

# [James William Kitching \(1922-2003\)](#) [1]

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James William Kitching collected and studied fossils of dinosaurs and early [humans](#) [3] in the twentieth century. He worked at the Bernard Price Institute for Paleontological Research in South Africa. During the fifty-three years he worked at the institute, Kitching spent eighteen of those in the field uncovering fossils. Kitching recovered fossils of early human ancestors, later called [Australopithecines](#) [4], as well as fossils of dinosaurs and ancient mammals. When he died in 2003, the Bernard Price Institute housed one of the largest fossil collections in the southern hemisphere. Kitching and his team had collected most of those fossils. Additionally, he helped discover [Massospondylus](#) [5] embryos, the first dinosaur embryos ever recovered, which enabled scientists to examine dinosaurs before birth.

Kitching was born in 1922 in Graaff-Reinet, South Africa, to his mother and to his father Croonie Kitching. The Kitching family lived in the village of Nieu Bethesda, which was surrounded by the Karoo desert. This region was rich fossils from the Triassic and Jurassic periods, approximately 250 to 145 million years old. Robert Broom, who worked in South Africa and discovered human ancestor fossils later classed as [Australopithecus afarensis](#) [6], frequented this area and knew the Kitching family. Croonie Kitching collected fossils as a hobby and occasionally hosted Broom on excavations at various sites. The younger Kitching hunted fossils with his father and found his first fossil at the age of six. At the age of seven, Kitching found a fossil of a never-before discovered species of marine sponge. Brown named the marine sponge species *Younopsis kitchingi*, later called [Hymeniacidon kitchingi](#) [7], after Kitching. Kitching formed a friendship and scientific relationship with Broom. The two also later published together on *Australopithecus* fossils.

As a young adult, Kitching hunted fossils instead of pursuing a university education. Kitching searched for fossils with Broom, and the two unearthed many fossils of extinct dinosaurs and mammals. Kitching left Africa in 1945 to serve in World War II in Italy. Upon his return from the war, he resumed his work to find fossils. In 1945, the University of Witwatersrand in Johannesburg, South Africa, founded the Bernard Price Institute of Paleontological Research. Broom, who was affiliated with the University of Witwatersrand, recommended Kitching to be appointed as the institute's first staff member. Kitching collected fossils for the institute, a project that he began immediately upon his return from the war.

In addition to studying dinosaurs, Kitching also studied human fossils. He discovered fossils of the early human ancestor *Australopithecus* in the 1940s, in the lime-heavy caves of Makapansgat, South Africa. Kitching's *Australopithecus* finds caught the attention of scientist Raymond Dart, who had studied the [Australopithecus africanus](#) [8] fossils called the Taung child. Dart used Kitching's fossil finds to support his hypothesis that *Australopithecus* made and used tools. In the 1960s, Kitching further uncovered and studied ancient fossils found in Pin Hole Cave near Derbyshire, England. The Pin Hole Cave yielded animal and human remains. Kitching studied the specimens in this region to infer how individuals from the [Homo](#) [9] genus (*Homo erectus* [10], *Homo neanderthalensis* [11], and *Homo sapiens* [12]) used tools during the Paleolithic era, approximately 2.5 million years to 12,000 years ago. In 1963 he published a book about the finds in England, titled *Bone, Tooth & Horn Tools of Palaeolithic Man*.

In addition to hunting fossils near his home in South Africa and in England, Kitching excavated fossils in Brazil and Antarctica. In 1970, he participated in the United States' Antarctic Research Program. Kitching identified the first fossils of [mammal](#) [13]-like reptiles in Antarctica. Similar fossils had been found on the African continent. Kitching's find was the first recorded fossil evidence of an ancient link between the African and Antarctic continents. This contributed to scientific theories about the existence of Gondwana, one of the many supercontinents in Earth's history.

Although Kitching never received an undergraduate degree, the University of Witwatersrand allowed for him to register for a master's of science program in the early 1970s. Ultimately, the examiners of his thesis thought it so thorough and extraordinary that in 1973 the university awarded him a doctorate in biostratigraphy instead of a master's degree.

In 1979, Kitching uncovered a clutch of six partial dinosaur eggs in Golden Gate Highlands National Park in Free State, South Africa. Kitching had been fossil hunting for a number of years at this location, also called the Rooidraai locality, and he had uncovered dinosaur bones from different species. The eggs unearthed in 1979, however, were the first eggs Kitching had discovered. To find out how old the eggs were, Kitching used biostratigraphy. When researchers use biostratigraphy to date a specimen, they first note the sedimentary layer of earth from which they extracted the specimen, then they look in that layer for other specimens from species of plants or animals already described and dated. Once the remains are dated, researchers can provide a comparative age for other specimens, such as Kitching's dinosaur eggs, found in the same strata, or layer of rock. Kitching determined that these eggs were from the Jurassic period, between 201 and 145 million years old. This made them the oldest dinosaur eggs that had been found.

Kitching took the eggs to the Bernard Price Institute for Paleontological Research, where he observed that three of the eggs contained visible embryonic remains, something never before described. He published an article in 1979 titled "Preliminary

Report on a Clutch of Six Dinosaurian Eggs from the Upper Triassic Elliott Formation, North Orange Free State." In the report, Kitching announced the discovery of the eggs to other scientists. Kitching also described the features of a partially exposed embryonic skull that had been preserved in one of the eggs. Kitching reported that, from what he could see, the preserved embryonic skull appeared to be dinosaurian. The features he referenced included the shape of the exposed skull roof, or parietal bone, as well as the size and shape of the nose region in the front of the face. He also described further work to be done with the eggs. Researchers still had to determine the species to which the eggs belonged, and they had to expose and document the embryonic remains in the eggs.

Despite reporting that researchers planned to study the embryonic remains, Kitching decided that the institute did not have the resources to remove the fossils from their surrounding rocks without harming the delicate bones. Kitching shifted his focus to the eggshell. Kitching used a scanning [electron microscope](#)<sup>[14]</sup> to determine if the eggs were more structurally similar to crocodiles or other reptiles, to [birds](#)<sup>[15]</sup>, or to dinosaurs. He found that the eggshell structures were most similar to other dinosaurs. In 1987, Kitching reported his conclusions in "Scanning Electron Microscopy of Early Dinosaur Eggshell Structure: a Comparison with Other Rigid Sauropsid Eggs."

Also in the 1987 article, Kitching hypothesized as to which specific dinosaur taxa the eggs belonged. He compared the size of the eggs to the body size of adult dinosaur fossilized remains found in the same area, and he determined that the eggs had to belong to an exceptionally large species of dinosaur. He concluded that the eggs belonged to large four-legged dinosaurs in the genus *Massospondylus*. Long bones from *Massospondylus* had been found at a site near where the eggs were discovered. Kitching used them as further evidence for his taxonomic assignment.

Twenty-seven years later, a team of scientists led by Robert Reisz and Diane Scott at the University of Toronto in Toronto, Canada, removed the rock matrix from the eggs and revealed two of the embryos Kitching had collected. They published their results in a 2005 article about the embryos, "Embryos of an Early Jurassic Prosauropod Dinosaur and Their Evolutionary Significance." In the article, Reisz and his team confirmed Kitching's taxonomic assignment of the eggs and the embryos to the genus *Massospondylus*, specifying that the embryos belonged to the long necked herbivores [Massospondylus carinatus](#)<sup>[16]</sup>. By studying the eggs, embryos, and the area in which they were discovered by Kitching, paleontologists learned more about dinosaur parental care and locomotion and gait. Kitching's discoveries also prompted more excavations at the Roodraai site, which yielded multiple eggs clutches.

In the 1980s, Kitching continued his career as lecturer in Karoo biostratigraphy at the University of Witwatersrand. He became director of the Bernard Price Institute for Paleontological Research in 1987. Kitching held both these positions until he retired in 1990, at the age of sixty-eight. He then became an honorary research fellow at the Institute, a position that he held until his death in 2003. Kitching also received an honorary doctorate from Nelson Mandela Metropolitan University at Port Elizabeth, South Africa, in 1981 and another from The University of Witwatersrand in 1996. Additionally, he participated in numerous societies and received many awards for his various fossil discoveries during his career. He received both the Gold Medal of the Zoological Society of South Africa and the Draper Award of the Geological Society in 1993, and the Gold Medal of the Simon van der Stel Foundation in 2000.

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