The world of Antarctic paleontology

The historic fossil find confirmed continental drift and opened a new field of study

by Kendrick Frazier

Photos: U. S. Navy

Elliot and Colbert (right) examine Coalsack fossil.

Those two contentious 19th-century paleontologists, Edward Drinker Cope and Othniel Charles Marsh, whose epic feuds and monumental scientific contributions have given such a rich and colorful history to vertebrate paleontology in North America, opened the world's eyes to the life of the past. Their work of hunting, digging and describing the bones of giant dinosaurs found in the rich fossil beds of Colorado, Wyoming and Montana provided the first clear picture of the giant land reptiles that roamed the world during the period 180 million to 60 million years ago.

Dinosaur remains had previously been found in Europe. Since Cope's and Marsh's finds in the 1870's and 1880's, bones have also been found in Asia, Africa, South America, Australia and even Greenland. But the continent whose existence has been known to man for only a century and a half, Antarctica, has yet to produce a single fossil fragment of a dinosaur. There is no clear indication it ever will.

For now vertebrate paleontologists are content to bask in the glory of the discovery and collection of the first fossil reptile bones of any kind from Antarctica. In a sense the bones symbolize a field of study only four months old.

The discovery on Nov. 23 of small reptile bone fragments at Coalsack Bluff, 400 miles from the South Pole (SN: 12/13, p. 549), is a historic find, the kind that will find its way into textbooks. Not only does it open the door to further study of reptilian paleontology in Antarctica but also it provides one final type of missing evidence to the theory of continental drift, the clincher in a sense.

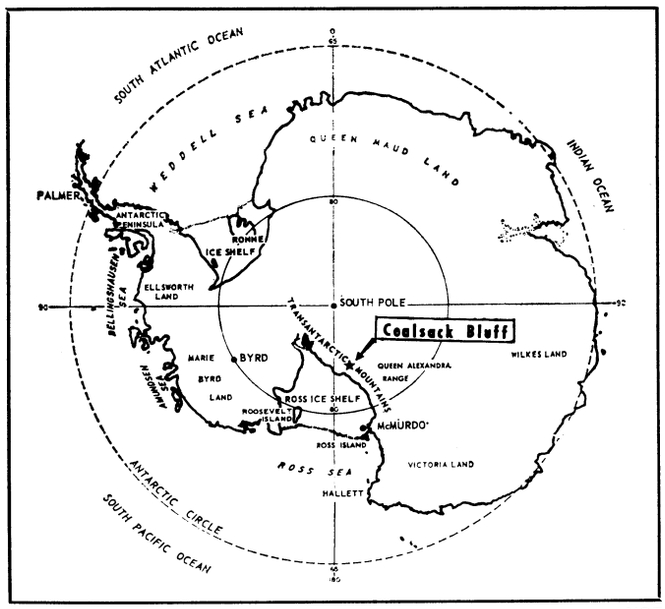
The reptiles of Coalsack Bluff are virtually identical with ones found elsewhere in the Southern Hemisphere, notably South Africa. The animals, it is certain, could not have crossed vast distances of salt water; the continents must have been connected some 200 million years ago. It all agrees well with evidence from other areas of science (SN: 2/28, p. 229).

When the discovery of the Antarctic fossil bed was announced in early December few details were available. The paleontologists and geologists who took part in the fossil hunt, with all 450 of the bones removed in work that continued into January, are now back in the United States. The scientists have returned to their universities and museums; the bones are at Flagstaff, Ariz., undergoing the scrutiny of Dr. Edwin H. Colbert, the noted vertebrate paleontologist who identified some of them in the field and who returned in time to be honored on his retirement from the American Museum of Natural History. He is now at the Museum of Northern Arizona in Flagstaff.

The story of the fossil discovery is one in which luck plays a leading role. Fortune and chance have their place in much scientific work, but the Antarctic fossil hunters had perhaps more than the usual allotment.

The first bit of luck was the discovery in December 1967 by the New Zealand geologist Peter J. Barrett, then doing graduate work at Ohio State University, of a small bone fragment that later was identified as a piece of the skull of a labyrinthodont, the name for a diverse group of fresh-water amphibians. It was the first—and until last November the only—land vertebrate fossil found in Antarctica.

The paleontologists who have just returned from Antarctica echo the words of Dr. Louis O. Quam, acting head of the Office of Polar Programs at the National Science Foundation: "I



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The lower bone basin at Antarctica's Coalsack Bluff was part of one of the truly great fossil finds of all times.

Powell and the others spent time collecting rather than searching for bones.

Jawbone of a Lystrosaurus (in cup).

think the remarkable thing is that Peter Barrett recognized the thing as a bone. It looked like a pebble."

It was this find of a single bone fragment that prompted the NSF to fund a paleontological-geological expedition to the Transantarctic Mountains, to search for vertebrate fossils as part of its 1969-70 U.S. Antarctic Research Program. Leading the 17-man group was Dr. David H. Elliot of the Ohio State University Institute of Polar Studies, which has an ongoing program of Antarctic geologic studies. The vertebrate paleontologists were Dr. Colbert, William J. Breed of the Museum of Northern Arizona, James A. Jensen of Brigham Young University and Jon Scott Powell of the University of Arizona.

The debt owed Peter Barrett has become even more clear since their collecting work at Coalsack Bluff was terminated in January. On Jan. 15, after his work at Coalsack Bluff was completed, Dr. Elliot, who first found the bones at the Bluff, took a helicopter to the exact site on Graphite Peak where Barrett had made the 1967 discovery.

"Three of us spent the whole day there without finding a bone," says Dr. Elliot. "We looked and looked and there was nothing that any of us saw that we could identify as a piece of bone. Barrett probably found the only bone there. It was absolutely incredible that he should have stumbled on it."

The decision by NSF, based on that one chance find, to send another group down to look for more fossils, was not made without some crossed fingers. Says Dr. Quam: "I must admit to a certain amount of trepidation when we decided to send seven paleontologists there. You can imagine how excited we were when we got word on the first day they had found fossil reptiles."

This brings in the second element of good fortune—the location of the camp. The party members agree that the position of the base camp was the most important factor responsible for the find. Credit to Dr. David Elliot should be more for his decision to place the camp where he did, they emphasize, than for his actual sighting of the fossils. The discovery would have been made by whoever happened to walk first over to the fossil site, only four miles northwest of the camp.

The expedition's camp had to be along the northwest side of the Queen Alexandra Range of the Transantarctic Mountains and at a place where a C-130 Hercules cargo plane could land on skis. Another requirement was a reasonable proximity to rocks suitable for fossil hunting or stratigraphic studies on days when weather or me-

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chanical difficulties would prevent the helicopters from flying the party to more distant areas.

Several sites were considered but rejected. The chosen site was windy and offered a less than perfect landing for the Hercules. "But even though it had these disadvantages," says Dr. Elliot, "I chose it because it was close to good rocks so we could work locally."

It was named Beardmore Camp, even though it was on the other side of the Queen Alexandra Mountains from Beardmore Glacier, which Shackleton's polar party had traversed in 1908-09. Scott's expedition crossed the same area in 1911-12, discovering in coal beds on Mt. Buckley the first fossil record in Antarctica of the Permian seed plant known as *Glossopteris*. Since it was difficult to explain how the seeds of this plant could have crossed the ocean, these fossils, more than 225 million years old, constituted the first such evidence in Antarctica of continental drift. But geophysics wasn't yet ready to accept such theory. General acceptance of the concept had to wait more than half a century.

The Navy built the camp, consisting of four quonset-style Jamesway huts, prior to the arrival of the scientific party on Nov. 22.

Nearby Coalsack Bluff was known, from previous geological study, to contain rocks of the same age-horizon as those yielding the amphibian fossil in 1967: Fremouw Formation of the Lower Triassic. This referred to layers of sandstone almost 225 million years old. The formation is recognizable for 300 miles down the mountain range.

On their first day out, Nov. 23, Dr. Elliot, Dr. James N. Schopf, a paleobotanist for the U.S. Geological Survey Coal Research Laboratory at Ohio State University, and Dr. Leon Lambrecht, a Belgian exchange scientist, took a motorized toboggan to a cull just west of Coalsack Bluff to have a look at the rocks and to check a report that *Glossopteris* plant fossils had been found in coal beds there.

"From Barrett's description of his vertebrate find I believed I should look for black phosphate pebbles," recalls Dr. Elliot. "I walked across and looked at the third of the sandstone bluffs. I found something which did not look much like a pebble. It was irregular and angular and had a pitted appearance. I retrieved it not being absolutely sure but suspicious that it was a bone." With Dr. Elliot's next step, the science of Antarctic vertebrate paleontology finally came alive.

"I dropped down to the next bluff," he says, "and there the black things were everywhere. They all had these irregular shapes and were pitted. Rather than dig and disturb them, I removed one I thought was the end of a small long bone about half the size of my little finger nail. Having seen so many, naturally I was very excited. But I wasn't absolutely sure because I haven't had experience in looking at bones." (He is primarily a geologist.)

"So I took it back to Dr. Colbert at camp, who passed it to Jim Jensen and then took it back and looked at it intensively, and said, 'Yes, I think we have bones there.' "

The vertebrate paleontologists on the scientific team had arrived at Beardmore Camp expecting to spend most of their time searching for fossils. The unexpectedly quick find meant that the remaining time could be spent merely collecting them.

The bones belonged to both reptiles and amphibians. Among them were bones of thecodonts, a general name for a variety of small reptiles which were ancestors of the dinosaurs. If they proved to be identical to the types of thecodont fossils found elsewhere, as they seemed to be, the continental drift argument would be greatly strengthened.

Better evidence was found on Dec. 4. "This was one of the worst days I had," says BYU's Jensen, a 52-year-old paleontologist who was heading the fossil removal effort. "The reason was that instead of crawling along on the cliff, I found a spot where there seemed to be quite a number of bones available. So I stayed up on the spot on the windy cliff through the day, in the cold, prying loose rocks with my ice ax and splitting them up with a chisel. The pieces have to be wrapped up in tissue paper, then in a paper towel, then placed in a bag. Then you have to label the bag. I had repeated this so many times my hands were getting stiff. For some reason which I don't understand, I kept sitting on the cold cliff working.

"I just happened to split open one rock at the right spot and there was what turned out to be the *Lystrosaurus* maxilla. Had I just gone along as our custom was, picking up things as we saw them, I wouldn't have found it. When I found it I was too numb. I really was quite numb. I went back to camp and turned it in to Colbert and went to eat. In a while he came dashing back and said, 'You've got a *Lystrosaurus.*' "

Jensen had to return to the United States early. He had suffered frostbite on his nose and right cheek and developed a throat ailment.

(Next week: Consequence of a find.)