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THE CONTRIBUTION OF ALUN R. HUGHES TO THE EARLY DEVELOPMENT OF CAVE TAPHONOMY: A TRIBUTE

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As a new direction in science crystallises into a recognised discipline, it is easy to overlook early seminal contributions, innovative and pioneering at their time, on which accepted conceptual structures were later built. More than 30 years ago, Alun Hughes made significant contributions of this kind to the field now known as cave taphonomy. The purpose of this brief tribute is to ensure that Hughes' part in the launching of the now fashionable field of taphonomy is not overlooked.

It was Raymond Dart's preoccupation with the bone rich grey breccia at Makapansgat Limeworks, and the dramatic conclusions he drew from the study of the contained fossil assemblage, that precipitated two decades of animated debate on the behaviour of australopithecines. From 1948 onwards, Dart produced a stream of highly provocative papers on the predatory nature of early hominids, claiming that australopithecines in southern Africa had not only been highly effective hunters but also murderous cannibals (Dart 1948, 1949a, b, 1953, 1956, 1957). He further argued that this instinctive behaviour was crucial to the understanding of aggressive tendencies in contemporary humans. As was clearly Dart's intention, these assertions provoked a spirited response from many people, including myself, and promoted the emergence of taphonomy as a discipline, based securely on observation and experimentation.

The acquisition of a fossil bone assemblage from the Makapansgat Limeworks breccia, running to over 7 000 specimens, was made possible by the systematic sorting of the Limeworks dumps by Hughes and his colleagues over a nine year period, starting in 1948. Fossiliferous blocks of breccia were then subjected to mechanical preparation in a major palaeontological operation supervised by Hughes. This project demonstrated Hughes' competence both in the field and the laboratory, – a dual ability abundantly confirmed in subsequent years.

The Makapansgat Limeworks collection represented the first complete fossil assemblage ever to have been extracted from an African early hominid site and the interpretation of the assemblage was a pioneering and unprecedented effort by Dart. Guidelines in fossil assemblage interpretation were few at that time and Dart came to the firm conclusion that most, if not all, of the very numerous fossil bones in the lower levels of the Limeworks cave had been collected there by hominids, who selected them for their potential usefulness as tools.

For more than a century it had been customary to attribute large bone accumulations in caves to spotted hyaenas (*Crocuta crocuta*), following an excavation conducted in 1921 by William Buckland (1823) at Kirkdale cave in Yorkshire which revealed vast numbers of hyaena remains, together with teeth of hippopotamus and other animals. He concluded that the cave had served as a hyaena lair during antediluvian times and that the layer of mud that covered the remains had been laid down in the cave by waters of the biblical deluge.

The concept of the bone-accumulating hyaena was vigorously challenged by Hughes (1954a, b) who solicited opinions from wildlife authorities and undertook a study of modern spotted hyaena lairs. He visited the farm Mala Mala, close to the Kruger National Park where he thoroughly investigated two lairs. One consisted of a series of nine antbear holes, the vicinity of which had been virtually cleared of vegetation by the trampling of hyaenas. Hughes excavated one of the tunnel systems and found that it covered a surface area of 13 m by 5 m, descending to a depth of almost 2 m. Although the tunnels had clearly been used as a hyaena breeding lair, they were empty except for a single tortoise carapace. Outside the entrance to the lair were four chewed bones and one set of hyaena droppings.

The second lair at Mala Mala consisted of a low shelter under an outcrop of granite. It too was empty, although a few broken bones, a tortoise shell and some droppings were found outside it.

In his search for additional evidence, Hughes (1958) also investigated four spotted hyaena lairs in the Kalahari Gemsbok National Park. These consisted of two hyaena resting places beneath calcrete outcrops along the Auob River, both of which were devoid of bones or droppings, and two similar breeding lairs. No bones were found inside either lair, although two chewed springbok horns lay outside the first and 18 bones and horns outside the second.

On the basis of his observations, Hughes was able to

conclude that, in normal circumstances, spotted hyaenas do not accumulate impressive collections of bones in their cave lairs, although it has been found subsequently that some items are occasionally brought back (Brain 1981). It now appears likely that the striking bone accumulations in British caves, such as Kirkdale and Tornewton, may have resulted from the fact that hyaenas were forced to take refuge in such places during severe winters and that many died and were eaten by their fellows on such occasions (Sutcliffe 1969).

The fossil assemblage that Hughes and his colleagues extracted from the Makapansgat Limeworks breccia contained the remains of many *Hyaena hyaena* individuals, living representatives of which still survive further north in Africa and Asia Minor as the striped hyaena. As early as 1961 Hughes recognised the need to study the habits of striped hyaenas and to establish whether these included bone-accumulating tendencies. With a grant from the Wilke Foundation he therefore visited East Africa in 1961 with the purpose of locating and examining the contents of striped hyaena lairs (Hughes 1961). The project was logistically difficult however and Hughes wrote: "if it is to be proved that striped hyaenas carry bones to and accumulate them in their lairs, then it is necessary for further investigations to be conducted into the habits of striped hyaenas". Following Hughes' advice, such studies have, in fact, been carried out, particularly in Israel (Skinner, Davis and Illani 1980).

It has been positively established that *Hyaena hyaena* is a highly significant collector of bones in its feeding and breeding lairs and that the Makapansgat Limeworks cave may very well have served as such a lair three million years or so ago.

The investigation made by Hughes of spotted hyaena lairs in the Kalahari Gemsbok National Park had an unexpected and highly significant by-product: it showed that porcupines are perhaps the most important of all bone-collecting agents in African caves. Unlike hyaenas, porcupines are not carnivores, but they have the habit of collecting dry bones and other objects in their lairs, and of gnawing them at their leisure. The habit appears to have a dual purpose: that of wearing back the constantly growing incisors and of providing a phosphate supplement to their diets.

In 1956 Hughes located two porcupine lairs in the calcrete banks of the Auob River, from which he recovered 90 and 57 bones respectively, noting that over 70% of each assemblage had been porcupine-gnawed. He also made a collection of 1420 bones and other objects from a porcupine lair in the calcrete bank of the Nossob River, in the south of the Kalahari Gemsbok National Park and kindly made this collection available to me for further study. I was able to return to the site 12 years after it had been cleared of bones by Hughes and recovered a further 380 objects (including an empty gin bottle with porcupine tooth marks on its screw-top!), establishing that the rate of bone collecting was about 32 bones per year at this particular locality. Other conclusions drawn from these Kalahari porcupine-collected assemblages suggested that the bones hoarded in the lairs mirror, in a crude way, the natural abundance of animal species in the area; that the porcupines select larger bones as favoured gnawing objects and that they have a very decided preference for dry and naturally defatted bones (Brain 1981). These and other well established conclusions about porcupine bone-collecting are now part of the source-literature on cave taphonomy and they owe their origin to the early insights of Alun Hughes.

For the last 25 years or so, Hughes has been preoccupied with the excavation of the Sterkfontein site under the general direction of Professor P.V. Tobias. This undertaking, carried out in the meticulous Hughes tradition, has provided a wealth of significant hominid and other fossils (e.g. Hughes and Tobias 1977), together with highly significant insights into the nature of the cavern itself and its contents. For me, one of the particular pleasures and privileges of my palaeontological sojourn at Swartkrans, over the same period and just across the valley from Sterkfontein, has been my regular weekly contacts with Alun Hughes, who I have come to respect and admire as the unfailing and unassuming gentleman of palaeo-anthropology.

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