphs were among the most ancient tetrapods.

The labyrinthodont amphibians were the very primitive group whose body structure was intermediate between their ancestors (sarcopterygian fishes) and the real terrestrial tetrapods. Labyrinthodonts were superficially similar to crocodiles. They lived in water and were probably fish eaters. Some of them could grow up to 4 to 5 meters long. Different labyrinthodont lineages gave rise to all the other tetrapods. The exhibition demonstrates different kinds of labyrinthodonts, such as batrachomorphs (from *Thoosuchus* with a skull of 7 cm long to *Eryosuchus* with a skull of 60 cm long and *Parothosuchus* with the body length of 170 cm) which scientists believe to be the ancestors of the recent frogs, small seymouriamorphs (*Ariekanerpeton*) probably ancestors of parareptiles, anthracosauromorphs (*Chroniosaurus*) - primitive relatives of the true reptiles and theromorphs.

Parareptiles were widely distributed during the Paleozoic era. They were the ancient ancestors of the turtles. There were many different kinds of parareptiles. The collection includes small lizard-size procolophons (*Nyctiphruetus*, *Tichvinskia*) giant 3 meters long pareiasaur (*Scutosaurus*) and very unusual flat-headed *Lanthanosuchus*.

The theromorphs (“mammal-like reptiles”) were the most advanced animals of the Paleozoic time. They were distant ancestors of mammals and, therefore, of ourselves. The Paleontological Institute has the unique collection of theromorphs. Here we demonstrate the primitive pelycosaurs (herbivorous *Ennatosaurus* and small insectivorous *Mesenosaurus*) and various higher therapsids such as large saber-toothed predators *Inostrancevia* and *Biarmosuchus*. The giant 3,5 meters long herbivorous *Estemmenosuchus* was one of the biggest terrestrial animals of that time.

Almost all animals, mentioned above lived more then 250 million years ago.

During the beginning of the Mesozoic era there were also some herbivorous theromorphs- dycinodonts (*Lystrosaurus*). The most advanced reptiles, thecodonts, also appeared (*Archosaurus* with the body up to 1,5 meters long). These large carnivores may have caused the final extinction of the herbivorous dycinodonts. Later they have spread all over the Earth, and gave rise to the dinosaurs.

The Mesozoic era was the age of reptiles, especially, dinosaurs. There were also diverse lizards, turtles, crocodiles and small mammals. The oceans were

inhabited by the giant carnivorous pliosaurs (the skull of the six-meter long *Liopleurodon* is on display) and their numerous relatives.

Dinosaurs. The dinosaurs were derived from the diapsid reptiles called thecodonts (this Latin word refers to the special way in which the teeth of those animals were attached to the jaws). The thecodonts are represented in the exhibit by a predator *Archosayrys*. The thecodonts gave rise not only to the dinosaurs, but also to the crocodiles, flying reptiles (pterosaur *Sordes*) and, according to one of the modern hypotheses, to the birds.

Although all dinosaurs are united by the same name, they include two distinctly different groups, Saurischia and Ornithischia. These groups were probably derived from different thecodont lineages.

The most spectacular Saurischian in the exhibit is the gigantic *Tarbosaurus bataar*. It is an Asian relative, and probably the ancestor, of the North American *Tyrannosaurus rex*.

There is also an interesting reconstruction of the mode of life of the carnivorous medium-size *Deinonychus* from North America. It was generally believed that this animal lived in open plains, formed packs and hunted other dinosaurs. The analysis of the limb structure of *Deinonychus* has proved that this animal could have been a good tree climber, like modern leopards.

Many ornithischian dinosaurs have returned to a quadrupedal locomotion. Small herbivorous *Psittacosaurus* was one of the most numerous dinosaurs in Central Asia during the Early Cretaceous time. They could walk both on two and on four legs, depending on circumstances. They most probably lived in herds, because it was easier to protect themselves from predators this way. *Psittacosaurus* is currently believed to be an ancestor of the horned dinosaurs, or ceratopsids. Near the skeleton of *Psittacosaurus* you see the skeleton of a primitive ceratopsid *Protoceratops* from the Late Cretaceous of Mongolia. The largest protoceratopses were up to 4 meters long. Some of their kind entered North America and gave rise to numerous descendants, for instance, to well-known *Triceratops* and *Styracosaurus*.

As with the majority of reptiles, all dinosaurs were egg-laying animals. Some dinosaurs protected their nests and even took care of their young. Many nests of the Mesozoic reptiles were found in Mongolia. You can see the nest of *hadrosaur dinosaur* eggs.

During the Mesozoic era, many groups of animals were trying to develop flight. World-famous *Sharovipteryx* illustrates some of the least successful attempts with a membrane on the hind limb and the tail. Pterosaurs were better adapted to flight, but only birds managed to colonize the aerial environment completely (four small eggs of Mesozoic birds *Gobipteryx* are on display).

The Sevsik collection (called as Mammoths Family – consists from mother, father and 5 kids of mammoths) is an unique sample of paleontological exhibits comprising seven complete mammoth skeletons of different individual age (from one month to 6-8 year old). It includes five skeletons of baby mammoths of various preservation and two mounted skeletons of adults. These are the latest members of the species *Mammuthus primigenius* from Central Russia (dated by the ¹⁴C method as less than 14 000 years) are submitted.

The Sevsik mammoths were collected in a quarry near the town of Sevsik (Bryansk Region) by an expedition of the Paleontological Institute of the Russian

Academy of Sciences in 1988-1991. This is a unique locality where a mammoth group was buried simultaneously as a result of natural disaster, which is evidenced by both geological data and the composition of the mammoth group. The Sevsk locality is the largest European taphocenosis of mammoth bones found in alluvial deposits. An excavation in the ancient river-bed yielded about 4000 mammoth bones of 33 or 34 animals of various individual age.

The Sevsk collection is also unique in that the series of mammoth skeletons belongs to one and the same family group and includes the only series of baby mammoth skeletons of the species *M. primigenius* of various age. None of other museums of the world possess a complete skeleton of a baby mammoth. The sample from the Sevsk locality consists of small-sized mammoths. Even smaller mammoths (so-called dwarf mammoths) are only known from the Holocene deposits of Wrangel Island in the Arctic Ocean.

Woolly mammoth, *Mammuthus primigenius* (Blumenbach, 1799), is the latest member of the *Archidiskodon-Mammuthus* lineage. In the Late Pleistocene woolly mammoth lived in Northern Eurasia and North America. In the continental biotopes, woolly mammoths became extinct approximately 8-6 thousand years BP, but they remained in some Arctic islands (e.g., in Wrangel Island) up to 3-4 thousand years BP. Woolly mammoth was a highly specialized animal, which could live under the Arctic conditions and survive severe winters. It had small ears and the huge tusks and was covered with dense wool. Mammoth was well adapted for feeding on grass, sedges and branches of bushes and trees.

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Woolly mammoths were especially widespread over the cold epochs of the Late Pleistocene in the Northern Eurasia. Together with woolly rhinoceros, primeval bison, reindeer, elk, musk ox, saiga, several forms of horses, and cave lion, they composed an animal community commonly called "Mammoth Faunal Assemblage" existing in the interval 200-10 thousand years BP. In the last glacial epoch, woolly mammoth together with some cold-adapted animals and Paleolithic men reached North America. Mammoth and his satellites inhabited south of ice-sheet in the tundra-steppe, which has no Recent equivalent. The species, which lived together, now are divided and inhabited different zones (tundra, woodland, steppe). Mammoths together with most ungulate mammals were the hunting objects of Paleolithic men. At the Pleistocene-Holocene transition, many giant mammals became extinct.

(59) Trogontherian elephant, *Mammuthus trogontherii* (Pohlig, 1891), is one of the largest members of proboscideans and a woolly mammoth ancestor. It was widespread in the Middle Pleistocene (800-200 thousand years BP) everywhere in Northern Eurasia. Trogontherian elephant inhabited forest-steppe zone, fed on leaves and branches of bushes and trees. It was also herbivorous, but to a lesser extent than woolly mammoth.

The skeleton of *Mammuthus trogontherii chosaricus* Dubrovo was excavated in 1990 in Novopetrovskoe locality, Moscow Region. This is a very scarce find of almost complete skeleton of Trogontherian elephant. The skull, limb bones, and a vertebra column were quite well-preserved. The fossils lied at a depth of 2.3 m in the lake deposits and were covered with moraine of the Middle Pleistocene glacier. The animal was 3.5 m high and 50-60 year old.

(60) The body of the woolly mammoth, *Mammuthus primigenius* (Blumenbach, 1799) was found in summer 1979 on the bank of the Yuribey River. The body lay on its back at a depth of about 2 m. This find was unique, as the fossils with bones connected by soft tissue were obtained for the first time. The soft tissues retained on the distal parts of the extremities, as well as near the stomach and intestine.

The plant mass in the stomach consisted of the remains of grass, sedge, herb, branches of larch, birch, and dwarf birch, and others. The presence of fruits and seeds indicates that the mammoth died at the end of summer. The animal was 2.3-2.5 m high and 10-12 year old and lived about 10 thousand years ago.

Woolly mammoth, *Mammuthus primigenius* (Blumenbach, 1799). The finds of remains of woolly mammoths on the islands of the Arctic Ocean are usual. The drop of world ocean level during the glaciations led to the formation of bridges between continents and islands and to the appearance of the land corridor between the Chukotski Peninsula of Eurasia and Alaska, so called "Beringia". About 8-6 thousand years BP, the World Ocean level again have been up and many animals occurred in insularity. The increasing warming, the disruption of the landscapes typical of mammoth and his satellites and the press of Paleolithic hunters led to the extinction of the mammoth fauna on the continents at the beginning of the Holocene. On the Arctic islands the mammoths could exist considerably longer.

(63-64) Cave lion, *Panthera (Leo) spelaea* Goldfuss, 1810, is one of the largest member of felids (order Carnivora) and the most huge predator of the Mammoth Assemblage. It was up to 3.5 m long and about 350-400 kg of weight and inhabited cold forest-steppes and mountains. The cave lion existed in the Middle and Late Pleistocene of Eurasia and in the Late Pleistocene of North America. It's general appearance is well known thanks to the pictures of Paleolithic painters.

(65) Sabre-toothed cat, *Homotherium crenatidens* (Fabrini, 1890), is a large predator belonging to machairodontines (order Carnivora). It lived in the late Pliocene and early Pleistocene in Eurasia. Large canines bear small denticles on the anterior and posterior edges.

(61) Yuribey woolly mammoth was covered with thick wool. The hair length on the back and sides near the elbow and groin was 7-20 cm. On the sacrum, hips, and belly, the hair length was up to 40-60 cm.

(67) Mummified mammoth baby was found in June 1977 in the valley of the Kirgilyakh Brook, a left tributary of the Berelekh River, in the southwestern part of the Chukotka Peninsula. The body lay on its left side in a natural posture in fossil ice mass. Carbon-14 dating has shown that it died 40-41 thousand years ago. The baby mammoth was 7-8 years old, 97.5-104 cm high in withers and weighted about 90-95 kg. It was covered with thick reddish-golden wool, with some nearly black hairs. The hair length ranged from 3-7 cm (on the legs) to 20 cm on the other parts of the body.

The unique material allowed studying histological and histochemical features of the baby mammoth skin, morphological structure of the blood system, cytological traits of the tissues, biochemical analysis of the muscle tissue, ultra structure of tissue, blood cells and proteins, biochemical analysis of collagen, brain lipides, and content

of gastrointestinal tract. The list of plants from its stomach included 12 species, among which there were mosses, sedge, herb, *Potentilla*, buttercups, branches of creeping shrubs.

Kirgilyakh mammoth was very thin, and apparently it starved for a long time without his mother. It died at the end of autumn or beginning of winter.