Obituary
Arthur Cruickshank — 1932–2011

A native of Gondwanaland, who studied the former continent's fossil tetrapods

Dr Arthur Richard Ivor Cruickshank died on 4 December 2011, aged 79, in the Borders General Hospital, Melrose, Scotland. Arthur Cruickshank was one of a post-war generation of palaeontologists who laid the foundations on which today's researchers build. Appropriately for someone from an expatriate Scots family living in Kenya, much of his work was on the extinct reptiles of the great southern continent of Gondwanaland.

Cruickshank was born in Nairobi, Kenya, on 29 February 1932. His grandfather was traffic manager on the Uganda Railway, which went from the port of Mombasa to Nairobi in Kenya and on into the interior and Uganda proper, through fine wildlife country. A recurring problem was the need to deal with individual lions that had developed a habit of eating staff and passengers, and the family story is that the traffic manager had to shoot at least one such lion himself. This was surely one of the lion stories he told Teddy Roosevelt, the former President of the United States, when they were travelling on a special train for Roosevelt's famous African safari of 1909–10 which yielded so many zoological specimens for the Smithsonian Institution in Washington and other American museums.

Cruickshank's father was Scottish through and through, from several generations of farmers near Elgin in Moray. Cruickshank's mother was of joint Devonshire and Scottish extraction. His parents travelled widely for his father's work as an engineer in the sisal plantations, often leaving their only child in a Nairobi children's home. Cruickshank contracted chronic malaria and in 1938, aged six, he was sent back to Scotland, where he boarded at Dollar Academy in Clackmannan. Wartime restrictions considerably reduced contact with his family, but eventually he was settled for his school holidays with a family in Coldstream which gave him an experience of family life and his life-long love of the Scottish Borders.

Cruickshank entered Edinburgh University Department of Geology in 1953, at a time when the novel theory of plate tectonics, or at least its earlier variant such as set out in Arthur Holmes' *The Principles of Physical Geology,* was arousing intense debate. Cruickshank embraced the new theory, unlike some of his teachers. It is perhaps open to question who was more dissatisfied with whom, but at any rate Cruickshank found it advisable to transfer to the Department of Zoology for his Honours year. He further cemented his shift to the palaeontological side of life with his first research, a project on the teeth of the giant rhizodontid fishes from the local Carboniferous in Lothian. In 1958 Cruickshank moved to the University of Cambridge for a doctorate under Dr Rex Parrington, studying specimens which Parrington had collected in an African expedition in the 1930s; Cruickshank's allocated beast was the dicynodont *Tetragonias,* a hefty plant-eater. His external examiner was absolutely astounded by what he had achieved from the specimens to hand. The resulting 45-page monograph was published in the *Journal of Zoology* in 1967. This was a typical example of the classic vertebrate palaeontological paper of the day: a full, bone-by-bone description, and comparison with close relatives, together with consideration of the feeding and locomotor abilities of the beast.

Cruickshank continued with his interest in dicynodonts, publishing on other Triassic species, as well as writing overviews of their evolution and functional morphology. To non-experts, dicynodonts all look more or less the same – animals from 1 to 3 metres in length, with barrel-shaped bodies, a large head with somewhat beak-like jaws for chopping plant food, massive legs, and an inadequate-seeming stumpy tail. But to 'dicynodontophiles' like Cruickshank, they are objects of beauty – and of great importance to understanding the evolution of life on Earth, for dicynodonts comprise the first major group of plant-eating land vertebrates.

Cruickshank took up a lecturing post at the Edinburgh University Department of Zoology, where he met his future wife Enid, then a student, who came from Denholm near Hawick in the Scottish Borders, and they were married in 1963. In 1966 he took up a lecturing post at Napier College, Edinburgh, before moving in 1967 to the University of the Witwatersrand, Johannesburg, where he was Assistant Director of the Bernard Price Institute for Palaeontological Research. This gave him access to a wide range of unstudied dicynodont specimens, allowing him to sustain his passion for these beasts.

Cruickshank tackled the Permo-Triassic aged rocks of southern Africa, and their fossil reptiles, with alacrity. He had already been to Cape Town for three months to study specimens of the dicynodont *Lystrosaurus* in the museum, before he joined the 1963 British Museum (Natural History) (now the Natural History Museum, London) expedition through East Africa (Figure 1). The South African group drove all the way from Johannesburg through Salisbury (now Harare) and Nyasaland (now Malawi) to meet the others in the Ruhuhu Valley in southern Tanganyika (now Tanzania). This was near to where Cruickshank's mother was living in Tanga, where Enid met him after taking a ship from South Africa. He continued studying his beloved dicynodonts, but also began to explore the basal archosaurs – important as the ancestors of crocodiles, dinosaurs, and modern birds. In the 1970s, he published definitive works on the anatomy and relationships of some of the most basal archosaurs, *Proterosuchus* and *Erythrosuchus.* The archosaurs had evolved at the very end of the Permian Period, and they diversified rapidly in the Early and Middle Triassic, following the devastating end-Permian mass extinction 250 million years ago. This work sparked wider interest in the evolution of the group, which today is still a hot topic of debate and research. By chance, some of the best early archosaur fossils were in the South African museums, and Cruickshank gave detailed anatomical descriptions which today are still widely quoted as definitive sources.

This work led to wider investigations of the succession of terrestrial ecosystems through the Permian and Triassic.

Figure 1. The British Museum (Natural History) East Africa Expedition 1963 — the South African group meets up with the main team at Lindazi Castle in Zambia. From left to right, the adults are Arthur Cruickshank, Barney Hershon (an interested amateur from Cape Town), Fuzz Crompton, John Attridge, Alan Charig and Barry Cox. The child was the son of the person running the hostel. Photograph courtesy Steve Tolan via Enid Cruickshank.

Cruickshank wrote about overall patterns of evolution among the archosaurs, and focussed also on the origin of the dinosaurs. Furthermore, with the palaeobotanist John Anderson, he wrote detailed, and then state-of-the art, overviews on vertebrate faunal successions worldwide through the Permian and Triassic. All this work on Permo-Triassic reptiles provided one of the first frameworks for understanding this crucial time: not only do Triassic rocks document the recovery of life from the most devastating of Phanerozoic mass extinctions, the end-Permian event, but this was also the time of the origin of the dinosaurs, as well as key elements of modern vertebrate faunas, including the first frogs, turtles, crocodile ancestors, lizard ancestors and perhaps lizards themselves, and later the mammals.

Cruickshank found South Africa exciting but difficult, in terms of both the job and of the wider South African scene; in the U.K., he was a life-long Liberal and active in the Liberal Democratic Party, especially after the family returned to Scotland in 1978. However, the new Prime Minister, Margaret Thatcher, clamped down on university research, so Cruickshank could find no permanent teaching or research post, but took what work he could get in local universities, colleges and museums, and especially as a tutor with the Open University. He continued to collaborate with his former South African colleagues in presenting papers on Permian and Triassic faunas, and early dinosaurs from southern Africa.

The Cruickshank family moved to Hinckley in Leicestershire in 1985 when his wife obtained a post as a librarian in Rugby. Hinckley lies near the Jurassic belt that crosses England from the east to south coasts, and a contract post at Leicestershire Museums Service led Cruickshank to a change of research direction. He now began to work on the Jurassic and Cretaceous plesiosaurs, large marine reptiles with four flippers. His initial post in Leicester was a short-term contract for routine curatorial and site documentation work, but Cruickshank soon took advantage of the Museum's facilities and its fine marine reptile collections from the local Jurassic. He became for many years an honorary research associate, de facto and then de jure, of Leicestershire Museums and then its Leicester City successor, as well as an Honorary Research Fellow of the Department of Geology at the University of Leicester. Some of his research work was supported by the Leverhulme Trust (through a grant to Mike Taylor, then at Leicestershire Museums).

One highlight was the description of Leicester Museum's *Rhomaleosaurus megacephalus,* locally nicknamed 'the Barrow Kipper'. The specimen originated from earliest Jurassic deposits at nearby Barrow-upon-Soar, and has become the symbol of the town. Cruickshank and his colleagues subjected the specimen to CT-scanning to study the internal structure of its nasal passages. In 1991 this was still a fairly new and unusual technique to use on fossils, but Cruickshank seized the opportunity when he found Philip Small, a doctor at the Queen's Medical Centre in Nottingham, in the evening class which Cruickshank took over when David Martill moved to Portsmouth. More recently he was part of the team which scanned a hollow 'mouldic' fossil inside a block of sandstone from Morayshire. These data were used to recreate a 3-D computer-generated rendition of the skull of a dicynodont, and then to rapid-prototype it in plastic, an early use of this technique in palaeontology.

Another opportunistic meeting, this time at a rather lower technical level, happened when Cruickshank observed his dentist using high-fidelity dental putty; he

Figure 2. Arthur Cruickshank at Mike Raath's 'CT6' site at the Chitake River, Rhodesia (now Zimbabwe), in September 1972. This site yielded many specimens of the small theropod then called *Syntarsus* (now *Coelophysis*). Cruickshank is overdressed for the broiling heat; the dapper safari bush gear was badly needed to protect against the area's voracious tsetse flies. He is standing at one end of the exposure of a small fluvial channel in the Forest Sandstone Formation (Early Jurassic), and pointing at the bone-bed in which 30-odd individual theropods were exquisitely preserved as jumbled bones. Most of the bones are white, showing little contrast with their matrix, but manganese-blackened bones are visible in places, such as perpendicularly below the 'CT6' mark on the outcrop. Photograph courtesy Mike Raath.

promptly besought the dentist to cast the tooth marks which he had observed on a bone of a kannemeyeriid dicynodont. This helped identify the characteristic dentition of the predator, a rauisuchian archosaur. The elemental simplicity of the resulting paper evidently threw at least one *Palaeontology* referee completely off balance; one praised it as a perfect piece of work, needing no changes, and another – fortunately ignored by the editors – damned it as unworthy of the august pages of that journal.

Cruickshank also happened to meet the engineer Professor Beric Skews of the University of the Witwatersrand, simply because Skews' little boy wanted to know all about dinosaurs; the result was an elegant hydrodynamical study of the long tabular horns of the Palaeozoic nectridean amphibians *Diplocaulus* and *Diploceraspis* – which look like newts with boomerangs for heads. Cruickshank and Skews concluded that the animals lurked on the bottom of rivers, raising their heads into the flow to gain a rapid lift force to help them lunge upwards at prey. Cruickshank's evening class students were often led, through initial bafflement at the counter-intuitive use of a wind tunnel rather than a water flume tank for their model nectrideans, to an appreciation of the Reynolds number and the concepts of scaling and dynamical similarity in fluid mechanics. Professor R. McNeill Alexander, the eminent biomechanicist, chose this study to exemplify hydrodynamics in his prestigious William Smith lecture on the biomechanics of fossil vertebrates to the Geological Society of London in 1989.

Cruickshank's work on plesiosaurs included a study of the first Westbury Pliosaur, still on show at Bristol Museum and Art Gallery; today this work is highly relevant to the newly unveiled giant Dorset Pliosaur. He co-described the weird *Pachycostasaurus* in Peterborough Museum, its ribs swollen into ballast to help it swim slowly along Jurassic sea floors, perhaps to graze on shoals of Jurassic shrimps – a carnivorous reptilian analogue of modern plant-eating sea-cows. Cruickshank returned to his Morayshire roots, not just with the aforesaid dicynodont but also with a study of the plesiosaur remains from the giant Rhaetian erratic at Linksfield near Elgin, and to his Gondwanaland roots with the support of the Royal Society of London, to study Cretaceous plesiosaurs in Australia, New Zealand and South Africa. The southern continent work came about in part to examine relatives of *Leptocleidus superstes,* from the Wealden of Sussex, which was startlingly similar to the early Jurassic *Rhomaleosaurus* despite being a Lower Cretaceous form; Cruickshank suggested that these Cretaceous pliosaurians had been displaced into near-shore and estuarine environments by the rise of competitors. He also examined other southern forms, co-describing the new *Kaiwhekea* from New Zealand with Ewan Fordyce.

Cruickshank's work on plesiosaurs took place when this important group was almost completely neglected. The situation is much different today, for his work helped stimulate a younger generation of researchers with whose studies, as well as those of his nearer contemporaries, he was much involved, often working in collaboration. As with his earlier work on Permo-Triassic beasts, he was a mine of information, always on hand to provide friendly support and advice to co-workers, students, amateur collectors (so important in this area of research), and

Figure 3. Arthur Cruickshank at his 'retirement' party, at the Strode Theatre, Street, Somerset, in July 2009. The cake is an accurate model of the holotype specimen of the Triassic-Jurassic boundary plesiosaur *Thalassiodracon hawkinsi* (Owen, 1840), found at Street. Photograph by Mike Taylor.

others interested in these fascinating animals. In total, and including the Permo-Triassic work, he supervised at least 11 research students (plus two ongoing), and examined eight others. In this and in many other ways he was a deeply appreciated friend and colleague, perhaps more so than he realized, and his memory will live long in the minds of those who knew and loved him. A colleague accurately recalled that 'he was the most urbane of palaeontologists, with one of the driest and quickest senses of humour I have known'. Cruickshank's modesty shone through when he was amazed by the numbers in attendance at a special session held in his honour, at a conference on the Triassic/Jurassic boundary fossils of the West Country of England, in Street, Somerset, in 2009 – an appropriate location for its plesiosaurs of world class importance, as well as its views of the Isle of Avalon of, indeed, *Arthurian* legend (see *Palaeontology Newsletter* **73**, 40–46, www.palass.org). He has one taxon so far named after him, the dicynodont *Angonisaurus cruickshanki* Cox & Li, 1983, whose type specimen he helped to collect on the 1963 expedition, and also prepared. Also to be named after him is the Street plesiosaur *Avalonnectes arturi* Benson, Evans & Druckenmiller, in press 2012.

Cruickshank was a long-standing member of the Palaeontological Association and served on its Council as Institutional Membership Treasurer from 1990 to 1992. For many years he was a Fellow of the Geological Society, and also a member of the Institute of Geologists, taking C. Geol. status. He also served variously on the councils and committees of the Zoological Society of Southern Africa, the Geological Society of South Africa, South African Society for Quaternary Research, and the University of the Witwatersrand Faculty of Science. He was on the Museum of Man and Science Board of Governors in South Africa, was Chairman of the Dinosaur Society (U.K.), and sat on the Tutorial and Counselling Staff Committee of the Open University in Scotland.

In 2006, the Cruickshanks moved back to the Borders and lived first in Denholm and then in Hawick. Late in life he suffered, with remarkable resolve and cheerfulness, from bowel cancer, and died in the Borders General Hospital at Melrose following a fall at home. A dedicated family man, Arthur Cruickshank is survived by his wife Enid, their children Peter, Susan, and David, and three grandchildren.

We thank Enid and Peter Cruickshank and many friends and colleagues for supplying information and photos. We acknowledge permission of the respective editors to publish this obituary in both *Palaeontologia africana* and *Palaeontology Newsletter* (submitted). This publication is invalid for taxonomic/nomenclatural purposes.

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SCIENTIFIC PUBLICATIONS OF DR A.R.I. CRUICKSHANK

Arthur Cruickshank did not maintain a list of his minor publications such as book reviews and letters to the editor. We have simply included those known to us, but our listing is unavoidably incomplete in this regard.

A. Research contributions

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