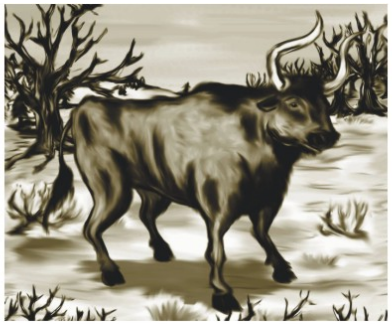

**Aurochs** (*Bos taurus* LINNAEUS, 1758)

**European cattle has been domesticated from the aurochs (*Bos taurus*), which appeared in Europe during the Mid-Pleistocene and became extinct in the 17th or 18th century.**

**The large body of the ruminant aurochs raised gradually towards the withers, and the backside was straight with short tails. It was covered by long, bushier-than-cattle hair of dark brown (males) or light reddish brown (females and juveniles) color with a whitish strip on the back. Based on a depiction of an aurochs from Augsburg, the chin and the planum nasolabiale as well as the belly and the inner surface of legs also had a whitish hue. Contours of the aurochs skull were straight, eye pits aslant forward and to the side, forehead plain, crest linear, and the upper part of the mandible slant. The horn of bulls pointed sideways, then forward and up. According to past observations horns were white with a black tip.**

**The vast range of the aurochs included the whole of Europe, and the Near and Middle East. Although it can not be traced as far north in Siberia as the bison, to the south it occurred in Mesopotamia, Palestine and even in North Africa.**

**Horse** (*Equus caballus* LINNAEUS, 1758)

**True *Equus* evolved ca. 1 million years ago with two major lineages: the *Caballoid* and *Stenonid* forms. Closed eye pits and elongated skull are general features of the genus *Equus*. Legs of true horses had grown bigger, straight and slender. They had only single toe ending in hoof, and thus walked on toe tip. *Equus* horses always roamed in large herds. True horses inhabited open grasslands exclusively. Their diet consisted of mostly tough grasses.**

**The hardy *Equus caballus* had colonized the whole of Europe and Asia. In response to adaptation to climate, three morphological types segregated in Europe.**

**In Central and Eastern Europe caballoid horses underwent a decline in body size during the last glacial period. This phenomenon was attributed to decreasing temperatures. In line with this explanation, fossil horses from higher latitudes are mostly small-bodied (*Equus caballus uralensis*), while the forest-steppes of Central Europe yield remains of the robust *Equus caballus lapites*. The thick-set *Equus caballus lenensis* typical in North and Northeastern Siberia had successfully established in open areas of the forest tundra and occasionally in tundra heaths more to the South.**

**Giant deer** (*Megaloceros giganteus* BLUMENBACH, 1799)

**The *Megaloceros* or "Irish Elk" evolved 400 thousand years ago and vanished 7700 years before now. Giant deer possessed the largest antlers ever encountered, measuring 3.65 m from tip to tip, well suiting an average body height at withers of about 2 m. For building these ponderous antlers and for growth, as well as for the construction of strong bones, large amounts of calcium (Ca) and phosphorus (P) were needed. For continuous supply of these elements the animals must have been grazing whole day.**

**Early forms like the Asian *Neomegaloceros* and the *Praesinomegaceros* were not yet restricted to open steppes or sparse woodlands. *Megaloceros giganteus* usually occupied forest steppes or other steppe-like habitats. Its diet included mainly grasses, but occasionally it also browsed on young tree and shrub foliage or bark. Giant deer was supremely well adapted to temperature extremes. The animal did not migrate during the alternating freezing and thawing periods in the Pleistocene. Furthermore, its fossils can be found in the north up to 60 degrees latitude.**

**Rapid climate change and associated alterations in the vegetation at the end of the Ice Ages might have caused the extinction of giant deer. Most probably, the animal was unable to obtain all essential mineral nutrients from the new fodder.**


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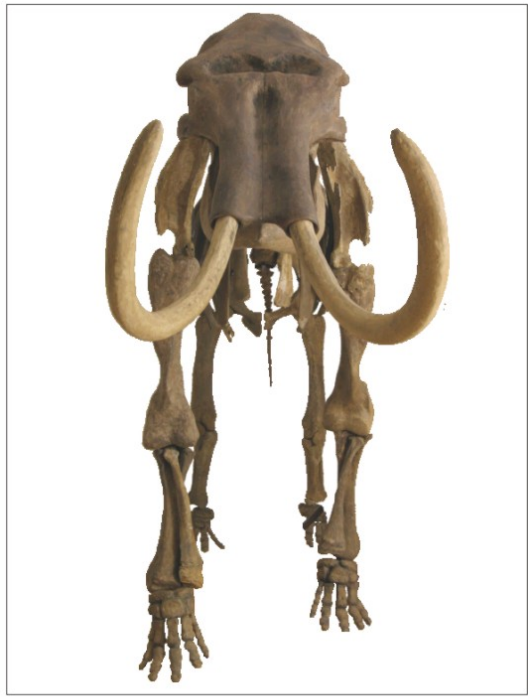
BAKONY NATURAL HISTORY MUSEUM

# Giants of the Ice Age in the Bakony Mountain

## EXHIBITION GUIDE



**Cave hyena** (*Crocuta crocuta spelaea* (GOLDFUSS), 1810)

**The cave hyena (*Crocuta crocuta spelaea*) probably appeared about 20 000 years ago and, like other large-bodied Ice Age mammals, became extinct 10 000 years ago.**

**The cave hyena differed from its extant relative in few morphological characters like the length of front and hind legs. There was no change in the size of middle limb bones (radius-cubitus and tibia-fibula). These morphological features suggest that the walking of cave hyena was probably different from that of present hyenas. Its body was also remarkably larger reaching a height of 1 m and weight up to 80 kg on average. These figures match maximum values measured on spotted hyenas. Hyenas characteristically possess large, massive jaw bones, which is the biggest relative to body size among mammals. There are only speculations on the behavior of the cave hyena with no evidence of living in hierarchically structured groups (clans).**

**The cave hyena was able to survive the cooling climate thanks to attributes such as the modified teeth (pair of carnassials, massive premolars), which made the beast capable of crushing through even the strongest bones with ease. Despite its hardy makeup, the cave hyena must have avoided areas of very low winter temperatures. A complete absence of cave hyena fossils from beyond the 60th degree latitude suggests this.**

**Like extant spotted hyenas, cave hyenas must have searched shelter in caves and crevices. They always preferred sparsely wooded areas, plains and mountains, but never established in such high altitudes as the cave bear did.**

**Cave bear (***Ursus spelaeus* ROSENMÜLLER, 1794**)**

**Cave bear evolved some 200-250 thousand years ago. Its name derives from the fact that fossils of this species have been uncovered from cave sediments almost exclusively. Its remains turn up from England to the Caspian Sea, most abundantly in mountains of Central and Eastern Europe.**

**Standing on two feets the height of the animal may have reached 3 m, and it weighed up to 8-900 kg. Skull length may have exceeded 0.5 m, being 30% larger than that of recent brown bear. In the skull of the cave bear the eye pit and the forehead protrude in a step-like manner, whereas the skull of modern bears is more evenly and slightly slanted. Furthermore, the back of cave bears sloped more steeply than that of modern bears because its front legs were longer than the hind legs. Systematically bears belong to carnivores. The wear of teeth clearly reveals that cave bears lived mostly on plant diet, and were carnivores only occasionally.**

**Unlike recent bears which use caves only for hibernation in winter, cave bears dwelled in caves all round a year.**

**Vegetation had transformed markedly in response to climate warming after the last glaciation at the end of the Pleistocene epoch some 15-20 thousand years ago. Like other members of the Ice Age megafauna (woolly mammoth, woolly rhinoceros, giant deer, etc.), cave bears must have gone extinct because of this environmental change.**

**Wolly mammoth** (*Mammuthus primigenius* (BLUMENBACH), 1799)

**Elephants (Elephantoidea) include the African elephants (Loxodonta) and Asian elephants (Elephas), as well as the closest relative of the latter, the mammoth, which lived in the Carpathian Basin for about 2 million years during the Pleistocene Ice Ages. The ancestor of the well-known woolly mammoth migrated from Africa to Eurasia ca. 3 million years ago, where it gave rise to a lineage of at least three different species which can be distinguished from each other based on tooth morphology. The earliest *Mammuthus meridionalis* existed between 2 million and 600 thousand years before present; it was followed by *M. trogontherii* from 600 to 200 thousand years ago. The most derived woolly mammoth (*Mammuthus primigenius*) lived from 200 to 10-15 thousand years before present, until the last interglacial period. During this almost 200-thousand years period, wolly mammoths had successfully established in most of Europe, Asia and North America.**

**Mammoths' body size was one and half times bigger than that of recent elephants, and measured up to 3.5 m height and 5-6 tons weight. Mammoths differed markedly from elephants not only in dimensions, but also in general appearance. For example, while mammoths were covered by thick fur, elephants have bare skin. The large ears of elephants are contrasted with tiny ones of mammoths. Altogether, the body morphology of mammoths was adapted to frozen polar environments, while that of elephants suits hot tropical climate. Characteristic features of woolly mammoth include relatively high, dome-shaped skull and peaked shoulders. Its back carried a large hump behind which it was straight. Front legs were longer than hind legs, and the whole body was covered by two layers of thick fleece.**

**Tusks are greatly modified upper incisors made of dentin. Mammoths possessed tusk from their birth and it continued growing until the death of the animal. The size of mammoth tusk far exceeds that of recent elephants. Both sexes carried these weird incisors, although female tusks were much smaller than those of males. Male tusks curved down and sideways such that the left tusk bended towards the right one and the right tusk towards the left.**

**Mammoths were herbivores feeding on plants of the "mammoth steppes": fresh sedge, grains, grasses, reed and associated forbs. An adult might have consumed up to 3-400 kg green tissue a day. Herds of 12-15 individuals with 1-2 juveniles kept wandering year-round in search for food. During warm months herds moved north approaching permanent ice, while in autumn returned to the arctic tundra.**

**As a consequence of climate warming following the last glaciation, cold steppes gradually disappeared, thus surviving mammoth populations became restricted to areas close to the polar circle. Some 15-10 thousand years ago mammoths crossed the Bering Strait and colonized first Alaska then the whole of North America.**

**Woolly rhinoceros** (*Coelodonta antiquitatis* BLUMENBACH, 1807)

**The woolly rhinoceros (*Coelodonta antiquitatis*), a descendant of *Dicerorhinus etruscus,* evolved in Asia about 350 thousand years ago, and migrated to Europe 200 thousand years before now.**

**This megaherbivore was up to 3.5 m long, almost 2 m high and weighed 3 tons. It had two horns in a line on its head. The longer anterior one grew above the nose and reached 1.3 m length and 10 kg weight. The posterior horn protruded from its forehead and was 40-50 cm long. Horn diameter at base was 25-30 cm. Beneath horns the nasal and frontal bones were strengthened.**

**The woolly rhinoceros had special, so-called subhypsodont teeth with wrinkled enamel crests and cement-filled grooves adapted to withstand the intensive wearing of tough steppe fodder.**

**Its body was covered by light brown fleece made of two sorts of hair: a thin, dense inner layer and an outer coat of long stiff hairs appearing on the sides. A little mane was on its neck and withers.**

**Similarly to the woolly mammoth, the woolly rhinoceros lived on cold tundras and steppes. It often occupied broad river floodplains and lakeshores where dense wetland vegetation provided ample food for this plant-eater. Its diet included mostly graminoids and young twigs of shrubs and deciduous trees (willow, birch and alder).**

**Woolly rhinoceroses were solitary animals, never formed herds. Courtship and reproduction occurred every 3-4 year. Families usually stayed together briefly as the female took care of her calf not longer than a couple of months. Then the young "adult" departed and searched for new feeding ground.**

**The woolly rhinoceros was a characteristic member of the Ice Age megafauna and was supremely well adapted to the harsh cold climate.**
**Like other members of the Ice Age megafauna, the woolly rhinoceros became extinct during the last interglacial period when the warming climate profoundly altered ecosystems, and led to the disappearance of fodder-rich steppe pastures.**

**Ancient bison** (*Bison priscus* BOJANUS, 1827)

**Adult males may have reached the size of 2 m height and 3 m length, weighing more than 2-2.5 tons. The width of horns atteined 1 m. The body was meagre and muscular covered by brownish fleece, the long legs terminated in wide hoofs. Despite their great body size bisons were highly agile animals. Experts assume top running speed of 40-50 km/h.**

**As a characteristic inhabitant of Ice Age cold steppes bison mostly grazed on steppe grasses, but during the harsh frosty winters it also browsed buds and twigs of forest edge trees.**

**Ancient bisons practially had no natural enemies, thus their abundance increased rapidly. Large herds counting up to 1000 individuals had roamed the cold steppes.**

**About 10 000 years ago at the beginning of a warming period the number of bisons gradually declined and finally they disappeared. In some areas of Europe, however, with altered stature they survived until the Middle Ages. The vikings and Russian princes regularly hunted on bison.**