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CHARLES KIMBERLIN (BOB) BRAIN – A TRIBUTE

This volume of *Palaeontologia africana* comprising mainly papers presented at the tenth biennial conference of the Palaeontological Society of Southern Africa is dedicated to a remarkable person, a committed scientist, passionate naturalist, a leader in science, and dedicated family man and friend, who is an inspiration to all who know him.

Charles Kimberlin Brain was born on 7 May 1931 in what was then Salisbury, Rhodesia. From his earliest years he had close contact with natural history as his father was an entomologist, and his mother qualified as a botanist. At the time of his birth his father (also Charles Kimberlin) was Secretary for Agriculture in Southern Rhodesia, and his earliest memories were of accompanying his father on botanical outings as he was compiling a book on the flora of Southern Rhodesia. His independence of thought was manifested at an early age when he announced to his parents that his name was not Charles Kimberlin, but Bob, and this name has stuck ever since.

In the course of the Second World War his father retired from his position in the Department of Agriculture, and worked for two years at the National Museum in Bulawayo where the young Bob came into contact with Geoffrey Bond (later Professor of Geology and Vice-Principal of the University of Zimbabwe) and Neville Jones (retired missionary and pioneer in the study of Rhodesian prehistory). Both had inquisitive dispositions and had a strong influence in instilling a sense of questioning in young Bob's mind.

At the end of the war the Brain family relocated to South Africa and settled in Pretoria where Bob spent the last three years of his schooling, matriculating at Pretoria Boy's High School at the age of 16 in 1947. During these three years he began his association with the Transvaal Museum as he went there to learn to mount birds. On matriculating, Bob proceeded to the University of Cape Town to read for a BSc degree with geology and zoology as major subjects. This subject choice was made despite contrary advice by university staff, as they perceived it to be a senseless combination with poor prospects for job opportunities. However this particular combination of subjects was later to bring about great research possibilities for Bob. After completion of this degree, Bob wished to continue with an MSc in marine biology but a shortage of finance necessitated him taking a job in 1951 as a geologist with the National Building Research Institute at the CSIR in Pretoria. However, by 1954 he was keen to return to natural history research and this was the beginning of his professional association with the Transvaal Museum.

Although a great deal of international interest had been generated by the discovery of australopithecine ape-men fossils by Dart and Broom, the geological context of these discoveries was very poorly understood in the early 1950s. At the suggestion of John Robinson, then working at the Transvaal Museum, Bob began to apply sediment analysis techniques which he had learnt at the CSIR to the Transvaal cave deposits. He subsequently came up with the suggestion that ancient soils might be used as indicators of past climates and also undertook an investigation of the stratigraphy of the sites. This was the beginning of Bob's long and successful association with the Swartkrans fossil hominid site which has brought both him and the site international acclaim and fame. As a result of this initial geological work, and on the recommendation of Kenneth Oakley of the British Museum (Natural History), a substantial grant was made to the Palaeontology Department at the Transvaal Museum by the Wenner-Gren Foundation for Anthropological Research in New York. This made it possible for Bob to be employed as a Research Associate in the Palaeontology Department from 1954-1957. In this time he undertook the first systematic investigation into the stratigraphy of the fossil hominid-bearing cave deposits, and established that each cave deposit was of a different age and reflected a different climatic regime. An important consequence of this research was his discovery, for the first time, of stone artefacts associated with *Australopithecus* both

Figure 1. Early days – out in the field, where he loves to be.

Figure 2. Partners in all they do – Bob and his wife, Laura

at Makapansgat and Sterkfontein. In 1957 he obtained a PhD from the University of Cape Town for a thesis entitled "*The Transvaal ape-man-bearing cave deposits*" which was later published as a monograph by the Transvaal Museum.

In 1955 Bob married Laura (Kraan), who was then working as a geologist at the CSIR. This was a union made in heaven which has brought them great happiness and fulfilment. Together they have travelled southern Africa and the world, whether it be on research and collecting expeditions, to attend conferences, or to address different gatherings. Everything they have done they have done together and Bob's manifold achievements are Laura's too. Together they have established a warm, welcoming and peaceful atmosphere in their home in Irene, south of Pretoria

In the same year, at the second Pan-African Congress on Prehistory, Bob first heard Raymond Dart present his ideas on the bloodthirsty carnivorous origins of man. These ideas emanated from his research at the hominid-bearing site at Makapansgat where he analysed several thousand fossil bone fragments, and was particularly interested in how all these bones had accumulated in the ancient cave. Later, in a series of papers, Dart postulated that the fossilised bones of animals found in association with remains of *Australopithecus* had actually been used as tools by them. These ideas stimulated in Bob a desire to understand the behaviour of early hominids, a quest which was later to occupy a great deal of his research time.

At the end of his contract period in the Palaeontology Department in 1957, Bob was appointed curator of Lower Vertebrates, the only position then available at the Transvaal Museum. This position was previously occupied by Dr Vivian FitzSimons, the noted South African herpetologist, who was currently director of the Museum. Bob worked closely with FitzSimons in completing a major book, *The Snakes of South Africa*, and published several papers on frogs, snakes and lizards. One of the highlights of this period of his research career was in demonstrating that behaviour patterns of certain reptile species could be used as taxonomic criteria in the same way as morphological features are used.

In the early 1960s new exciting museum developments were taking place in Rhodesia as three new museums were about to be built. Keen to return to his country of birth, in 1961 Bob accepted appointment as Keeper of Zoology at the newly erected Queen

Victoria Museum in Harare and at the same time was Deputy Director of the National Museums of Rhodesia. These positions he held until1964. During this time he speculated on the nature and behaviour of early man and undertook pioneering comparative behavioural research on vervet and samango monkeys. He was also responsible for the planning and installation of the zoological display at this museum which remains virtually unchanged to this day.

At the invitation of Vivian FitzSimons, Bob returned to the Transvaal Museum in 1965 to take up the post of Curator in the Department of Palaeontology after John Robinson had left to take up a position at the University of Wisconsin. Three years later Bob was appointed Director of this museum, a position he held for twenty-three years. Being back in Pretoria, he now at last had the opportunity to research the fossils of the early man caves of the Transvaal, as he was convinced that these would provide new insights into the behaviour of early hominids. Because the existing fossil collections from Sterkfontein and Kromdraai seemed adequate for this purpose, his first objective was to accumulate a large and representative collection of fossil bones from Swartkrans. This was achieved by first sorting for seven years through the dumps of the lime miners, and later by extensive excavations and investigations. Wednesdays were set aside for fieldwork at Swartkrans, and for 21 years Bob assiduously kept this weekly appointment so that he could work with his technicians. In the process Bob discovered several hundred early hominid fossils, making him singly one of the greatest discoverers of early man in Africa. This broadly focussed model taphonomic study continued for twenty-eight years resulting in numerous publications and culminating in the publication of two milestone books, namely *The Hunters or the Hunted? An Introduction to African Cave Taphonomy* and *Swartkrans: a Cave's Chronicle of Early Man.*

With characteristic diligence and a multifaceted approach to solving scientific problems, Bob in addition collected and studied discarded bony food remains scattered around "Hottentot" (Nama) settlements along the banks of the Kuiseb River in Namibia in order to understand the effects of human behaviour on bone accumulations. This necessitated gathering every bone fragment lying around 15 villages. Because the skeletal representation from these accumulations was comparable to the fossil samples, Bob was able to deduce that only those skeletal parts which were robust enough to survive the feeding activities of humans and carnivores were the ones with the greatest chance of becoming fossilised. In addition, he studied the feeding behaviour of various carnivores, especially cheetahs which he kept in captivity, in order to establish the different ways in which fossil bone-accumulations occurred in cave deposits. Bob demonstrated that primate skeletons were more vulnerable to damage from chewing than those of antelope of equivalent body weight in that the postcranial skeletons of baboons tended to disappear while the heads survived, whereas most components of the antelope skeletons survived. This work showed that the disproportional representation of skeletal parts in bone assemblages that had originally been recognised by Dart at Makapansgat, and had been attributed by him to human activity, possibly had other explanations. This research led directly to the new discipline of cave taphonomy, a study which allows reconstruction of early hominid and other animal behaviour, and in which Bob established himself as an international leader.

Meticulous analysis by Bob of thousands of fossil remains as well as stone and bone artifacts from Sterkfontein, often with numerous international collaborators, produced the most detailed information available on the fauna of this part of Africa. Of particular significance were his findings relating to the cultural status of hominids at this time, 1.8 to 1 million years ago, as well as information on the importance of predation in early hominid life. He came to the conclusion that the australopithecine remains in the caves of the Sterkfontein valley had been taken to the caves by carnivores and eaten there, the fossils representing discarded food remains. One of the most dramatic findings during the later years of the Swartkrans excavation was the discovery of burnt bone through a vertical profile of six metres. After a great amount of careful histological and experimental work by Bob, with chemical confirmation by Andrew Sillen, these burnt bones were shown to provide the earliest evidence for the controlled use of fire by hominids, dating to about one million years ago, and suggested that fires were repeatedly made on the floor of the cave over a period of some thousands of years. An additional highlight was the discovery of bones with characteristic scratch marks and smooth tapering points that Bob considered had been used as digging tools, a conclusion confirmed by his son Conrad, who conducted digging experiments using modern bone flakes.

From this thorough work at the Swartkrans site Bob was also able to identify cycles of deposition within the Quaternary period. He linked habitat changes to global variability in temperature and correlated these, for the first time, with hominid evolutionary events in Africa. For the results of this multi-faceted research Bob was awarded a DSc by the University of the Witwatersrand in 1981.

Bob Brain, together with Bernard Carp, Vivian FitzSimons and Charles Koch was one of the founders and initiators of the Namib Desert Research Station in 1959 when they organised an expedition to the Gobabeb area to select a site for the station. As director of the Transvaal Museum, Bob was later responsible for guiding Gobabeb to becoming a research station of international repute for the work on desert ecology undertaken by its staff and collaborators. Several times a year he visited Gobabeb where he camped in the same spot under the acacia trees and always made a wood fire to give a homely atmosphere to his camp. Bob himself undertook research and wrote papers on various aspects of natural history of the Namib. These ranged from

Figure 3. The consummate communicator – Bob explains what happened at Swartkrans

taxonomic work on micro-organisms, the use of protozoans as palaeoecological indicators, through observations on the temperature balance of lizards, the description of new gecko species, speculations on the origin of sidewinding locomotion in adders, to taphonomic studies on "Hottentot" food remains.

During his term as Director, Bob established the Transvaal Museum as a happy and highly productive institution with an international reputation for its research endeavours. This he achieved by allowing his staff considerable personal freedom, provided that productivity was maintained. He strove to maintain the Transvaal Museum as a place of quiet scholarship staffed by committed people who derived real pleasure from working at the museum.

Apart from leading from the front with his own busy research schedule, Bob was in addition a dedicated museum educationalist. During his directorship the education department of the Museum was greatly expanded under the stimulating guidance of O.P.M. ("Proz") Prozesky. Bob also planned and co-ordinated the completion of three new display halls: The Austin Roberts Bird Hall, Life's Genesis I and Life's Genesis II. For the latter two exhibits he successfully experimented with a 'narrative concept' where visitors were treated to a series of displays depicting the development of life from its simplest beginnings to its present complexity. The advantage of this display technique is to provide the visitor with a unified experience rather than a set of disjointed displays.

In addition to all his other activities Bob has given long, loyal and distinguished service to the museum profession, has served on the Council of the Southern African Museums Association for many years and has been its President for two terms. In addition he has served on the councils of many professional societies and been president of the Southern African Archaeological Society, Zoological Society of Southern Africa, South African Biological Society, South African Society for Quaternary Research, Southern African Association for the Advancement of Science (President of section D - Zoology), and was the first President of the Palaeontological Society of Southern Africa. He has also inspired others to undertake research and has acted as supervisor to at least 18 masters and doctoral students.

When he retired as Director of the Transvaal Museum in 1991, Bob became Curator of Lower Invertebrates at the Museum and his research interest shifted to micro-invertebrates, where he gave particular attention to the fauna of saline and temporary water bodies in the arid western regions of South Africa. His attention was attracted to rotifers in particular, on which he undertook mainly taxonomic research. These simple multi-celled organisms led him to think about the origins of multicellularity and resulted in his pioneering search for ancestral multicellular micro-invertebrate fossils in limestones of the Neoproterozoic Nama Group. This has proved to be a very labour intensive project in which his wife Laura has played an important part, as she is responsible for cutting and grinding numerous rock samples and preparing hundreds of thin sections in the hopes that some prehistoric ancestral multicellular creature would be revealed. This research is now producing internationally significant results. Recognising the importance of predation to the evolution of animal sense organs and intelligence, Bob is currently investigating the roots of predation in these very early animal communities.

As is evidenced by the more than 150 scientific papers and several books he has published, Bob Brain has had and still pursues an extraordinarily diverse and productive research career. He is heralded as one of the foremost naturalists Africa has produced. Being a naturalist in the truest and best Darwinian tradition, all research projects undertaken by him have been well formulated, imaginative, innovative and have produced significant results with universal applicability. For his scientific pursuits he has received many awards including: One of the Four Outstanding Young South Africans (1966), Gold Medal of the Zoological Society (1978), Senior Captain Scott Memorial Medal of the South African Biological Society (1987), Achievement Award of the Claude Harris Leon Foundation (1992), John F W Herschel Medal of the Royal Society of South Africa (1991), and the South African Medal of the South African Association for the Advancement of Science for exceptional contributions to science (1997). He was categorised as an A-rated scientist of the Foundation for

Research Development (from its inception in 1984 till his formal retirement in 1997), and he holds honorary DSc degrees from the Universities of Cape Town, Natal, Pretoria, and Witwatersrand.

In all his research endeavours Bob always had the assistance of Laura and their delightful daughters, Rosemary (Mel) and Virginia (Ginny), and sons Tim and Conrad (Nad). While growing up each of them derived great enjoyment, personal involvement, fulfilment and commitment in the Brain family research endeavour. They have all played a role in the development of Bob's research visions and Bob once described his house as "children inter-stratified with rocks and fossils". The Brain home has always been one of love, laughter and enjoyment, and much banter amongst individuals of the family. The children lovingly tell the story that Bob had once collected a snake, and in order to preserve it before taking it to the museum, he had coiled it up in an opaque plastic bag and placed it in the freezer. You can imagine Laura's surprise, and the children's delight, when she removed the package from the freezer to prepare sausage for breakfast!

Bob has always stressed the importance of fun in research, and maintained that if this was in place then self-motivation, creativity and productivity would follow naturally. He warned against the dangers of obsession with performance and productivity to the detriment of creativity as he felt that scientists could become project driven to the point that they function badly as whole and integrated personalities.

This volume of palaeontological papers is dedicated by colleagues and friends in admiration of a truly great palaeontologist who has pursued science for the sake of enjoyment and fulfilment. This broad-minded and good-natured naturalist has many friends and the admiration of all his colleagues.

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REFERENCES CONSULTED

ARDREY, R. 1967. *The Territorial Imperative*. London, Collins Clear-Type Press, London, 416pp.

BRAIN, C.K., VAN RIET LOWE, C & DART, R.A. 1955. Kafuan stone implements in the post-australopithecine breccia at Makapansgat. *Nature* (London) **175,**16-20.

BRAIN, C.K. 1958. The Transvaal Ape-man-bearing Cave Deposits. *Transvaal Museum Memoir* **11,** 1-131.

BRAIN, C.K. 1959. Observations on the locomotion of the South West African adder, *Bitis peringueyi,* with speculations on the origin of sidewinding. *Annals of the Transvaal Museum*, **24,**19-24.

BRAIN, C.K. 1976. Life's Genesis: a display concept at the Transvaal Museum. *Southern African Museums Association Bulletin* **12,** 137-145.

BRAIN, C.K. 1976. The narrative concept in museum display. *Southern African Museums Association Bulletin* **13,** 90-95.

BRAIN, C.K. 1980. Criteria for the recognition of bone-collecting agencies in African caves. In: Behrensmeyer, A.K. & Hill, A.P., Eds. *Fossils in the Making*, 107-130. Chicago & London, University of Chicago Press.

BRAIN, C.K. 1981. The evolution of man in Africa: was it a consequence of Cainozoic cooling? *Proceedings of the Geological Society of Southern Africa*, Annexure to Vol. **LXXXIV** 1-19. Alex. L. Du Toit Memorial Lecture 17.

BRAIN, C.K. 1981. *The Hunters of the Hunted? An Introduction to African Cave Taphonomy*, 356. Chicago & London, University of Chicago Press.

BRAIN, C.K. & SILLEN, A. 1988. Evidence from the Swartkrans cave for the earliest use of fire. *Nature* (London) **336,** 464-466.

BRAIN, C.K. 1991. The Transvaal Museum 1968-1991: A place of Quiet Scholarship. *Supplement to Transvaal Museum Bulletin* **22,** 1-8.

BRAIN, C.K., Ed. 1993. *Swartkrans, a Cave's Chronicle of Early Man, Transvaal Museum Monograph* **8,** 23-33.

BRAIN, C.K. 1995. The importance of predation to the course of human and other animal evolution. *South African Archaeological Society Bulletin* **50,** 93-97.

DIPPENAAR, N.G., Ed. 1992. *Staatsmuseum 100*. Pretoria, National Cultural History Museum, Museum of the Geological Survey & Transvaal Museum, 1-126.

HELME, N., Ed.1982. *Irene personalities*. Pretoria, Gutenberg Book Printers. 130pp.

MACRAE, C. 1999. *Life Etched in Stone, Fossils of South Africa*. Johannesburg, Geological Society of South Africa, 305pp.

SEELY, M.K., Ed. 1990. Namib Ecology: 25 years of Namib Research. *Transvaal Museum Monograph* **7,** 5-12.

APPENDIX 1: PUBLICATIONS OF C.K. BRAIN

1. BRAIN, C.K. & ROBINSON, J.T. 1953. A geological note on the australopithecine-bearing deposit at Swartkrans. *Cong. Geol. Internat. Sec V, Alger, 1952.*
2. BRAIN, C.K. 1955. New evidence for the correlation of the Transvaal ape-man-bearing cave deposits. *Proc. 3rd Pan African Congress on Pre-history.* Article 20.
3. Brain, C.K. & MASON, R.J. 1995. Later African Chelles-Acheul site at Nakop, southern Kalahari. *South African Archaeological Bulletin* **10**(3), 22-25.
4. BRAIN, C.K., VAN RIET LOWE, C & DART, R.A. 1955. Kafuan stone implements in the post-australopithecine breccia at Makapansgat. *Nature* (London) **175,** 16-20.
5. BRAIN, C.K. 1958. Some aspects of the ape-man period in the Transvaal. *South African Museums Association Bulletin* **6,** 171-176.
6. BRAIN, C.K. 1958. The Transvaal Ape-man-bearing Cave Deposits. *Transvaal Museum Memoir* **11,** 1-131.
7. BRAIN, C.K. 1958. Web-footed geckos of the Namib (*Palmatogecko rangei). African Wildlife* **12,** 67-70.
8. BRAIN, C.K. & FITZSIMONS, V.F.M. 1958. Serpentes, Colubridae: *Calamelaps ventrimaculatus websteri* nov. subsp. *Occasional Papers of the National Museums of Rhodesia,* 22B.
9. BRAIN, C.K. 1958. A short account of the reptiles of the Kalahari Gemsbok National Park. *Koedoe,* 1(1) 99-104.
10. BRAIN, C.K. 1958. Mounting reptiles in wax. *Southern African Biological Society Bulletin* **2,** 67-68.
11. BRAIN, C.K. 1959. The hood the mamba. *African Wilf Life*, **13**(1), 60-62.
12. BRAIN, C.K. 1959. A breeding note on the South African skink, *Typhlosaurus lineatus* Boul. *Copeia* **1,** 71-72.
13. BRAIN, C.K. 1959. Mating in the South African Molesnake, *Pseudapsis cana* (Linn.). *Copeia* **1,** 70-71.
14. BRAIN, C.K. 1959. Sidewinding snakes of South West Africa. *Der Kreis*, 6.
15. BRAIN, C.K. 1959. Sidewinding locomotion of the South African adder, *Bitis peringueyi. South African Museums Association Bulletin* **7**(3), 58-61.
16. BRAIN, C.K. 1959. On collecting lizards by means of a rubber band. *Transvaal Museum Bulletin* **3,** 8.
17. BRAIN, C.K. 1959. The Cunene Gorge. *The Transvaal Museum Bulletin* **3,** 3-4.
18. BRAIN, C.K. 1959. Observations on the locomotion of the South West African adder, *Bitis peringueyi,* with speculations on the origin of sidewinding. *Annals of the Transvaal Museum* **24**(1), 19-24.
19. BRAIN, C.K. 1960. Studies on chameleon feeding behaviour. *Transvaal Museum Bulletin* **5,** 7-8.
20. BRAIN, C.K. 1960. The reptiles and amphibians of the Loskop Nature Reserve. *Fauna and Flora* **11,** 46-62.
21. BRAIN, C.K. 1969. South African lizards and snakes. *Archimedes* **11** (1), 1-9.
22. BRAIN, C.K. 1961. *Chamaeleo dilepis*, a study of its biology and behaviour. *H.A.R. Journal* **15,** 15-19.
23. BRAIN, C.K. 1961. On the museum display of live South African lizards. *Southern African Museums Association Bulletin* **7,** 158-188.
24. BRAIN, C.K. 1962. A review of the gecko genus *Ptenopus*, with the description of a new species. *Cimbebasia* **1,** 1-18.
25. BRAIN, C.K.1962. Observations on the temperature tolerance of lizards in the central Namib desert. *Cimbebasia* **1,** 1-18.
26. BRAIN, C.K. 1962. Observations on the birth of young *Chamaeleo jacksoni. H.A.R. Journal* **17,** 11-13.
27. BRAIN, C.K. & PROZESKY, O.P.M. 1962. On the body temperature of birds collected on the Carp-Transvaal Museum Namib Desert Expedition. *Cimbebasia* **5,** 1-8.
28. BRAIN, C.K. 1962. The zoological significance of limestone cave deposits. *Zoological Society of Southern Africa Bulletin* **4,** 3-5.
29. BRAIN, C.K. 1962. A simple method for the preparation of frogs and other small animals for museum display. *Southern African Museums Association Bulletin* **7,** 351-353.
30. BRAIN, C.K. 1965. Comments on a visit to Makapansgat Limeworks, December, 1962. *South African Archaeological Bulletin* **20,** 110-111.
31. BRAIN, C.K. 1965. Chameleons. *Outlook*, 1**4,** 7-10.
32. BRAIN, C.K. 1965. Observations on the behaviour of Vervet Monkeys, *Cercopithecus aethiops. Zoologica Africana* **1,** 13-27.
33. BRAIN, C.K. 1965. Adaptations to forest and savannah: some aspects of the social behaviour of *Cercopithecus* monkeys in southern Africa. *Proceedings of the Wenner-Gren Symposium on Primate Social Behaviour, Austria* **1965,** 1-31.
34. BRAIN, C.K. 1966. Trends in zoological research at southern African museums. *Southern African Museums Association Bulletin* **8,** 349-356.
35. BRAIN, C.K. 1967. Hottentot food remains and their bearing on the interpretation of fossil bone assemblages. *Scientific Papers of the Namib Desert Research Station* **32,** 1-11.
36. BRAIN, C.K. 1967. Bone-weathering and the problem of bone pseudo-tools. *South African Journal of Science* **63,** 97-99.
37. BRAIN, C.K. 1967. New light on old bones. *Southern African Museums Association Bulletin* **9,** 22-27.
38. BRAIN, C.K. 1967. The Transvaal Museum's fossil project at Swartkrans. *South African Journal of Science* **63,** 378-384.
39. BRAIN, C.K. 1967. Procedures and some results in the study of Quaternary cave-fillings. **In:** Bishop, W.W. & Clark, J.D. Eds, *Background to Evolution in Africa,* 285-301. University of Chicago Press.
40. BRAIN, C.K. & COOKE, C.K. 1967. A preliminary account of the Redcliff Stone Age cave site in Rhodesia. *South African ArchaeologicalBulletin*, **21,** 171-182.
41. BRAIN, C.K. & JENKINS, T. 1967. The peoples of the lower Kuiseb valley, South West Africa. *Scientific Papers of the Namib Desert Research Station* **35,** 1-24.
42. BRAIN, C.K. 1968. Who killed the Swartkrans ape-men? *South African Museums Association Bulletin* **9,** 127-139.
43. GARTLAN, J.S. & BRAIN, C.K. 1968. Social and ecological variability in African monkeys, *Cercopithecus aethiops* and *mitis*. **In:** Jay, P, Ed., *Primates*, 253-292. Holt, Rinehart & Winston, New York and London.
44. BRAIN, C.K. 1968. The problem of educational labels in natural history displays. *Southern African Museums Bulletin.*
45. BRAIN, C.K. 1969. The contribution of Namib Desert Hottentots to the understanding of australopithecine bone accumulations. *Scientific Papers of the Namib Desert Research Station* **39,** 13-22.
46. BRAIN, C.K. 1969. Faunal remains from the Bushmen Rock Shelter, Eastern Transvaal. *South African Archaeological Bulletin* **24,** 52-55.
47. BRAIN, C.K. 1969. The probable role of leopards as predators of the Swartkrans australopithecines. *South African Archaeological Bulletin* **24,** 170-171.
48. BRAIN, C.K. 1969. New evidence for climatic change during Middle and Late Stone Age times in Rhodesia. *South African Archaeological Bulletin* **24,** 127-143.
49. BRAIN, C.K. 1969. Zoological aspects of the Quaternary conference. *South African Archaeological Bulletin* **24,** 208.
50. BRAIN, C.K. 1969. Field observations on lizards (Scincidae: *Mabuya*) in the Kalahari Gemsbok National Park. *Koedoe* **12,** 1-10.

51. BRAIN, C.K. 1970. New finds at the Swartkrans australopithecine site. *Nature* (London) **225,** 1112-1119.
52. BRAIN, C.K. CLARKE, R.J. & HOWELL, F.C. 1970. More evidence for an advanced hominid at Swartkrans. *Nature* (London) 225, 1219-1222.
53. BRAIN, C.K. 1970. Museums and our deteriorating environment. (Presidential Address). *Southern African Museums Association Bulletin* **9,** 365-375.
54. BRAIN, C.K. 1971. Museums and the human species. *Southern African Museums Association Bulletin* **9,** 527-536.
55. BRAIN, C.K. 1972. An attempt to reconstruct the behaviour of australopithecines: the evidence for interpersonal violence. *Zoologica Africana* **7,** 379-401.
56. BRAIN, C.K. & FREEDMAN, L. 1972. Fossil cercopithecoid remains from the Kromdraai australopithecine site. *Annals of the Transvaal Museum* **28,** 1-16.
57. BRAIN, C.K. & KEMP, A.C. 1972. The future of zoological research at Southern African natural history museums. *Southern African Museums Association Bulletin* **10,** 143-150.
58. BRAIN, C.K. 1973. The significance of Swartkrans. *Journal of the South African Biological Society* **13,** 7-23.
59. BRAIN, C.K. 1973. A simple machine for the breaking of cave breccia. *Transvaal Museum Bulletin* **14,** 16.
60. BRAIN, C.K. 1973. Seven years' hard labour at Swartkrans. *Transvaal Museum Bulletin* **14,** 5-6.
61. BRAIN, C.K. 1974. A hominid skull's revealing holes. *Natural History* (New York) **33,** 44-45.
62. BRAIN, C.K. 1974. Human food remains from the Iron Age at Zimbabwe. *South African Journal of Science,* **70,** 303-309.
63. BRAIN, C.K. 1974. The use of microfaunal remains as habitat indicators in the Namib. *South African Archaeological Society Goodwin Series* **2,** 55-60.
64. BRAIN, C.K. 1974. Some suggested procedures in the analysis of faunal remains from southern African Quaternary sites. *Annals of the Transvaal Museum* **29**(1), 1-8.
65. BRAIN, C.K., VRBA, E.S. & ROBINSON, J.T. 1974. A new hominid innominate bone from Swartkrans. *Annals of the Transvaal Museum* **28,** 55-63.
66. BRAIN, C.K. 1975. An introduction to the South African australopithecine bone accumulations. **In:** Clason, A.T. Ed. *Archaeozoological Studies.* Amsterdam, North Holland Publishing Co.
67. BRAIN, C.K., 1975. An interpretation of the bone assemblage from the Kromdraai australopithecine site, South Africa. **In:** Tuttle, R.H. Ed. *Paleoanthropology, Morphology and Paleoecology*, 225-243. The Hague, Mouton Publishers.
68. BRAIN, C.K. 1975. Mammal research at the Transvaal Museum, a historical survey. *Publications of the University of Pretoria*, New Series **97,** 17-20.
69. BRAIN, C.K. 1976. Some principles in the interpretation of bone accumulations associated with man. **In:** Isaac, G.L. & McCown, Ed. *Louis Leakey and the East African Evidence*, 96-116. California. W.A. Benjamin Inc.
70. BRAIN, C.K. 1976. A re-interpretation of the Swartkrans site and its remains. *South African Journal of Science* **72,** 141-146.
71. BRAIN, C.K. 1976. Life's Genesis: a display concept at the Transvaal Museum. *Southern African Museums Association Bulletin* **12,** 137-145.
72. BRAIN, C.K. 1976. The narrative concept in museum display. *Southern African Museums Association Bulletin* **13,** 90-95.
73. BRAIN, C.K. & FREEDMAN, L. 1977. A re-examination of the cercopithecoid fossils from Swartkrans (Mammalia: Cercopithecidae). *Annals of the Transvaal Museum* **30,** 211-218.
74. BRAIN, C.K. & BRAIN, V. 1977. Microfaunal remains from Mirabib; some evidence of palaeoecological changes in the Namib. *Madoqua* **10,** 285-293.
75. BRAIN, C.K. 1978. Some aspects of the South African australopithecine sites and their bone accumulations. **In:** Jolly, C.J., Ed., *Early Hominids of Africa,* 131-164. London, Duckworth.
76. BRAIN, C.K. 1978. Interpreting the bone accumulations from the Sterkfontein valley caves: a case study in Quaternary research. *Annals of the Transvaal Museum* **23,** 465-468.
77. BRAIN, C.K. 1979. Visitor reaction to the Life's Genesis narrative-type display sequence. *Southern African Museums Association Bulletin* **14,** 59-68.
78. BRAIN, C.K. 1980. Swartkrans as a case study in African cave taphonomy. *Palaeontologia Africana* **23,** 73-74.
79. BRAIN, C.K. 1980. Criteria for the recognition of bone-collecting agencies in African caves. **In:** Behrensmeyer, A.K. & Hill, A.P., Eds, *Fossils in the Making*, 107-130. Chicago & London, University of Chicago Press.
80. BRAIN, C.K. 1980. Some protozoans from saline pools in the Namib. *Namib Bulletin* **3,** 10-13.
81. BRAIN, C.K. 1980. Has research at natural history museums outlived its usefulness? New trends at the Transvaal Museum. *Southern African Museums Association Bulletin* **15,** 59-68.
82. BRAIN, C.K. 1981. Hominid evolution and climatic change. *South African Journal of Science* **77,** 104-5.
83. BRAIN, C.K. 1981. Presidential address: taphonomy as an aid to African palaeontology. *Palaeontologia Africana* **24,** 1-4.
84. BRAIN, C.K. 1981. The evolution of man in Africa: was it a consequence of Cainozoic cooling? *Proceedings of the Geological Society of Southern Africa*, Annexure to Vol. **LXXXIV,** 1-19. Alex. L. Du Toit Memorial Lecture 17.
85. BRAIN, C.K. 1981. *The Hunters or the Hunted? An Introduction to African Cave Taphonomy.* Chicago & London, University of Chicago Press. 356.
86. BRAIN, C.K. 1982. Palaeoanthropology invited review: *Lucy, the Beginnings of Humankind* by Johanson, D.C. & Edie, M.A. *Quarterly Review of Archaeology* **3,** 3.
87. BRAIN, C.K. 1982. From myth to methodology. *Nature* (London) **295,** 82.
88. BRAIN, C.K., 1982. Cycles of deposition and erosion in the Swartkrans cave deposit. *Palaeoecology of Africa* **15,** 27-29.
89. BRAIN, C.K. 1982. Plumbing the depths of Swartkrans. *Pal News* **3,** 16-21.
90. BRAIN, C.K. 1982. The Swartkrans site: stratigraphy of the fossil hominids and a reconstruction of the environment of early *Homo Proc. Congres International de Paleontologie Humaine,* Nice, October 1982, 676-709.
91. BRAIN, C.K. 1982. The Terminal Miocene Event: a critical environmental event. **In:** Vogel, J.C., Ed., *Late Cainozoic Climates of the Southern Hemisphere*, 491-498. Rotterdam & Boston, A.A. Balkema.
92. BRAIN, C.K. Some ideas on the evolution and extinction of African mammal species. *Proceedings of the International Symposium of the Endangered Wildlife Trust - The Extinction Alternative.* Pretoria, 1983.
93. BRAIN, C.K. & TURNER, G.P. 1984. Problems in unravelling multi-agent involvement in bone accumulations. **In:** Hall, M. *et al.,* Eds, *Frontiers: Southern African Archaeology Today*, 340-343. *Cambridge Monographs in African Archaeology,* 10.
94. BRAIN, C.K. 1984. Some advances in South African palaeontology during the last 25 years. **In:** Reinecke, A.J., Ed., *Commemorative Publication - 25 years of Zoological Research in Southern Africa,* 86-92. Zoological Society of Southern Africa.

95. BRAIN, C.K. 1984. African ancestors. *Nature* (London) **308,** 794-795.
96. BRAIN, C.K. 1984. "Ancestors": a unique palaeoanthropological event in New York. *South African Journal of Science* **80,** 297-298.
97. BRAIN, C.K. & ADAMS, C.G. 1984. Observations on Foraminifera living in a Namib spring. *South African Journal of Science* **80,** 94.
98. BRAIN, C.K. 1985. New insights into early hominid environments from the Swartkrans cave. **In:** Coppens, Y., Ed., *Le Environment des Hominides au Plio-Pleistocene*, 325-343. Paris, Fondation Singer-Polognac,
99. BRAIN, C.K. 1985. Temperature-induced environmental changes in Africa as evolutionary stimuli. **In:** Vrba, E.S., Ed., *Species and Speciation*, 45-52. *Transvaal Museum Monograph* **4.**
100. BRAIN, C.K. 1985. Rotifer research. *South African Journal of Science* **81,** 536.
101. BRAIN, C.K. 1985. Comments of the Namib's past. *South African Journal of Science* **80,** 158-159.
102. BRAIN, C.K. 1985. Cultural and taphonomic comparisons of hominids from Swartkrans and Sterkfontein. **In:** Delson, E., Ed., *Ancestors: the Hard Evidence*, 72-75. New York, Alan R. Liss Inc.
103. BRAIN, C.K.1985. Sixty years of the southern apes. *Southern African Museums Association Bulletin* **16,** 262-265.
104. BRAIN, C.K. 1985. Little-known reference to Pleistocene fossil human footprints. *The Digging Stick* **2,** 2.
105. BRAIN, C.K. 1985. Interpreting early hominid death assemblages: the rise of taphonomy since 1925. **In:** Tobias, P.V., Ed., *Hominid Evolution, Past Present and Future*, 41-46. New York, Alan R. Liss Inc.
106. BRAIN, C.K. 1986. Prospects for a southern African continental record of Cainozoic temperature changes. *South African Journal of Science* 80, 94-96.
107. BRAIN, C.K. 1986. New developments in the Swartkrans palaeontological research project. *Pal News* **5,** 27.
108. BRAIN, C.K. 1986. 50 years of the Museums Association. *South African Panorama* **31,** 30-31.
109. BRAIN, C.K. & ERASMUS, M.C. 1986. *The Making of the Museums Profession in Southern Africa.* A special publication of the Transvaal Museum and the South African Museums Association, Pretoria. 46 pages.
110. BRAIN, C.K. 1987. Some adaptations for survival by African hominids during the last five million years. *South African Journal of Science* **83,** 610-612.
111. BRAIN, C.K. 1987. Skeletons in the cupboard. *Nature* (London) **336,** 277.
112. BRAIN, C.K. 1987. The status of rotifer research in southern Africa with an account of early explorations by Charles F. Rousselet. *Transvaal Museum Bulletin* **22,** 13-20.
113. BRAIN, C.K. & SILLEN, A. 1988. Evidence from the Swartkrans cave for the earliest use of fire. *Nature* (London) **336,** 464-466.
114. BRAIN, C.K., CHURCHER, C.S., CLARK, J.D., GRINE, F.E., SHIPMAN, P., SUSMAN, R.L., TURNER, A. & WATSON, V. 1988. New evidence of early hominids, their culture and environment form the Swartkrans cave. *South African Journal of Science* **84,** 828-835.
115. BRAIN, C.K., 1988. New information from the Swartkrans cave of relevance to "robust australopithecines". **In:** Grine, F.E., Ed., *Evolutionary History of the Robust Australopithecines* 311-316. New York, Aldine de Gruyter.
116. BRAIN, C.K. 1989. New thoughts on an ancient process. *South African Journal of Science* **85**(10), 631.
117. LEE-THORP, J.A., VAN DER MERWE, N.J. & BRAIN, C.K. 1989. Isotopic evidence for dietary differences between two extinct baboon species from Swartkrans. *Journal of Human Evolution* **18,** 183-189.
118. NEWMAN, R.A. & BRAIN, C.K. 1989. An SEM study of damage marks on fossil bones. *Proceedings of the Electron Microscope Society of Southern Africa* **19,** 137-138.
119. GRINE, F.E., COLFLESH, D.E., DAEGLING, D.J., KRAUSE. D.W., DEWEY, M.M., CAMERON, R.H. & BRAIN, C.K. 1989. Electron-probe X-ray microanalysis of internal structures in a fossil hominid mandible and its implications for biomechanical modelling. *South African Journal of Science* **85,** 509-514.
120. BRAIN, C.K. 1989. Human evolutionary themes in museum displays: some problems and principles. *Southern African Museums Association Bulletin* 18(3), 125-126.
121. BRAIN, C.K. 1989. The place of the naturalist in contemporary science. *Southern African Biological Society Journal* 30, 14-17.
122. BRAIN, C.K. 1990. Detecting decay. *Nature* (London) **343,** 32.
123. BRAIN, C.K., 1990. The evidence of bone-modification by early hominids in southern Africa. **In:** Robson, B. & Sorg, M.H., Eds, *Bone Modification,* 291-297. Centre for the Study of the First Americans. Maine, Orono.
124. BRAIN, C.K. 1990. Old flame. Burned bones provide evidence of an early human use of fire. *Natural History* (New York) **4,** 6-10.
125. BRAIN, C.K. 1990. A proposal for the integration of South African research collections in natural history. *Southern African Museums Association Bulletin* **18,** 263-264.
126. BRAIN, C.K. 1990. Twenty five years of Namib Research - a personal perspective. **In:** Seely, M.K., Ed., *Namib Ecology: 25 years of Namib Research.* Transvaal Museum Monograph **7,** 5-12.
127. BRAIN, C.K. 1991. Review of *Owls, Caves and Fossils*, by Peter Andrews. *Journal of Human Evolution* **20**(6):531-532.
128. BRAIN, C.K. 1991. The contribution of Alun R. Hughes to the development of cave taphonomy, a tribute. *Palaeontologia Africana* **28,** 79-81.
129. BRAIN, C.K. & RAATH, M.A. 1991. An Inventory of the South African Research Collections in Natural History. *Southern African Museums Association Special Report* 1-192.
130. BRAIN, C.K. 1991. The Transvaal Museum - a place of quiet scholarship. *Supplement to Transvaal Museum Bulletin* **22,** 1-8.
131. BRAIN, C.K. & WATSON, V.1992. A guide to the Swartkrans early hominid cave site. *Annals of the Transvaal Museum* **35,** 2343-365.
132. BRAIN, C.K. 1992. South Africa's contribution to the study of early man. *Australopithecus* **1,** 1-2.
133. BRAIN, C.K. 1992. Natural History at the Transvaal Museum, 1901-1992. *Staatsmuseum 100.* **In:** Dippenaar, N.G., Ed., Natural History at the Transvaal Museum, 1901-1992. *Staatsmuseum* **100,** 14-55. Special centenary publication. Pretoria, National Cultural History Museum, Museum of the Geological Survey and Transvaal Museum.
134. BRAIN, C.K. (Ed.) 1993. Swartkrans, a Cave's Chronicle of Early Man. *Transvaal Museum Monograph* **8,** 1-270.
135. BRAIN, C.K. 1993. Structure and stratigraphy of the Swartkrans cave in the light of the new excavations. **In:** Brain, C.K. Ed., *Swartkrans, a Cave's Chronicle of Early Man. Transvaal Museum Monograph* **8,** 23-33.
136. BRAIN, C.K. & SHIPMAN, P. 1993. The Swartkrans bone tools. **In:** Brain, C.K. Ed. *Swartkrans, a Cave's Chronicle of Early Man. Transvaal Museum Monograph* **8,** 195-215.
137. BRAIN, C.K. 1993. The occurrence of burnt bones at Swartkrans and their implications for the control of fire by early hominids. In: Brain, C.K. Ed., *Swartkrans, a Cave's Chronicle of Early Man. Transvaal Museum Monograph* **8,** 229-242.
138. BRAIN, C.K., 1993. A taphonomic overview of the Swartkrans fossil assemblages. **In:** Brain, C.K., Ed., *Swartkrans, a Cave's Chronicle of Early Man. Transvaal Museum Monograph* **8,** 257-264.

139. BRAIN, C.K. & KOSTE, W., 1993. Rotifers of the genus *Proales* from the saline springs in the Namib Desert, with the description of a new species. *Hydrobiologia* **255/256,** 449-454.
140. BRAIN, C.K., 1994. The Swartkrans Palaeontological Research Project in perspective: results and conclusions. *South African Journal of Science* **90,** 220-223.
141. LEE-THORP, J.A., VAN DER MERWE, N.J. & BRAIN, C.K., 1994. Diet of *Australopithecus robustus* from Swartkrans from stable isotope analysis. *Journal of Human Evolution* **27,** 361-372.
142. BRAIN, C.K., 1994. A new record of *Adineta* (Rotifera: Bdelloidea) from Antarctica. *Rotifer News* **22,** 15-16.
143. BRAIN, C.K., 1994. Research collections in South African natural history museums: their scope, relevance and coordination. *South African Journal of Science* **90,** 439-442.
144. BRAIN, C.K., 1994. 100 years of research and education on southern African biodiversity at the Transvaal Museum. *South African Journal of Science* **90,** 442-443.
145. BRAIN, C.K., 1995. Understanding the stratigraphic complexity of South African australopithecine cave deposits: the contribution of John T. Robinson. *South African Journal of Science* **91,** 435-437.
146. BRAIN, C.K. 1995. The importance of predation to the course of human and other animal evolution. *South African Archaeological Society Bulletin* **50,** 93-97.
147. BRAIN, C.K. 1995. Back to beginnings. A search for the earliest animals. *The Phoenix* **8,** 7-9.
148. BRAIN, C.K. 1995. Rotifer Symposium IV. Proceedings of the Sixth International Rotifer Symposium, Banyoles, Spain, June, 1991. *South African Journal of Zoology* **30,** 30-31.
149. BRAIN, C.K., FOURIE, I. & SHIEL, R.J. 1995. Rotifers of the Kalahari Gemsbok National Park, South Africa. *Hydrobiologica* 313/ **314,** 319-324.
150. BRAIN, C.K. 1996. The influence of climatic changes on the completeness of the early hominid record in southern African caves, with particular reference to Swartkrans. **In:** Vrba, E.S, Denton, G.H., Partridge, T.C. & Burckle, L.H., Eds, *Paleoclimate and Evolution with Emphasis on Human Origins,* 451-458. New Haven & London, Yale University Press,
151. BRAIN, C.K. 1996. The contribution of Raymond Dart to the development of cave taphonomy. *Palaeontologia Africana* **33,** 81-83.
152. BRAIN, C.K. 1996. The Rotifer fauna of Namibia. **In:** Barnard, P., Ed., *Biological diversity.* Ministry of Environment and Tourism, Namibia.
153. BRAIN, C.K. 1996. Eric David Hollowday: amateur field naturalist with a passion for rotifers. *Rotifer News* 28, 4-8.
154. BRAIN, C.K. 1997. The southern African mammal fauna in evolutionary perspective. **In:** Mills, G., Ed., *The Complete Book of Southern African Mammals.* Cape Town, Struik.
155. BRAIN, C.K. 1997. The importance of Nama Group sediments and fossils to the debate about animal origins. *Palaeontologia Africana* **34,** 1-13.
156. BRAIN, C.K. 1998. *Austin Roberts, a Lifelong Devotion to South Africa's Birds and Beasts.* The John Voelcker Bird Book Fund, Cape Town, 195 pages (a scientific biography).