A NEW CHRYSOCHLORID FROM MAKAPANSGAT

By G. DE GRAAFF

ABSTRACT

In this paper a new species of golden mole *Chrysotricha hamiltoni* sp. nov. from Limeworks, Makapansgat, is described. This is the first occurrence of a fossil golden mole at this site; two fossil forms (*Proamblysomus antiquus* Broom and *Chlorotalpa spelea* Broom) have previously been recorded from Sterkfontein.

INTRODUCTION

During a visit to the fossil-yielding dumps at Limeworks in the Makapansgat valley near Potgietersrus in the Central Transvaal in April 1957, Mr. J. W. Kitching of the Bernard Price Institute for Palaeontological Research discovered a small skull embedded in a piece of yellowish grey breccia. The exposed portion was the dorsal part of a cranium from which the parietals had been flaked off leaving a well preserved endocranial cast in position within the remainder of the skull.

On development the specimen proved to be the virtually complete skull of a new species of golden mole. Hitherto only two genera have been found as fossils in the dolomite caves of the Transvaal. These were both discovered in the Sterkfontein valley near Krugersdorp. These two fossil types, *Proamblysomus antiquus* Broom, from the locality known as Bolts Farm, and *Chlorotalpa spelea* Broom from the *Plesianthropus* cave at the Sterkfontein site were identified and described by Broom (1941). A third golden mole fossil skull has been found at Kromdraai: it possibly belongs to the species *Proamblysomus antiquus* but its identity is uncertain owing to the damaged condition of the palate and the teeth. (Broom 1948).

The specimen to be described here ranks in size with *Proamblysomus antiquus* but diverges in its morphology. It is the first fossil golden mole to be recorded from Makapansgat and in consequence of that fact it is proposed to name it after the original owner of the farm, who first permitted the Historical Monuments Commission to declare the Cave of Hearths site a national monument and thus inadvertently set in train the series of discoveries made upon this farm since 1936.

The exact horizon from which the specimen originally hailed cannot be determined accurately because the breccia was found amongst the sorted material from the dumps. Judging from its appearance the breccia was probably from the top *Australopithecus*-bearing layer near the dolomitic roof.

No other skeletal remains were closely associated with the specimen so that it had not formed part of an owl pellet. These fossilized owl pellets display a characteristic conglomeration of small partially digested bones, jaws and teeth chiefly of rodents. It may therefore be looked upon as an article of australopithecine

diet concerning which the late Dr. Robert Broom (1946) said: "To have obtained the giant rodent moles (*Gypsorhychus*) he (*Australopithecus*) must have been able to dig with either sticks or stones: and it is unlikely that he could have captured a spring hare (*Pedetes*) except by digging." Alternatively, one may say in the case of the capture of the golden mole that this specimen could have been dug up by *Australopithecus* with either horns or bones.

Preparation

Despite its fragility and small size the specimen was developed manually with a small hammer and chisel. After the main bulk of breccia had been removed the specimen was subjected to the acetic acid technique.

The individual bones in the skull cannot be demarcated with certainty. This is partially due to the fact that it appears to be an adult specimen in which the cranial bones are anchylosed and during the processing the skull acquired a number of layers of glyptal cement to protect the specimen against the corrosive action of the acid. When removing the excess cement with a suitable thinner the glyptal was dissolved but tended simultaneously to remove the thin and fragile bones. As the glyptal holds together the fragile material it was decided rather to preserve the specimen with the protective layers of glyptal surrounding the bones than to risk further damage.

Chrysotricha hamiltoni sp. nov.

The original owner of the Makapansgat farm was the late Mr. J. M. Hamilton and the estate on which the remarkable palaeontological discoveries were made that have made this site known internationally is today the property of his daughter Mrs. M. J. Bonamour of Durban. As amongst the various numerous fossils from this site none have hitherto commemorated the ancestral owner's name it has been decided to name this particular specimen *Chrysotricha hamiltoni* sp. nov. It is housed in the fossil mammal collection of the Bernard Price Institute, Catalogue Number MF. 1.

The skull is virtually complete except for some slight damage to the anterior part of the snout and the region inside the orbit. The principal dimensions upon which the identification is based are given in table I.

A brief description of the dorsal, ventral, occipital and lateral aspects of the skull will indicate the amount of damage suffered by it during the process of fossilization.

a. *Norma dorsalis*. The anterior portions of the nasals and premaxillaries with their characteristic projections for the attachment of nose pads in the living animal are not present. The posterior parts of the nasals are complete and the junction of the nasals with the frontals is clear in the form of a small but distinctly raised ridge. The nasal-maxilla suture is not clear. The right frontal is undamaged while the left frontal has been flaked off latero-posteriorly. The large parietals have, as stated, been flaked off entirely, exposing the well preserved endocranial cast.

The delicate zygoma have nevertheless survived the rigours of fossilization and it has been possible to keep the arches intact while removing the breccia surrounding them. The posterior zygoma forms a slightly broader plate at the point of fusion with the undamaged squamosal elements. There is no trace of a jugal bone in the arch and the arches are formed by a backward process of the maxilla.

b. *Norma ventralis*. The maxillaries are well preserved. The premaxillaries are intact on the palatal aspect, containing the large incisor sockets of the first large incisors. The anterior palatine foramina are visible as two small breccia-filled cavities. The maxillaries furthermore form the greater part of the palate. The posterior portion of the right maxilla has been damaged slightly but that of the left side has been preserved. The intact sockets thus afford information about the number of teeth. There were nine in each tooth row.

5 6

Figures 5 and 6—Dorsal and ventral views of the skull of *Chrysotricha hamiltoni* sp. nov.

The boundary between the palatines and the maxillaries is not distinct. The palatine bones are preserved, being strengthened above by the breccia filling the internal choanae. Consequently the vomer cannot be seen clearly. The pterygoidal elements are present, though without their characteristic pterygoidal processes.

The base of the cranium (the basisphenoid and the basioccipital) is undamaged.

The area covered by these bones is relatively small. The tympanic bullae are well preserved and rather large, the right bulla being slightly damaged in the petrosal area.

The passage leading to the external auditory meatus is visible from the outside in the shape of a small raised ridge.

The norma dorsalis and norma ventralis are shown in figures 5 and 6 respectively.

c. *Norma occipitalis.* The dorsal part of the supra-occipital has flaked off with the parietals. On the lateral side of the supraoccipitals there is a rounded area of bone of moderate size which Broom regards as the tabular. (Broom 1916). This area is somewhat flaked on the right side. The occipital condyles are well formed and strong while the associated exoccipitals are undamaged. The foramen magnum is a well-defined aperture rather arched dorsally.

d. *Norma lateralis.* The condition of the zygomatic arches has already been described. The lachrymal is small and cannot be made out in this skull. The infraorbital foramen, damaged on the left side, is large, while the deep parts of the orbits are somewhat damaged and distorted so that the alisphenoid and orbitosphenoid bones and the associated foramina cannot be distinguished with certainty. The bullae do not extend farther down ventrally than the occipital condyles.

Discussion

Simpson (1945) has placed the Chrysochloroidea together with the Tenrecoidea as a fairly well defined group among the recent Insectivora. In addition, he remarks: " . . . Broom especially has shown that the Chrysochloroids are basically different from the other 'zalambdodonts'. (i.e. Tenrecoidea). He removed them from the Insectivora and made a new Order for them. This seems too radical, but the structural difference is so great that it cannot be affirmed that the Chrysochloroids are phyletically closer to the tenrecoids than to the other insectivores, although the two share the common anatomical feature of being zalambdodont, that is, having a single outer V on the upper molars instead of two."

Roberts (1951) has followed Broom's concept and has placed the golden moles of South Africa in a separate Order. This paper is not intended to discuss the intricate taxonomic position of these animals and the classification presented by Roberts in "The Mammals of South Africa" has been followed for this fossil specimen.

Roberts has subdivided the Chrysochloridae into nine genera. The specimen under review here does not belong to the genera *Chrysospalax* (Gill) and *Bematiscus* (Cope) because it has a far smaller type of skull and the zygomatic arches are not produced upwards posteriorly to form a broad plate covering the temporal region, meeting dorsally on the cranium to form a raised ridge.

The fossil cannot be placed in the genera *Cryptochloris* (Shortridge & Carter), *Chrysochloris* (Lacépède) and *Eremitalpa* (Roberts) because the former two possess

characteristic temporal bullae which are absent in the fossil while the latter has a skull very broad in relation to its length, the index being 85-90 (Roberts).

Of the remaining four genera, *Chrysotricha* (Broom) *Neamblysomus* (Roberts), *Chlorotalpa* (Roberts) and *Amblysomus* (Pomel) this specimen is most closely related to the genus *Chrysotricha* as is evidenced by the following characteristics:

1. The width to length index of the fossil skull is high: 75. The highest index found in the Chrysochlorid genera to which this specimen might possibly be referred is 69-73 (Roberts). This genus is *Chrysotricha*. The remaining genera all vary between 58 and 66 (Roberts).

   Seven *Chrysotricha* skulls were measured and the average breadth to length index value was found to be 71.33, while the variation in the seven specimens was between 69.7 — 72.9 with $\sigma = 0.38$. The fossil differs by $9.5 \times \sigma$ from the mean value of the seven examples. In comparisons of a series with a single specimen a difference of $9.5 \times \sigma$ may be regarded as being of specific value.

2. The number of upper teeth in the fossil has been taken as nine judging from the sockets on the left maxilla. Assuming that the number of teeth in the lower jaw is the same, the fossil had a dental complement of 36 teeth: a feature characteristic of the recent genus *Chrysotricha* but exhibited also by the genus *Amblysomus*.

3. The overall shape of the fossil skull resembles that of *Chrysotricha* the closest of all the living genera: both have a rather stout muzzle compared with the more slender and elongated muzzles of the other genera.

4. In shape, the dental arch of the fossil approximates that of *Chrysotricha* more nearly than that of all the other living genera.

5. The first upper premolar has been compared with the equivalent tooth in recent comparative material. It resembles that of *Chrysotricha* in shape although it is very much larger and more robust as is to be expected from teeth developed in such a relatively big skull.

The fossil golden moles found and described by Broom clearly belong to different genera. *Proamblysomus antiquus* and *Chlorotalpa spelea* are not as robust as the Makapansgat form, the muzzle of the Makapansgat example being shorter and heavier than the lighter and more slender muzzles of both Sterkfontein examples. The dental arch in *Chrysotricha hamiltoni* is also much more curved than the former two.

The Makapansgat specimen thus differs from all hitherto found fossil golden moles and it may represent a new genus. However, until more material of this animal is found, it is preferable to refer the fossil to a recent genus and of these *Chrysotricha* appears to be the most suitable. The establishment of a new species

Table

	Greatest length	Greatest width	Greatest height	Interorbital constriction.	Upper tooth row	Palate length	'Width across frontals'
*Chrysotricha o. obtusirostris	24.0	17.0	—	—	—	—	—
*C.o. limpopoensis							
Min.	23.2	15.7	10.7	7.0	9.2	8.5	—
Max.	24.2	16.8	11.3	8.7	10.0	9.2	
*C. chrysilla							
Min.	21.5	15.8	10.5	6.8	8.5	8.5	—
Max.	22.6	16.7	11.5	7.5	9.2	9.2	
**Proamblysomus antiquus	?29.0	20.2	—	—	—	—	8.4
**Chlorotalpa spelea	23.4	14.9	—	—	—	—	7.2
Chrysotricha hamiltoni	26.4	19.8	12.8	7.7	—	11.7	—

* Measurements after Roberts (1951).
**Measurements after Broom (1941).
All measurements in millimetres.
Method of measurements taken, as defined by Roberts (1951).

is based primarily on the substantially greater size of the fossil compared with the living members of this genus. (See Table)

The present distribution of the living species of *Chrysotricha* is important. According to Roberts (1951) the genus is confined to the eastern littoral from Zululand, north of Natal, to Inhambane, about 200 miles north-east of Lourenco Marques, in Portuguese East Africa. It is also interesting to note that the northern limit of this species is approximately on the same latitude as the Potgietersrus area i.e. 24° S. This littoral coastal area is rather moist and hot in contrast to the arid, semi-subtropical climate that the Makapansgat valley experiences today. Assuming that the Pleistocene fossil moles prospered under ecological conditions favourable to the recent members of their several genera, the occurrence of a fossil *Chrysotricha* in the Makapansgat valley would indicate a considerably more humid climate in the Central Transvaal during deposition of the grey breccia deposits than prevails today.

It has been noted in some animal groups (e.g. in some genera of the Bovidae) that in occasional instances the ancestral forms tend to approach the upper size limit of the existing species. If the diagnosis made is correct, then this fossil *Chrysotricha,* which has dimensions far beyond the upper means of any of the existing species, exhibits the same principle.

Acknowledgements

The author wishes to thank most cordially Mr. J. W. Kitching for handing over the specimen to him for description; Prof. R. A. Dart, Head of the Dept. of Anatomy, University of the Witwatersrand and Dr. A. S. Brink of the Bernard Price Institute for Palaeontological Research, Johannesburg, for their assistance in the preparation of this paper; Mr. J. Meester and Dr. J. T. Robinson of the Transvaal Museum, Pretoria, for the loan of recent comparative and fossil type specimens in their care; and finally, Mr. A. R. Hughes for taking the excellent photographs.

References

BROOM, R., 1916. On the Structure of the Skull in *Chrysochloris. Proc. zool. Soc.* London. 449.

BROOM, R., 1941. On Two Pleistocene Golden Moles. *Ann. Transv. Mus.*, xx, 215.

BROOM, R., 1948. Some South African Pliocene and Pleistocene Mammals. *Ann. Transv. Mus.*, xxi, 1.

BROOM, R. and SCHEPERS, G. W. H., 1946. The South African Fossil Ape-Men: The Australopithecinae. *Mem. Transv. Mus.*, ii, 272 pp.

ROBERTS, A., 1951. The Mammals of South Africa. Central News Agency, South Africa.

SIMPSON, G. G., 1945. The Principles of Classification and a Classification of Mammals. *Bull. Amer. Mus. nat. Hist.*, lxxxv.