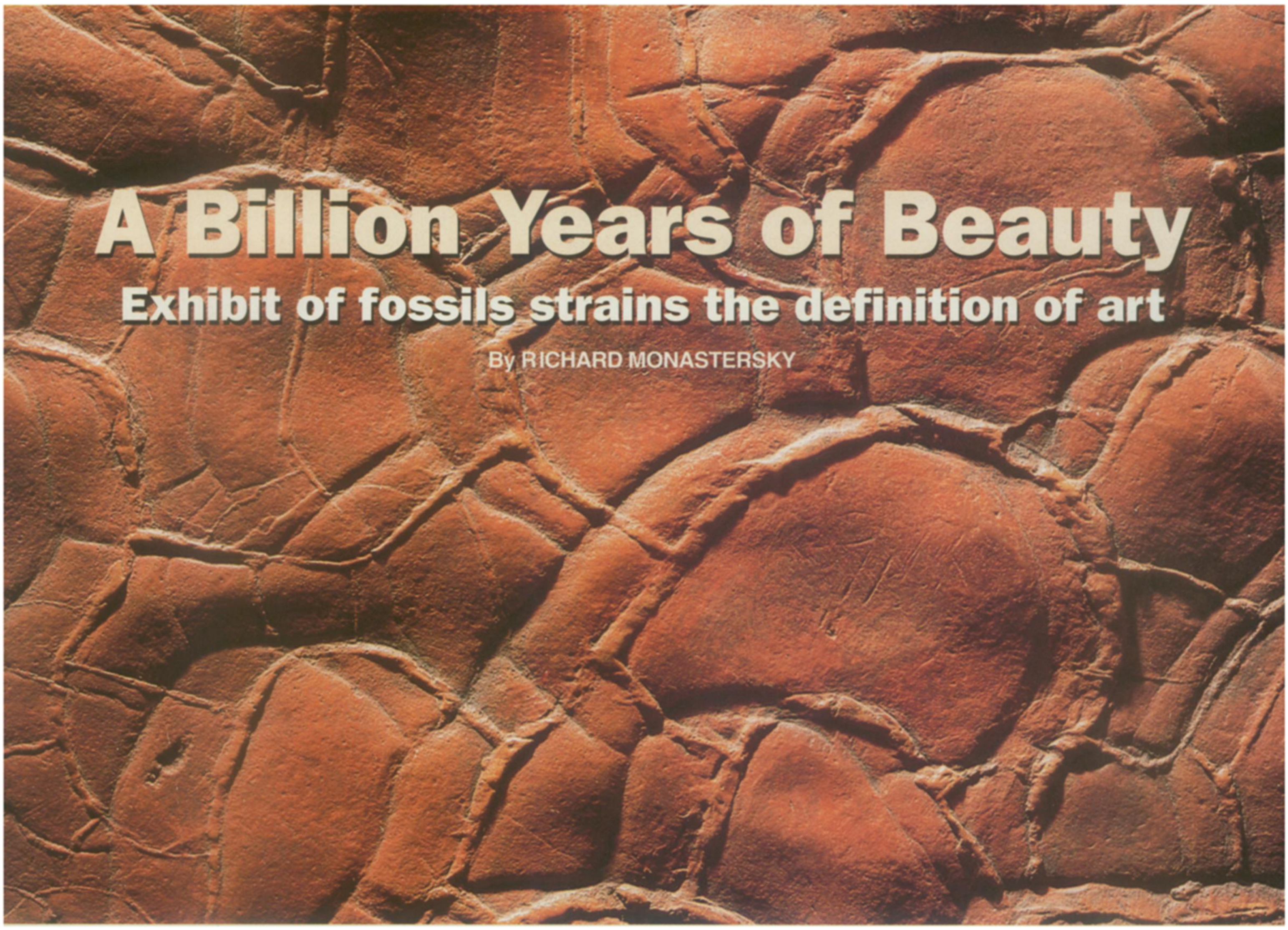
A Billion Years of Beauty

Exhibit of fossils strains the definition of art

By RICHARD MONASTERSKY



William K. Sacco

Mud Cracks. *This complicated pattern, found in the Fish River Canyon of Namibia, formed almost 600 million years ago in the late Precambrian era. A muddy layer of sediments got trapped between two sheets of sand. As more sediments piled on, the mud compacted and broke into characteristic hexagonal plates. The sand layers compacted less and filled in the spaces between the pieces of mud, which eventually turned into shale. Millions of years later, the upper sandstone layer and the shale eroded away, leaving behind the sandy dividers on top of the underlying sandstone. The pattern is doubled, as in a poorly printed newspaper, because the two sandstone layers slipped out of register when the Namibian rocks were pushed up into mountains.*

Visitors shuffling through Yale University's Peabody Museum of Natural History may find themselves scratching their heads when they reach the so-called hall of mammals. Missing are the sabertooth cat, giant sloth, dire wolf, and many other long-time residents of this room.

Instead, viewers encounter a series of 6-foot-tall stony slabs, mounted vertically like paintings and illuminated from above by spotlights. Each of the intricately patterned panels carries a fanciful title but little else in the way of explanation—a style more in keeping with an art gallery than a scientific exhibit.

One piece bears the name "Shrimp Burrow Jungle" and looks like a Jackson Pollock drip painting stripped of its colors. Another jagged slab, called "Nature as Fingerpainter," is covered with curvy wrinkles that bring to mind thumbprints or the fleshy folds of an infant's skin.

These giant blocks are part of the exhibit "Fossil Art," which has been touring North American natural history museums for the past year. Created by German paleontologist Adolf Seilacher, the show explores how the blossoming of animal life transformed the landscape of the ocean bottom. At the same time, Seilacher's displays delve into the murky chasm separating art from science, forcing viewers to consider how the two endeavors overlap. In the process, it raises the thorny question, Can fossils be considered a form of art?

"The whole exhibit tries to bridge the cultural divide between arts and sciences because this is an ingrained division that is not necessary and natural," says Seilacher, a professor at both Yale University and Tübingen University in Germany.

Despite the name of the show, the panels at the Peabody are not actual fossils. Rather, they are epoxy replicas of stone surfaces that Seilacher and his Tübingen crew visited in Australia, Canada, France, Germany, India, Italy, Japan, Libya, Namibia, Pakistan, Scotland, Spain, and the United States.

Seilacher embarked on his artistic quest in 1992, after winning the prestigious Crafoord Prize from the Royal Swedish Academy of Sciences for his contributions to paleontology. To make a dramatic statement that could compete with the dinosaurs in most museums, Seilacher came up with the plan to display large sections of bedding planes—sheets of former seafloor sediments sculpted many millennia ago by water and animals.

Because the team could not remove the giant blocks of rock, museum preparator Hans Luginsland used latex and silicone to make high-quality casts of them. After the casts dried, the team rolled them up like carpets. Back in Germany, the molds were used to recreate the original stone surfaces.

The bedding planes reveal a different facet of paleontology than most museum fossil displays do. Typical exhibits—dinosaur skulls, mammoth tusks, trilobites—present the anatomy of extinct creatures. Most of the surfaces in "Fossil Art" preserve the impressions made by bygone beings instead of presenting the animals themselves.

"With just two or three exceptions . . . all of Seilacher's examples represent the activities and behaviors of organisms—burrows, traces, tracks, and trails—rather than their overt anatomies. Thus, we learn that organic effort can be as beautiful as organic form," says Harvard paleontologist Stephen J. Gould in a foreword to the exhibit catalogue. He calls Seilacher "the acknowledged master" in the field of deciphering such traces, a discipline called ichnology.

"Fossil Art" starts off with examples of nature's trickery, with fossil-like patterns that formed long before animals ever started sculpting the seafloor. Reaching back over a billion years ago, the exhibit's first pieces display rippled shapes carved not by organisms but by ocean currents, waves, and the slow compaction of seafloor sediments.

Jens Rydell

Lasso Trail. *A half-billion years ago, just after the Cambrian evolutionary explosion, an animal left behind this looping trace, called* Psammichnites gigas, *in Spanish sandstone. Though researchers do not know what creature left these marks as it crawled beneath the seafloor, the details of the trackway provide "a phantom image of the animal," says Adolf Seilacher. "It moved through the sediment like a submarine, being connected with the sediment surface only by a narrow snorkel. During locomotion, this snorkel swayed to and fro, leaving behind a sinusoidal trace like a pendulum would if it were mounted in the back of a toboggan." The zigzag pattern runs down the middle of the track.*

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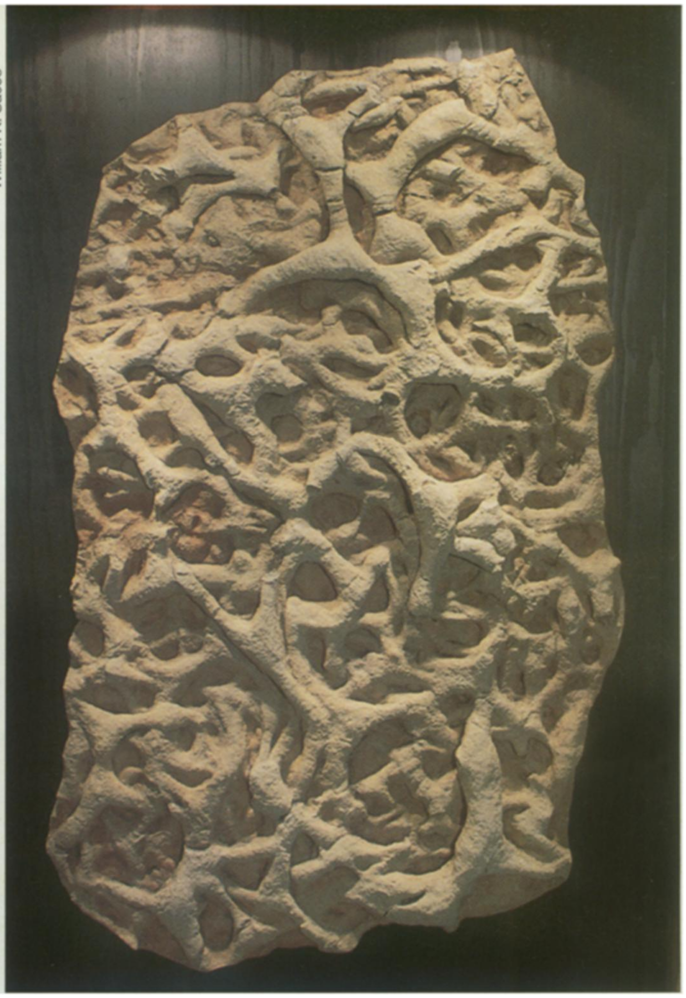


Shrimp Burrow Jungle. *A tapestry from the Triassic period, this cast of a limestone bedding plane from central Italy shows the burrows created by mole shrimp more than 200 million years ago. Modern species of mole shrimp create similar tunnels by using their strong legs to dig several meters below the seafloor. Where three tunnels meet, the shrimp excavate an expanded junction where they can somersault to change direction. Wider sections may be used for storing or processing food, says Seilacher.*

Fooled by such intricate forms, paleontologists have sometimes categorized them as fossils and given them Latin names.

Seilacher has debunked several such pseudofossils, but he now sits on the opposite side of the debate regarding one specimen. Last year, he and his colleagues reported finding worm burrows in a 1.1-billion-year-old rock from India (SN: 11/1/97, p. 287), the actual specimen of which is on display in the exhibit. These marks would push back the record of animal life by a half-billion years, but some other paleontologists think that Seilacher has himself been fooled in this instance (SN: 10/17/98, p. 255).

From the Indian specimen, the exhibit moves to its main feature—the pivotal period when life grew more complex and began covering the seafloor with biological graffiti. This evolutionary revolution spanned the end of the Precambrian era and beginning of the Cambrian period, from some 600 million to 520 million years ago.

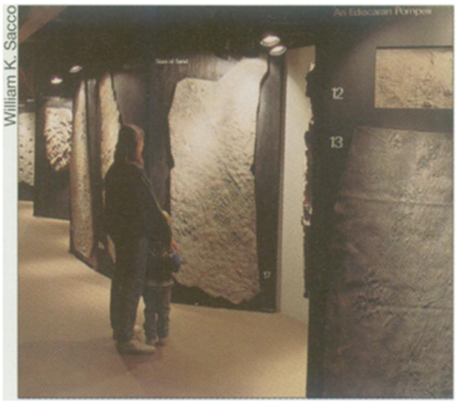
Before this time, Earth's oceans had teemed with bacteria and other microbes that first appeared at least 3.5 billion years ago. These minute forms had the run of the planet until the late Precambrian, when a smorgasbord of enigmatic beings appeared, some the size of dinner tables. Called the Ediacaran biota, these hard-to-categorize organisms apparently led a peaceful lifestyle, passively soaking up energy from the sun and from chemicals in the ocean. Mobile animals also lived at this time, but they dwelled in the shadow of the more massive and abundant Ediacarans (SN: 11/22/97, p. 326).

At the start of the Cambrian, life took a turn toward the swift and savage. Driven by an escalating arms race between predators and prey, species started acquiring elaborate shells and hard skeletons. Other creatures, escaping from the fury, began mining food from beneath the seafloor. They churned up the sedimentary layers and opened up entirely new habitats. In a shrug of geologic time, most of the modern animal phyla appeared and began leaving elaborate trails in the sea bottom.

Seilacher describes all this in detail in the catalogue to the exhibit, but he has intentionally left such information off the fossil displays. He forces people to confront them first as pure designs, as pieces of abstract art.

The success of that gambit depends, not surprisingly, on the eye of the beholder. Sally Hill, an exhibit designer at the Eli Whitney Museum in Hamden, Conn., says that the fossil replicas fit her own personal definition of art. "The object is art because you enjoy looking at it as art, in my mind," she says. "To me, the scale of them and the texture of them makes you want to touch them, to feel them, to eat them. They're really beautiful."

As yet, however, Seilacher has not managed to interest an art museum or gallery in taking the "Fossil Art" show, which will travel next to the Nova Scotia Museum of Natural History in Halifax.


William K. Sacco

Museum goers take in ancient aesthetics at Yale University.

Some within the art community have trouble with Seilacher's attempts to characterize the fossils as art. "That I find just naiveté. That I can't accept," says Richard S. Field of the Yale University Art Gallery, who spoke at a panel discussion on the exhibit last month. "You can't take a cast of a fossil bed and say that it's art. It has nothing to do with human intention. . . . You can't credit the mollusk and the trilobite with having intention," he says.

Photographer Richard Benson, dean of Yale University's School of Art, took a different view during the discussion. "As a practicing artist, I'm interested in art that human beings make, and human beings making the thing is part of the defining aspect of art," says Benson. "You could make the case that [Seilacher] is the artist," he says, because the scientist fashioned the casts.

Seilacher balks at that role, though. "I have no interest in being called an artist or to be an artist." To him, nature has played the role of the artist by producing something captivating that can move people and invite meditation.

Through the power of this experience, Seilacher hopes to dispel the popularly held conception that science and emotion are antithetical. "The sense of visual fascination is at the base of many scientific discoveries and descriptions. We should not shy away and say that science is something else, that science is not appealing to the emotion. I think emotion is a large part of it. But of course, the emotion has to be controlled by reasoning and arguments and so on."

Field agrees with Seilacher that science and art have far more in common than many people realize. "Dolf wants to bring the two cultures together, and this is a great exhibition for showing that art and science are not that far apart," he says. "One could argue that the arts are a form of inquiry just as the sciences are. In fact, there isn't such a great difference." □

Earth Science

From a meeting of the American Geophysical Union in San Francisco

Central U.S. quake threat debated

Geoscientists might have vastly overestimated the earthquake hazard of the Missouri boot-heel region, according to a new study of geologic stress in that area.

The Mississippi valley near New Madrid, Mo., is famous among geologists because it spawned three great earthquakes—some of the United States' largest shocks on record—in the winter of 1811–1812. Given that history, researchers have regarded the New Madrid fault zone as the biggest quake threat in the central United States.

That view gained support from 1991 surveying measurements that indicated the ground was warping rapidly. New data, however, suggest that the original findings were themselves warped. "It is very unlikely that in the next 5,000 years we will see another great earthquake in New Madrid," says Seth Stein of Northwestern University in Evanston, Ill.

Stein and his colleagues used Global Positioning System (GPS) satellites to track ground motion around the New Madrid region from 1991 to 1997. They found no evidence that the region is storing up geologic stress, he says.

The group that did the original study now reports findings similar to those of Stein. After resurveying the region and obtaining a longer, better record, scientists from Stanford University and the University of Connecticut in Storrs conclude that the ground is warping at no more than 10 percent of the rate they previously reported, says Paul Segall of Stanford.

Segall and his colleagues disagree, however, with Stein's conclusions. "I'm a little alarmed by [him] saying that the earthquake hazard at New Madrid has been grossly overstated. That's premature," says Segall. "He may be right, but we don't know that."

Current conditions may not reflect what the fault has been doing over the past 2 centuries, says Segall. There are theoretical reasons to suspect that the ground stored up substantial stress after the quakes of the early 19th century. —*R.M.*

The swell side of El Niño

The oceanic fever known as El Niño recently heated up the planet so much that Earth temporarily took on a bloated appearance. Satellite measurements show that the average height of the ocean surface increased dramatically by 20 millimeters during 1997 and then fell in 1998—a natural cycle that could hinder efforts to detect any human-caused climate change.

The U.S.-French satellite, called TOPEX/Poseidon, gauges sea level by bouncing radar beams off the ocean surface. According to the radar data, sea level started rising precipitously in early 1997 in concert with the warming of the tropical Pacific. The ocean surface then fell as El Niño waned this year. This is the first time that scientists have measured El Niño's effect on sea level, says R. Steven Nerem of the University of Texas at Austin.

The discovery that El Niño can cause such drastic expansions of the ocean will complicate future climate studies, says Nerem. From long-term tidal records, oceanographers know that global sea levels have been climbing gradually at a rate of nearly 2 mm per year. Computer climate models suggest that the rate should start to accelerate as greenhouse gas pollution warms the climate, which melts glaciers and causes sea water to expand.

"If you have such large sea-level variations in [El Niño], it's going to be hard to detect climate change," says Nerem. The large natural swings will initially dwarf any subtle acceleration; to detect this change, satellite radar would have to continuously monitor sea level for 30 years, he concludes.

TOPEX/Poseidon, launched in 1992, has already lasted well beyond its planned lifetime. The French-U.S. team plans to send up a similar radar instrument in May 2000. —*R.M.*