

**François and Paul Ellenberger** - *The dinosaur locality of Maphutseng (Basutoland, southern Africa)*

The sedimentary (Molteno, Red Beds, Cave Sandstone) and volcanic beds of the Stormberg Series terminate the substantial continental southern African Karoo Series, the paleontological interest in which is well known. Their flora (Molteno flora) and reptilian fauna (relatively poor compared to the underlying Beaufort Series) reveal an important turnover. The most pronounced occurrence is the appearance of dinosaurs, which diversified abruptly at the end of the Molteno. There are diverse saurischian genera known mostly from bone remains, generally fragmentary, discovered here and there in the southern African Stormberg. Most authors are in agreement in attributing this series to the Middle or Upper Triassic, perhaps to the Rhaetian in the case of the "Cave Sandstone."

These dinosaurs in particular are understood because of the review of S. H. Haughton in 1924. This author showed that fossils recovered in the "Red Beds" are distributed roughly in two horizons, near the top (poorly defined) of the formation and at its base, respectively. The bones of the latter bed (which seems to include the top of the Molteno) are those of large, massive animals, incompletely known and distributed among several genera of prosauropods (*Plateosaurus*, *Melanorosaurus*, *Euskelosaurus*, etc.). Higher up, more slender and gracile forms predominate: carnosaurs proper (ex. *Gryponyx*) and thecodontosaurids. S. H. Haughton, after a very detailed analysis of the sedimentary environment, related this agility to an increasingly arid climate.

Our search of Basutoland, pursued with the help of C.N.R.S., has thus far confirmed these data. The most interesting discovery is that of a rich Maphutseng locality (Mohale's Hook district), made in August 1955 under the direction of M. S. Motsoane. A bone-bearing lens is situated at the base of the "Red Beds," in beds that still, in fact, have a typical Molteno facies: sandy clay and soft sandstone (molasse-type) in small banks, gray when freshly broken but turning rapidly to pale yellowish-green in air. The clays, eroding quickly after a rain, contain abundant carbonaceous debris of rarely identifiable plants (*Dicroidium* sp.). Then, laterally, these beds appear to pick up the red facies typical of "Red Beds": the locality represents a lake where the diminished hydroclimatic conditions that prevailed in the Molteno would have been maintained later elsewhere.

Situated at the foot of a hill, the fossiliferous lens had once exceeded 1 hectare in area. But erosion has partly denuded it, with near total destruction of the exposed bones.

Nevertheless the parts remaining intact were situated on a weak prominence, in ideal conditions for systematic exploitation (the spot is accessible to all-terrain vehicles). Our search began in August 1955 with the collection of some surface bones, which were interesting but broken into multiple fragments: vertebrae, a large ilium (55 cm), etc. Then small exploratory searches were started, revealing an excellent, extraordinarily massive femur (among others), 90 cm in length. Our luck then produced (Sept., 1955) a large pile of bones lying nearly intact from erosion, instead called "Thotobolo ea 'Ma-beata," a few meters from native huts.

The bones of this pile (femora, tibiae, various long bones, ribs, phalanges, claws, vertebrae, etc.) were found totally disarticulated, in groups or spread out, within a bed 20 to 30 cm thick, with soft sandstones to the west and clay to the east. Some of these bones were fossilized already broken, notably the vertebrae, rarely intact. The top of the fossiliferous bed is hard, impregnated with black manganese oxides that also infuse the bones, though very slightly deformed in spite of their porosity. Nevertheless certain bones were \* from bed to bed by hardening, a sort of hard-ground lake.

The importance of the locality exceeded our moderate materials, and Mr. A. W. Crompton, head of the Department of Paleontology at the National Museum of Bloemfontein, offered to give us his particularly efficient technical assistance. The collection of the bones, which posed many delicate problems, was henceforth efficiently equipped. Thanks to this collaboration, and also to the understanding of the British authorities and natives of Basutoland, two fruitful seasons of searching could be well directed. The first, in November 1955, allowed the extraction of 300 pieces of bone by the method of using plastered cloth bands to form a carapace. The second, in February 1956, brought this number to 700 (this must represent more than 450 distinct, complete bones), without exhausting the fossiliferous pile, visible to this day over an area of 35 m<sup>2</sup>. Thus this is a locality of a richness unknown in the south African Stormberg. This is additionally the first detailed scientific search in Basutoland.

The bones recovered represent nearly all parts of the skeleton except the skull, and come from 7 to 8 individuals of variable size but, it seems, a single species (we already have at our disposal 9 femora, 3 humeri, 3 coracoids, 22 claws, about forty thoracic ribs, etc.). The preparation of all this material and the reconstruction of the skeleton evidently will be long-term. Nevertheless, from now on, we can propose that which follows.

It appears to be of a new form of prosauropod, near *Melanorosaurus* or *Plateosauravus*, but doubtless still more massive. According to the recovered bones, the hypothesis of a quadrupedal saurischian seems to assert itself from the start: the

moderate length of the humerus may exceed  $3/4$  that of the femur. A habitually quadrupedal form, if ultimately the restoration of the skeleton confirms this, poses many interesting problems. It may perhaps extend to related genera, though the type of locomotion hardly seems to have been discussed. This probable quadrupedalism is however on a par with a number of primitive characters (massive amphicoelous vertebrae, etc.).

**CONCLUSIONS.** In currently supposing the existence of primitive quadrupedal saurischians in the beginning of the Stormberg (Middle Triassic?), phylogenetic questions are posed. The more or less complete disappearance of these massive forms and the success of bipedalism in the upper Stormberg (confirmed by the study of footprints) can be explained either by extinction or emigration, two possible responses of these large reptiles (probably herbivorous and amphibious) to the drying of the Gondwanan continent in this period.

In the first case, it would be an ephemeral branch, a first aborted attempt to reach the future sauropod condition. In the emigration hypothesis, one wonders whether the northern Jurassic sauropods were not derived directly from the Triassic quadrupedal prosauropod forms. If this was so, the bipedal stage generally admitted in the phylogeny of sauropods could be pushed back to a distant past (perhaps a thecodont stage) or totally suppressed in certain phyletic lineages. These hypotheses are perhaps a little premature. They emphasize at least the major interest in the archaic dinosaurs of the Stormberg, and the importance of the localities discovered in Basutoland, of which that of Maphutseng is the most typical.