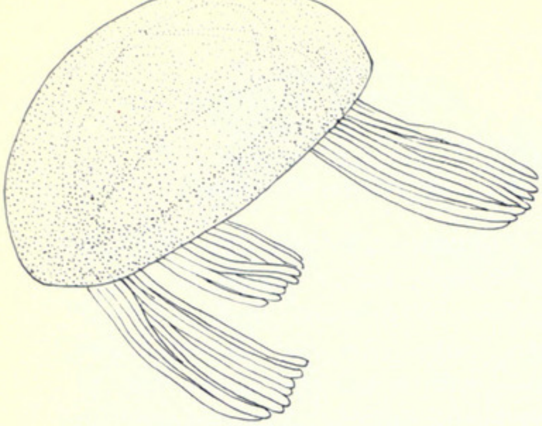

Anthracomedusa turnbulli

Jellyfish in them thar hills

by Eugene S. Richardson, Jr.
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The strip mines of Illinois are one of the two or three finest areas in the world for collecting invertebrate fossils. Behind the enormous coal mining machines of the Peabody Coal Company come the geologists, amateur and professional, searching for animals dead a quarter of a billion years. In this article, Dr. Richardson tells of two important finds from Pit Eleven, near Wilmington, Illinois. In two photo reports that follow, the Bulletin presents the lively Museum field crew that worked the area during the past summer, and a survey of the Pit Eleven fauna.

It's five million, six hundred thousand years to the mile. By the time you've driven fifty miles southwest from the modern center of Chicago, you step out of your car onto the 280,000,000-year-old rocks of the Pennsylvanian period in the spoil heaps of a strip mine outside of Wilmington, Illinois.

You have brought some peanut butter sandwiches (or other delicacy) and a jug of water, of course—and you're going to catch jellyfish. This is a field trip. Perhaps you are one of the Museum's field crew. Or perhaps you're one of the hundreds of amateur collectors who are drawn to this spot. In either case, you have come for fossils, the remains of prehistoric life. More importantly, you are helping in a nearly unique cooperative venture in which Museum scientists and amateur collectors pool their efforts to elucidate a part of the story of life in the vanished past.

Working alone or as members of the Earth Science Club of Northern Illinois, the Des Plaines Valley Geological Society or other such organization, a host of collectors pursue their hobby and the advancement of science at the same time. Returning home tired and happy after a day in the field, these enthusiastic cooperators wash their specimens, carefully identify them, catalog them, and put them tenderly away in museum-style cabinets. Many an architect in this area would be startled, revisiting what he had thought was to be a recreation room or a utilitarian basement, to find it brightly lighted, lined with handsomely built hardwood cabinets of shallow drawers, with perhaps a few glass-topped display cases or a work table with the latest stereo-zoom microscope.

If this is your first field trip, you look a bit uncertainly at the steep and random spoil heaps with their slippery surface of clay and pebbles. The spiky xerophytic vegetation that is beginning to cover the hills bites you on the ankle. The unshaded sun hammers down on your head and shoulders. You look hesitantly at that dark line in the west, remembering that this is "Tornado Alley." You wonder why some people prefer strip mines to the corn fields that were here.

But look now at some of those pebbles on the hillside. They are red, brilliant in the sunshine. They are symmetrically shaped, rounded, somewhat flattened. These are ironstone concretions, a thing apart, something special. A drab gray when first dug up by the giant excavating machinery, they redden—it's a kind of rusting—in a year or two as sun and rain and air attack them. When first dumped on the spoil heap, they were still encased in the drab gray shale where they grew an eon ago, formed by interaction of mineral-bearing water and an organic nucleus, an animal or a plant. The shale, exposed to weather, has now broken down to the clay of the hills, but the sturdy concretions remain. Some, you note, have broken in the winter frost and summer sun. You pick one up, already neatly split along its equator. There, in its center, is a neatly preserved shrimp, the fossil remains of a creature that lived here more than a quarter of a billion years ago, a specimen unseen by human eyes until you picked it up. Forget the slippery hills, the prickle-bushes, the beating sun! Forget the possible thunderstorm; you're out for fossils!

The strip mine was not actually dug for the purpose of turning up fossils. From the point of view of the operator (a curious view, perhaps) the fossils are a by-product and coal is what they're after. Fifty to a hundred feet below the flat farmland lies one of the most extensive beds of coal on this continent. Known here as the Wilmington Coal, it is the Colchester Coal of western Illinois, the Lower Kittanning Coal of Pennsylvania, and has other names where it is mined in Oklahoma, Missouri, Kentucky, Michigan and other states.

Coal, as is well known, is made up of the carbonized remains of plants. Plants in such numbers as to make up this vast bed mean a forest of uncommon size. Study of the Pennsylvanian rocks and coals by many geologists in the century past enables us to visualize this forest of the Wilmington Coal. Giant tree-sized ferns and horsetails and their allies, shallow-rooted, quickly growing, continually falling and accumulating on the sodden ground, lived in a vast flat swamp. Only under water can the fallen trees go through the proper chemical changes to become coal. Broad though that swamp forest was, it continually shifted its position, forming a broad band, probably hundreds of miles across, between an inland sea to the south and west and the modest uplands to the north and east. Trees on those uplands, falling on drier ground, decayed without trace while the trees in the great swamp built up the layer of substance that was almost coal. Sea level rose (or the crust of the continent sank); gently the sea advanced across Oklahoma, Missouri and Illinois. Now the former swamp forest was buried under sea-floor muds; the broad belt of swamp moved on ahead into what had been the uplands. For a while, when the shoreline lay here near Wilmington, the advance of the sea was halted.

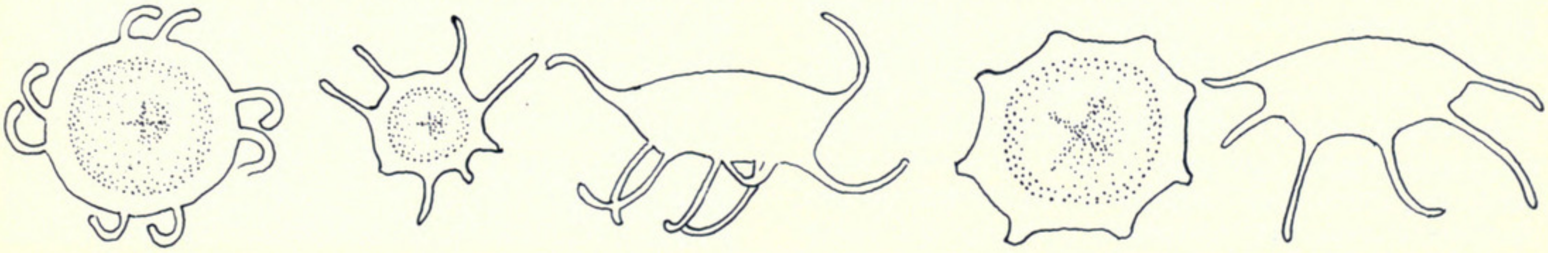
This was the time when the fossils that we find were living. For you are walking now on that former shore. But how shall we define that shore? It was no sandy strand with land on one side and sea on the other. Back into the swamp forest ran countless intricate inlets, bays, bayous and channels; far out to sea stretched a complex of islands, bars, peninsulas and shallows. Mud, carried through the swamp by sluggish streams, poured into the edge of the sea, building a delta. Like all deltas, it was chiefly under water. In time, before the sea resumed its march across the low and swampy land, the delta muds built up to a hundred feet in thickness. Now, this seems utterly improbable in water that we have solemnly declared to be shallow. The answer lies in the behavior of the earth's crust. Under the center of Illinois during this Pennsylvanian period the crust sagged more than elsewhere. While the shoreline tarried at the strip mines, the inland sea floor slowly dropped at about the same rate as the mud accumulated, and the water remained shallow.

Animals of many kinds lived on the flanks of the growing delta, drawn by the nourishing water near the swamp. Worms and snails, shrimps and clams, chitons and sea-cucumbers moved about on the mud surface, some in great numbers. Through the murky water swam Tully Monsters, sharks, bony fishes, shrimps, scallops and many others. The water draining from the land carried along fronds and pinnules, spores, stems and seeds; insects, thousand-leggers, spiders and little amphibians drifted with them out onto the delta.

All of these and more, falling to the sea floor, were quickly covered by the raining mud—so quickly on the whole that they had no time to decay before they were encased forever in the firm sediment. Before decay could attack, each little fossil-to-be was locked into place by a halo of iron mineral that soaked and hardened the shale it lay in. Teeth and bones remained unchanged as time went on; shells changed from one limy mineral to another or dissolved, leaving a perfect mold.

But what of the soft tissues of the animals? They broke down chemically after having left their impress upon the rock. All that remains today for the collector is the impression, plus some invisible amino acids and other organic compounds that have soaked into the rock. Except in these strip mines, it is most extraordinary to find even an impression of a soft-bodied animal such as a Tully Monster or a worm —or a jellyfish. Many of these impressions, exposed on the broken equator of a split concretion, have almost no relief—no ups and downs. It is the organic leftovers that finally make them visible. When a concretion has been cracked by sun and frost, the inside surface is exposed to two powerful oxidizing agents, sun and air. Between them, they make the ironstone turn red, just as the outside of the concretion did before. But where the amino acids had soaked the rock, on the impression of the fossil, they take up the oxygen before the iron gets it, and the impression remains pale.

Drawings, by the author, of five different specimens of Octomedusa pieckorum. Invertebrate fossils may be preserved at any angle, and a series such as this provides a great deal of information about the animal.



Often we find pale markings of no definable shape. Those unrecognizable ones must represent some of the shapeless masses of jelly-like material that lie about on any sea floor. There was enough to them to start the chemical process that built a concretion, but they tell us nothing definite. Others have a shape revealing some soft-tissued creature gently buried while yet intact. Among these are brilliantly visible jellyfish.

Here and there about the world there have been finds of fossil jellyfish. The *Treatise on Invertebrate Paleontology*, which will occupy a four-foot shelf when fully published, devotes only 27 pages to an exhaustive survey of the world's fossil jellyfish. They are not abundant. But they are disproportionately interesting because they represent unusual forms of preservation. Paleontologists, like other people, savor exceptions. One treasures the improbable. We like jellyfish.

A few years ago, one of the collectors cooperating with the Museum, Jim Turnbull of Libertyville and the U. S. Marines, dropped in to see us with a perfectly fine jellyfish in one of the familiar ironstone concretions. Recognizing its significance, Jim kindly gave it to the Museum for permanent deposit. We jokingly ordered some more. He returned to the strip mines, to the hill where he had found that one, and the following week was back with two more, which he also deposited with us.

Jim's jellyfish are large and splashy specimens, four or five inches across the bell, with groups of tentacles almost that long hanging from four corners. Faint dark lines crossing the bell correspond to certain structures known as *septa* that similarly divide the bell of some modern jellyfish into four areas. When Professor Ralph Johnson saw the specimens, he recognized them as being very clearly members of a living group, the Order Carybdeida, but a species new to science.

Somewhat earlier, I had the privilege of examining the collection of Mr. and Mrs. Ted Piecko of Chicago, collectors who also cooperate with the Museum. Among their fossils were several small concretions containing another kind of jellyfish. The Pieckos generously deposited several of them at the Museum. The Piecko specimens were tiny, less than an inch across, light pink against a darkly oxidized background. They had eight stubby little tentacles evenly spaced around the edge, with a *velum*, or little shelf, around the inner edge of the bell. But the clinching point was the mouth, a small x-shaped impression on a little mound in the center. Again, an undoubted jellyfish, but one not so closely modeled on the lines of any known modern form.

Now we had two kinds of Pennsylvanian jellyfish from the strip mines. As Dr. Johnson and I visited collections in the homes of other cooperative strip-mines enthusiasts, we saw other specimens of the same two jellyfish, but no additional forms. It was time to make them known to science.

Thereupon, according to the time-honored practice of collaborating authors, Dr. Johnson wrote the descriptions and handed me the typescript. I made changes and additions and subtractions in red pencil and handed him the mutilated remains. He rearranged it, keeping some of my work and restoring some of his. This resulted in a nice, clean typescript; I made some more red hen-tracks. He weeded them out, the paper was re-typed, and we submitted the result to the Chief Curator of Geology. From him it went off to a reader outside the Museum and returned with blue pencil marks. We accepted some of the pencilling, re-typed the manuscript, and sent it again to the Chief Curator, from whom it went first to the Director and then to the Editor. Even so does a legislative bill pass from House to Senate to President to Printer. In due course the Museum Press produced a nicely printed little book on the jellyfish, the product of two authors and with the advice and consent of an adequate chain of authority.

Octomedusa pieckorum

He who puts a fossil (or a living animal or plant) upon the record for the first time, has the prerogative of devising its scientific name. Some of these names are frightful jawbreakers and should never have been thought up; others may conceal a story or a joke. Often the scientific name is based on the collector's name. We elected this latter course, in recognition of the collecting prowess of the donors of the jellyfish. *Anthracomedusa turnbulli* says in Greek (*Anthracomedusa*) "Coal-Age Jellyfish" and in Latin "of Turnbull." Similarly, *Octomedusa pieckorum* means "Eight-sided Jellyfish" (in Greek) "of the Pieckos" (in Latin).

Soon after this little book appeared, copies of it came into the hands of our cooperating collectors. Mr. A. W. Kott, of Summit, Illinois, dropped in to see us one day and received a copy. 'So that's what the jellyfish look like, is it?' said he. 'Yes,' I replied; 'They're very rare.' Having studied the pictures, Mr. Kott went forth into the spoil heaps and was back at the Museum again the following week—with four hundred specimens of the little *Octomedusa*.

We are in a position to say that there are jellyfish in them thar hills.