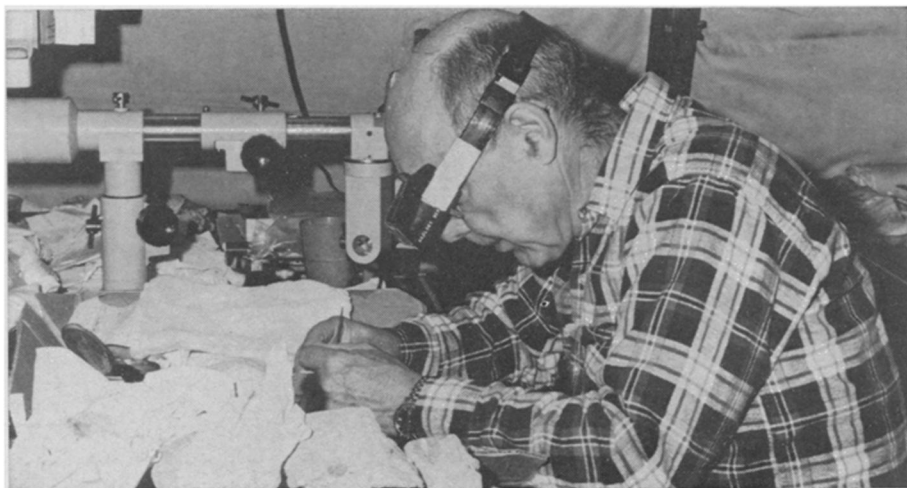




Photos: U.S. Navy

Elliot will head the next expedition.



Colbert, at the Beardmore Camp, was only about 90 percent sure of his find.

by Kendrick Frazier

Paleontology is a science that depends on precise identifications. The find of a bone belonging generally to a certain group of animals may be interesting, useful, even exciting; but the true intellectual significance surfaces when the exact animal it belongs to becomes known.

The identification by Dr. Edwin H. Colbert, on the evening of Dec. 4 at Beardmore Camp, of a *Lystrosaurus* bone (SN: 3/28, p. 324) meant that he had specified the genus of the reptile. The science of Antarctic vertebrate paleontology had come of age.

Such a specific link of an Antarctic fossil only 400 miles from the South Pole with the *Lystrosaurus* fossils of South Africa and Asia was a certain indication that the southern continents were contiguous at the time the animals lived, nearly 225 million years ago.

The skull fragment was about two inches long and contained a single tooth, a characteristic clue to the *Lystrosaurus*, a dog-sized, swamp- and river-dwelling herbivorous reptile that had only one extended tooth on each side of the head. Dr. Colbert is a careful man, and he admits being taken aback slightly when he learned that polar veteran Dr. Laurence M. Gould of the University of Arizona, visiting the camp as chairman of the National Science Foundation's advisory panel for Antarctic programs, had informed the agency that night of the discovery of a *Lystrosaurus*. His now-famous message described it as one of the greatest fossil finds of all time (SN: 12/13, p. 599).

"I was about 90 percent sure," says Dr. Colbert. But some doubt persisted in his mind, and he remained uneasy until his return to the United States in January. Then he stopped off in Berkeley at the Museum of Paleontology of the University of California to make a

comparison with *Lystrosaurus* fossils there. The skull fragment, he found, was identical with one at the museum.

No other animal has yet been identified so specifically from the bones. But Dr. Colbert, working with the bones now at the Museum of Northern Arizona, is hopeful he will be able to make such identifications in the coming months. The work involves searches of the literature and detailed comparisons with other specimens. A large majority of the 450 bones from Coalsack Bluff are reptile, not amphibian. About 10 to 15 percent belong to *Lystrosaurus*. Dr. Colbert estimates that from six to ten different genera of animals are represented, but he is having difficulty identifying them partly because most of the bones belong to parts of the body other than the skull, which is most characteristic. All of the bone fragments are small enough to be held in the palm of a hand.

The reptile bones belong to two extinct orders: thecodonts, ancestors of the dinosaurs, and therapsids, advanced mammal-like reptiles. Among the latter are dicynodonts, of which *Lystrosaurus* is a member, a large and successful group of various plant-eating reptiles with characteristic beaked skulls and some mammal-like skeletal features.

The most extensive collections of *Lystrosaurus* fossils are in museums in Johannesburg and Cape Town, and Dr. Colbert hopes to do some comparative studies when he travels to South Africa in July to report on the find at the International Symposium on Gondwana Stratigraphy and Paleontology. He will also deliver a report at the meeting of the International Scientific Committee on Antarctic Research (SCAR) in Oslo in August. In the meantime he, Dr. David Elliot and the two other senior vertebrate paleontologists, William J. Breed of the Museum of Northern Arizona and James Jensen of Brigham Young University, are preparing a preliminary report for SCIENCE.

TRIASSIC REPTILES—II

Horizons for Antarctic paleontology

More extensive expeditions
are planned to follow up the
Lystrosaurus fossil find



Powell waxes fossils before removal.



The sandstone cliffs of Coalsack Bluff housed the bones in splendid isolation.

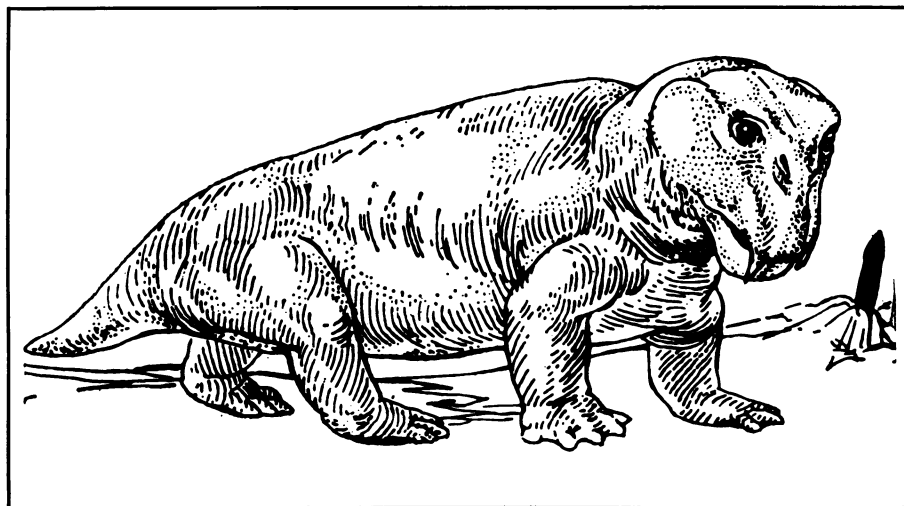
The animals whose bones are now being studied at Flagstaff died along a stream that flowed through their part of Antarctica more than 200 million years ago. Their bones were eventually swept downstream and buried under sand; the stream bed later solidified into the medium- and coarse-grained sandstone that composes part of what is now called Coalsack Bluff. There they rested in splendid isolation, while Antarctica's climate gradually shifted from temperate to polar. By the time scientists visited their domain, erosion of the surrounding rock had exposed them once again to the elements.

Work at Coalsack Bluff continued into early January. By then a point of greatly diminished returns had been reached, and the paleontologists decided further work there this season was an uneconomical use of their time. The upper sandstone cliffs had by this time been relieved of most of their fossil treasure. The lower bone bed, a fault block created at some time in the past by a geological movement that split off part of the cliff and folded it at nearly a right angle, still held fossils. But removing any more would involve an extensive quarrying operation requiring blasting, and the necessary drills and dynamite weren't readily available.

Several hundred bones probably lie within those particular rocks, possibly even more. "It will not be difficult to blast off the overburden and get to them," says Jensen. But they may remain there.

With the members of this season's scientific party barely settled back at their home institutions, NSF has begun to plan a return geological-paleontological expedition to the Transantarctic Mountains during the 1970-71 season.

Already decisions have been made on where their camps will be located, but who will go has not been decided. "Plans depend on what the scientific



Colbert, *The Age of Reptiles*

Lystrosaurus fossils had previously been found in South Africa and in Asia.

community wants to do," says Dr. Louis O. Quam, acting head of NSF's Office of Polar Programs. Despite the necessary tentativeness of details at this stage, seven months before the season begins, there is no doubting the agency's enthusiastic desire to support further searches for vertebrate reptile fossils in Antarctica.

Dr. Elliot will probably return as head of the 1970-71 scientific party. But Dr. Colbert and Jensen have already ruled themselves out for a return trip because of age, although Dr. Colbert hopes to send several graduate students. Breed also doesn't expect to return.

The most natural place to return to, it might seem, would be Coalsack Bluff. But despite the fossils that undoubtedly remain, that isn't necessarily what will happen.

As Dr. Colbert points out, "Antarctica is one-third again as large as the United States, and we have just begun to scratch the surface." Of course only the mountain ranges, where rock is exposed above the per-

manent ice sheet, can yield fossils.

"There is really no overriding reason why we should go close to Coalsack Bluff when we return," explains Dr. Elliot. "Probably the best material has already been taken. It would be far more valuable to look elsewhere."

As a result NSF has decided to place the 1970-71 project at two sites a considerable distance southeast of Coalsack Bluff. The first camp will be set up on McGregor Glacier, about 150 miles away. About midway through the season the party will probably move to a second camp on Amundsen Glacier next to the Nilsen Plateau, about 230 miles from both Coalsack Bluff and the South Pole.

A similar two-camp sequence had been planned for last season's expedition. McGregor Glacier was in fact to have been the second campsite. But the rich find at Coalsack Bluff, while the researchers were working out of Beardmore, the now-dismantled first camp, plus the recurrent helicopter difficulties, changed those plans.

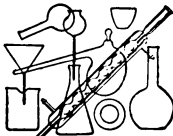
Both sites selected for the 1970-71

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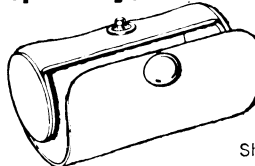
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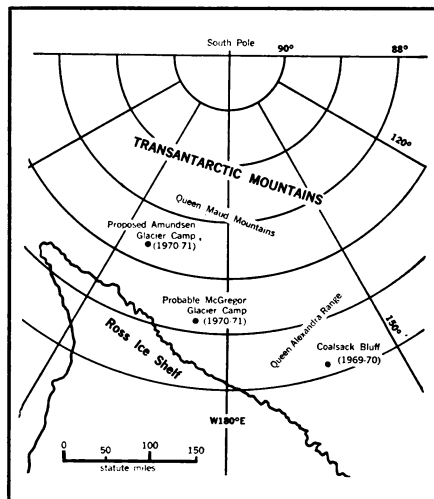
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The fossil search will continue.

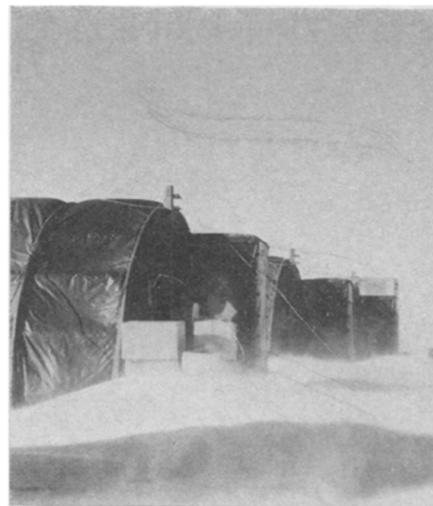
camps are again near extensive deposits of Permian coal deposits and overlying Triassic rock. The areas are similar in geology to the Beardmore Glacier region where Coalsack Bluff is located.

Both sites meet the same requirements as the Beardmore Camp: a suitable landing site for the C-130 support planes and a close enough proximity to exposed rocks that some useful work can be done when helicopters are not available to take the scientists to locations farther away. In addition to fossil searches and general geological investigations, some geological mapping will be carried out. Probably fewer paleontologists will be sent than last year, when seven participated, including the four vertebrate specialists.

What do the paleontologists expect to find in this and future expeditions? There is every expectation that more Lower Triassic reptile fossils can be found, possibly in abundant quantities. The discovery of a complete skull would be a scientifically important find, making possible more precise identifications than are now possible. With a skull, for instance, a paleontologist might be able to determine if the *Lystrosaurus* in Antarctica was of the same species as *Lystrosaurus* in South Africa.

Another frequently mentioned hope is to find an articulated skeleton. All the bones found so far were scattered randomly by the waters that washed them away. According to Breed, the chances of finding a complete skeleton in the sandstone of Coalsack Bluff were slim. The place to look would be in a deposit of clay which might have buried an animal in place.

Another possibility is that reptile fossils will be found of Permian Age, the geologic period immediately preceding the Lower Triassic.



The Beardmore Camp near Coalsack.

Most of the scientific attention in this past season's expedition has been directed to the land vertebrate fossils, but there were also some paleontological finds of other kinds that will possibly merit return looks. Dr. Paul Tasch of Wichita State University, who last year reported a fossil insect wing in Antarctic sediments (SN: 7/12, p. 30), this year collected in Jurassic sediments on Blizzard Peak and in the Marshall Mountain area many fossils of tiny fresh-water crustaceans known as clam shrimp. As with the vertebrates, their presence in Antarctica cannot be explained by the present positions of the continents.

On Storm Peak, 25 miles south-southeast of the Beardmore Camp, Dr. Elliot found a perfectly preserved fossil specimen of an inch-and-a-half-long Mesozoic fish that he believes may merit a return visit to the area next season. But its true importance has to await a determination of whether it is a salt-water or fresh-water fish.

As for reptiles of larger size and more recent existence than those of Coalsack Bluff, the paleontologists are not sure whether fossils of dinosaurs will be found in Antarctica. The dinosaurs rose to dominance in Jurassic times, some 50 million years later than the more primitive reptiles of Coalsack Bluff. Exposed continental sediments of Jurassic Age are not nearly as abundant as the Triassic rock formations.

Yet the surprises that have already come out of Antarctica have conditioned the paleontologists not to be dogmatic. "There is no evidence yet of dinosaurs in Antarctica," says Dr. Colbert, one of whose books describes the great dinosaur discoveries on the other six continents. "But until three years ago there was no evidence of reptiles either." □