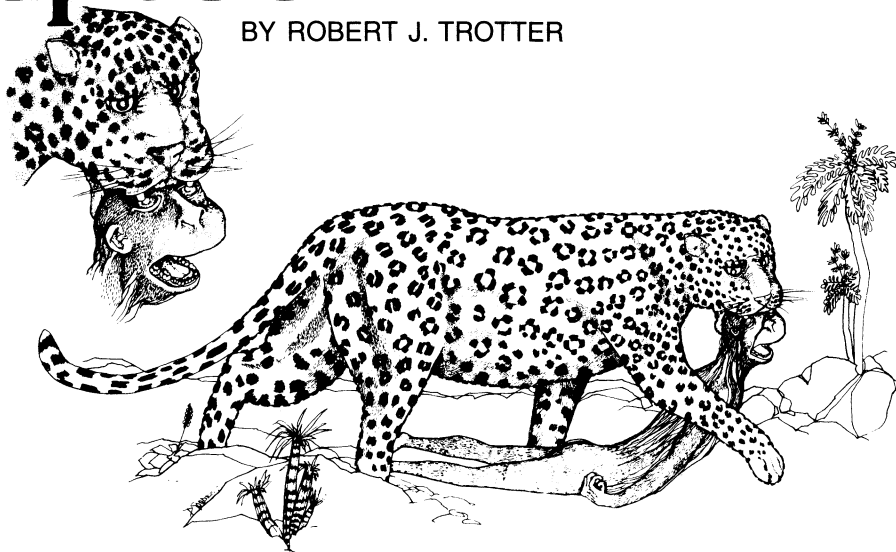


# From Endangered to Dangerous Species

BY ROBERT J. TROTTER

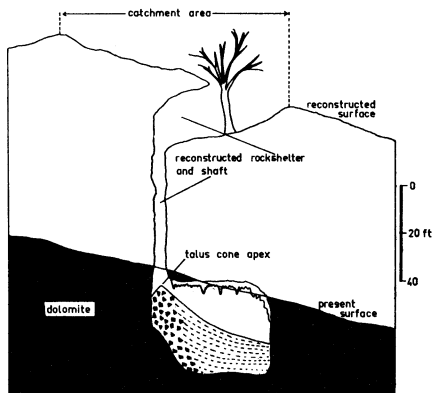


A perfect fit: Reconstruction of how a leopard might have transported its prey.

Swartkrans is a time capsule. It is a special South African cave in which thousands of relics have been preserved for millions of years. The sheer abundance of fossil relics (more than 14,000 to date) makes Swartkrans one of the most important hominid sites in the world. The ongoing paleontological interpretation of the fossils makes Swartkrans one of the most interesting. After years of work, a story is emerging of how populations of primates lived first as prey and then as predator. The latter, *Homo erectus*, were on the direct evolutionary line that led to modern humans.

The story of how the Swartkrans time capsule was discovered and opened begins in 1925 with Raymond Dart's watershed find of a primate skull he named *Australopithecus*. Dart claimed that the skull, which came from a limestone quarry in the village of Taung, South Africa, represented a sort of evolutionary "missing link" between the great apes and humans. Dart's claim was met with skepticism, but it stimulated the search for hominid fossils in South Africa. Subsequent finds, during the next 25 years, vindicated Dart's position, and some of the most spectacular discoveries were made in the Sterkfontein valley outside of Johannesburg.

The Swartkrans site is in this valley. It was first investigated in 1948 by Robert



Swartkrans cave as it may have existed.

Broom and J.T. Robinson. Their excavation resulted in the recovery of about 3,000 fossils, including bones of a variety of animals, numerous specimens of *Paranthropus* (a heavy or robust species of *Australopithecus*) and remains of a second hominid that has since been classified as *Homo erectus*.

The paleontological work of 1949 uncovered a large seam of pure travertine, and lime miners took over the site for commercial purposes. After one more archaeological expedition in 1952, the site was abandoned until 1965 when C.K. Brain, director of the Transvaal Museum in Pretoria, South Africa, began work

Ongoing interpretation of a South African fossil site tells a story of how hominids died and lived more than one million years ago

there. Swartkrans has now produced remains of more australopithecine individuals (currently 88) than any other single site in the world. This remarkable richness, Brain told a recent symposium in Washington sponsored by the L.S.B. Leakey Foundation, requires a special explanation.

After the chaos of the lime miners had been cleared away, the new exposures showed that the original entrance to the cave was probably a precipitous shaft about five feet in cross section. Soil, rock and other debris are funneled down a shaft like this during rain storms and build up a talus or debris cone in the cave below. This may explain how Swartkrans was able to serve as a sort of time capsule for more than one million years.

Another factor adding to and helping explain the richness of the Swartkrans deposit is the probability that a large, protected rockshelter may have existed on the surface, perhaps 50 feet above the present site. Erosion has long since removed the overlying hillside with its shaft and rockshelter, but the original form, says Brain, can be reconstructed on the basis of the known geological conformation of the immediate area.

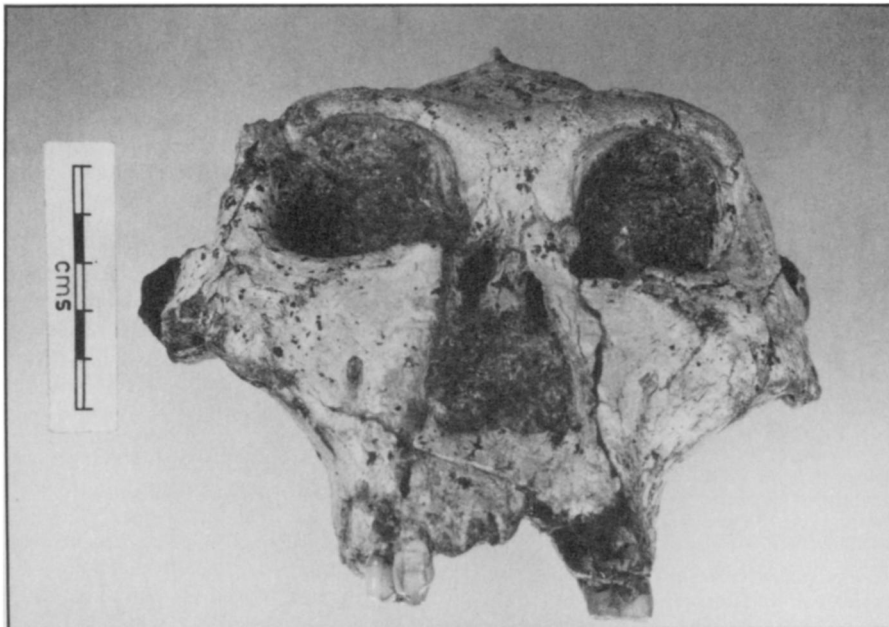
If this interpretation of the cave form is correct, Brain says, it is important to realize that the cavern containing the fossils would have been inaccessible to most animals except bats and owls. The deposit would, therefore, reflect events in the catchment area on the surface during the accumulation period. Anything left on the surface by animals or humans could eventually have found its way down the shaft. About 10 bones per year would account for the thickness of the deposit.

It is the interpretation of these bones, their type, number and condition, that tell the story of what went on above. The main interest lies in the large number of australopithecine remains. How did they come to be in the cave? Brain concludes that the hominids were eaten in the area of the rockshelter by some predator or scavenger.

The skeletal remains are extremely fragmentary. Of the 88 individuals from Swartkrans, it is not even possible to assemble a single complete skeleton. What bones there are have been extensi-



Workers remove the debris and rubble which miners dumped into the excavation.



Swartkrans Paranthropus may have succumbed to the pressures imposed by predation.

vely damaged and, in some cases, show clear marks of carnivore teeth. "Taken in conjunction with the other Swartkrans animals," says Brain, "there can be no doubt I think that the australopithecines

were consumed by some carnivore."

On the basis of the known Swartkrans fauna, the carnivores in question would most likely have been saber-toothed cats, hyenas or leopards. The probable story,

says Brain, is that leopards were the major predators around Swartkrans, with spotted hyenas acting as scavengers. Both are well represented in the Swartkrans fossils.

Where leopards share a hunting area with spotted hyenas, they are forced to feed in places inaccessible to the scavengers. Brain studied leopard kills in Kruger National Park, and in 12 of 15 cases the cats took their prey into trees. In the other three cases, when the prey was left on the ground, the hyenas were able to snatch it away from the leopards. Brain also noted that leopards would typically return to the carcass in the tree during a period of three to four days. After that time, the head and lower leg segments would invariably be left, usually hanging on strips of skin. The rest of the skeleton generally disappeared. This eating behavior helps explain the disproportionate number of hominid skulls (as opposed to post-cranial bones) found in Swartkrans.

Studies of the antelope remains (which account for more than 40 percent of the animal fossils) from the Swartkrans deposit suggest that during the time the cave was being filled, open grassland conditions prevailed as they do today. Leopards hunting in such an area have to make use of cliffs, caves and the few available trees for protection of their prey. Interestingly, there is a significant correlation between the occurrence of large trees and caves in the Transvaal highveld or grassland. Caves are typically of the shaft or sinkhole variety, with depressions surrounding their entrances. Such depressions often support and shelter large stinkwood trees, which flourish in sheltered areas. Knowledge of these conditions and of leopard and hyena behavior strongly suggest that Swartkrans cave and its associated trees were often used by leopards as a feeding place and a lair. The bones below are a good indication of the leopards' menu.

Another piece of evidence for Brain's theory is a hominid skull that may actually have been leopard prey. The skull, probably a *Paranthropus* child, was found at Swartkrans in 1949. At the rear of the skull are two intriguing holes, one in each parietal bone (the large bones that form the top and sides of the skull). Brain has described these holes: Each is slightly elongated in a lateral direction and is approximately 6 millimeters in its shortest diameter. It is clear that the holes were made by two pointed objects, whose tips diverged slightly. On the internal surface of the parietals, flakes of bone have been lifted in a characteristic manner, suggesting that the bone was fresh and pliable when the injury was inflicted. If the two

Photos: Transvaal Museum

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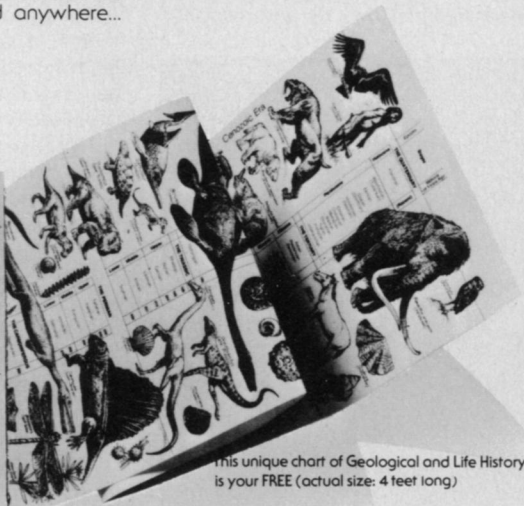
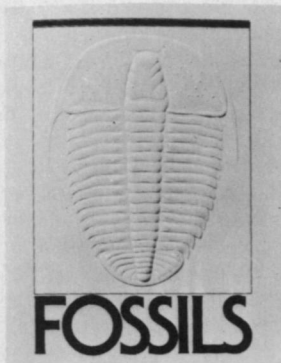
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holes were made simultaneously, the objects responsible must have been approximately 33 millimeters apart.

A survey of the spacing of canine teeth of South African carnivores shows that the teeth of lions, hyenas and the extinct saber-toothed cats are more than 33 millimeters apart. While saber-tooths and other animals probably preyed on hominids, the evidence from the skull with the holes in it points again to leopards. The 33-millimeter figure is well within the spacing range of leopard canine teeth.

A leopard typically kills its prey with a firm grip across the throat but, when dragging a dead animal to a protected feeding place, will often grip the head in its jaws. This may have been the case with the Swartkrans child. Under the weight of the child's body, the leopard's lower canines may have penetrated the rather thin parietal bones while the upper canines were firmly embedded in the face. "This evidence," says Brain, "suggests further that these cats posed a continuous threat to the security of early hominid populations and may have contributed to the decline of the robust australopithecines and to their final extinction."

But Swartkrans is more than a receptacle for leopard leftovers. With more and more evidence, the story continues to the point where the hominids moved off the endangered species list and became hunter instead of hunted. E.S. Vrba of the Transvaal Museum has helped piece together this part of the story with her study of the size and type of antelope fossils found at Swartkrans. The size of the prey indicates the size of the predator. Antelope fossils from the oldest part of Swartkrans suggest, as Brain says, that the rockshelter may have been used as a leopard lair. The later fossil assemblages, however, are dominated by species of low weight. The pattern, says Vrba, is again strongly suggestive of predation, this time by a predator specialized in small prey.

Was this later predator *Homo*? Two *Homo* skulls as well as more than 50 stone tools from the cave indicate that the rockshelter may have been used by hunting (or at least scavaging) hominids. Vrba reported her findings last March in *NATURE* (254:301). She concluded that the only available evidence "indicates (at least predominant) hominid occupation of caves in the same places that were previously dominated by carnivores."

With his own, Vrba's and a variety of other evidence from the Swartkrans time capsule, Brain concludes that "the robust australopithecines gradually succumbed to the pressures imposed by predation and, possibly, by competition with more advanced hominids. The lineage appears to have become extinct sometime during the Middle Pleistocene. In contrast the *Homo* lineage, through intelligence and ingenuity, outgrew the threat to its security and gradually succeeded in beating the African cats at their own game." □