Namibian fossils reveal ancient oddities

Paleontologists working in Namibia have unearthed the remains of an evolutionary enigma—a fossil so bizarre that it doesn't fit easily into the modern categories of animals, plants, or any other kingdom. The organism, which lived more than half a billion years ago, flourished alongside a broad array of unclassifiable species that filled the oceans immediately before the explosion of animal life in the Cambrian period.

The newly identified fossils, called *Swartpuntia*, look somewhat like a revolving door the size of a hand. In life, the organism had at least three vertical sheets attached to a central stalk that grew up from the seafloor, says Guy M. Narbonne of Queen's University in Kingston, Ontario. Narbonne and his colleagues report their discovery in the November JOURNAL OF PALEONTOLOGY.

Swartpuntia is the most recent addition to a group of organisms known as the Ediacaran biota, which first appeared about 600 million years ago and went extinct at the start of the Cambrian, 543 million years ago. Found around the world, Ediacaran fossils represent the first large, complex creatures to appear on Earth. The Namibian site captures a snapshot of these species immediately before they disappeared.

"These are probably the youngest Ediacaran fossils in the world. They provide us with a glimpse of the climax of Ediacaran evolution just prior to the Cambrian explosion," says Narbonne.

When researchers first uncovered a large number of these fossils in the 1940s in South Australia, they interpreted the Ediacaran biota as the earliest animals. In the 1980s, however, Adolf Seilacher of Tübingen University in Germany argued that they were neither animal nor plant but belonged instead to an extinct kingdom of life constructed like fluid-filled versions of the Michelin Man, a well-known tire company mascot. Seilacher named them vendobionts (SN: 7/8/95, p. 28).

The Namibian discovery provides new support for part of Seilacher's idea. The flat sheets of *Swartpuntia* consist of a series of inflated chambers, matching the vendobiont model, says Narbonne. They grew in shallow waters and may have harbored photosynthetic algae or bacteria. He categorizes *Swartpuntia* and similarly constructed species as members of an extinct group that may fit into the animal kingdom or may represent an extinct kingdom of life.

First unearthed in Namibia in 1995, *Swartpuntia* has more recently turned up in North America, according to Benjamin M. Waggoner of the University of Central Arkansas in Conway. Waggoner found a specimen this February while conducting fieldwork in southern Nevada, he reported last month at a meeting of the Geological Society of America.

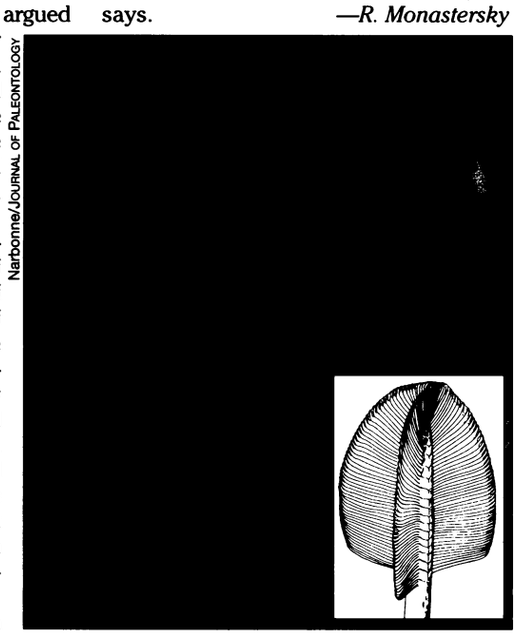
Waggoner agrees that *Swartpuntia* and several other Ediacaran species belonged to a group of sheetlike, inflated creatures. "I'm not so sure where they should be placed on the tree of life. I'm remaining agnostic on that larger issue."

Not all Ediacaran species remain mysterious, however. Earlier this year, Waggoner identified a fossil called *Kimberella* as a close relative of a mollusk (SN: 8/30/97, p. 132). Other Ediacaran fossils record the tracks that worms made in the seafloor.

Even as they struggle to decipher what the various Ediacaran organisms were, paleontologists are attempting to understand what happened to these diverse life forms. Narbonne lists three possible reasons for their demise.

One is that these large, soft, defenseless creatures could not survive after the first predators evolved. Another possibility is that some Ediacaran species actually persisted into the Cambrian but failed to fossilize because worms started to churn up the seafloor.

A third explanation arises from studies of the ratio of two carbon isotopes, which reveal an abrupt change in seawater chemistry at the end of Precambrian time. "This is the most profound, sharpest excursion in carbon isotopes in Earth's history," says Narbonne. The geochemical upheaval could have hastened the Ediacarans' extinction, he says. —*R. Monastersky*



Narbonne/JOURNAL OF PALEONTOLOGY

Puzzling Namibian fossil and a reconstruction of the organism (inset).

Birds may find way with cognitive map

No matter where they roam, many animals return regularly to their nesting grounds, food storage sites, or other key locations. However, researchers have yet to determine conclusively whether any of these creatures constructs a mental picture of real-world landmarks, also known as a cognitive map, that guides them to their destinations.

Members of one bird species, the Clark's nutcracker, display a type of geographic insight which suggests that they may indeed consult cognitive maps, according to a report in the Nov. 20 NATURE. After learning that they can recover edible seeds at the halfway point between two landmarks that vary in the distance that separates them, Clark's nutcrackers consistently seek out that midpoint in new situations.

"This finding is consistent with the existence of a cognitive map in Clark's nutcrackers, but it's not conclusive," says psychologist Alan C. Kamil of the University of Nebraska in Lincoln, who conducted the investigation with Nebraska colleague Juli E. Jones.

Many animals have shown an ability to reach a desired location on the basis of its distance and direction from a stable landmark, but Clark's nutcrackers navigate according to abstract geometric relationships between pairs of moving landmarks, Kamil and Jones assert.

Clark's nutcrackers avidly store seeds in the wild. A single bird may bury as many as 25,000 seeds in several thousand places during the fall, returning as many as 9 months later to dig up the booty.

In a large observation room, five nutcrackers readily learned to retrieve seeds buried by the scientists halfway between a green pipe and a yellow pipe. During the training, the short, vertical pipes were always oriented along a north-south line, but the distance between them was varied.

In trials featuring five new distances between the pipes, the birds flew to the halfway points, where the researchers had again buried seeds.

The animals strayed slightly from the halfway mark when the landmark orientation was rotated 45° from the north-south line. They veered even farther off course when facing a 90° rotation. As the degree of rotation increased, Kamil theorizes, the birds were more apt to take their bearing from a single landmark rather than compare bearings from both landmarks.

Further research is needed to explore whether pigeons and other avian species also exploit geometric links between landmarks as they move about, remarks psychologist Sara J. Shettleworth of the University of Toronto. —*B. Bower*

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