The oldest sponges: A scratchy way of life

A team of paleontologists working in Mongolia has discovered the earliest conclusive evidence that sponges thrived on the seafloor just before the start of the Cambrian period 544 million years ago. The find represents an evolutionary benchmark for these scientists, who regard sponges as the most primitive multicellular animal, says Martin Brasier of the University of Oxford in England.

The Mongolian sponges lived at a pivotal point in Earth's history, when the ancestors of most modern animal groups appeared suddenly in the seas. Prior to this so-called Cambrian explosion, the oceans were home to a perplexing group of creatures known as the Ediacaran fauna—simple organisms that paleontologists find it difficult to categorize (SN: 7/8/95, p. 28).

Unlike their Ediacaran contemporaries, however, the Mongolian fossils present no puzzles: They consist of tiny glassy spikes identical to the spicules of some sponges today. "These are absolutely unequivocal," says Brasier. "An awful lot of what we get out of the Ediacaran fauna and the Cambrian explosion doesn't have any clear relative today and is very paradoxical."

Measuring one-tenth of a millimeter across and made of silica, the Mongolian spicules formed a rudimentary glassy scaffolding—one of the earliest animal skeletons. Still common today, such glass-barbed sponges are quite different from their smoother relatives, which can be harvested for use in the bathtub.

Several researchers have reported other finds of Precambrian sponge spicules, but many turned out to be volcanic shards or mineral crystals and all remain controversial, says Brasier. In Australian rocks of Ediacaran age, paleontologists have found round fossils that they identify as the compressed bodies of sponges. Some researchers, however, have questioned whether these spiculeless impressions were indeed sponges.

Because the Mongolian spicules are easy to interpret, paleontologists are confident that the creatures lived as modern sponges do, by filtering nutrients from the water. The Precambrian remains therefore provide the earliest example of filter feeding, an extremely common mode of life in the modern seas.

Paleobiologist Andrew H. Knoll of Harvard University says that Brasier and his colleagues, who report their discovery in the April GEOLOGY, have clearly documented the existence of sponges in the latest stage of the Precambrian period. This find confirms what many researchers have long believed—that sponges and more complex animals must have evolved by the time the Ediacaran fossils appeared around the world. *—R. Monastersky*

Brasier

Pieces of the oldest known sponges.

Grains sort themselves into layers

Separating glass from sugar sounds like a tedious task requiring tweezers and tenacity, but a group of physicists has found an easier method. In experiments described by Hernán A. Makse of Boston University in the March 27 NATURE, glass beads and grains of sugar sorted themselves into layers when poured slowly into one end (left, in this photo) of a deep, narrow glass container.

The glass beads (white) tumbled to the bottom of the pile sooner than the sugar grains (dyed red) because of the beads' smaller size and smoother surface. The beads accumulated there, creating a barrier that grew leftward and upward until it formed a complete layer. The larger, rougher sugar grains rolled over the layer of beads, which acted as ball bearings. Once the grains reached the bottom, they also began to form a roadblock. Alternate layers of glass and sugar continued to build up simultaneously.

Understanding this phenomenon could help explain how rock slides destroy towns far from where an avalanche begins and might benefit industries that mix and transport small grains, writes Jay Fineberg of the Hebrew University of Jerusalem in an accompanying commentary.

— P. Smaglik

Makse et al./NATURE

Enriched mice show adult neuron boost

If you want to liven up the cages of laboratory mice, try giving them paper and plastic tubes, nesting material, a fiber tunnel with several openings, and a running wheel from an early age. Not only do the rodents revel in this type of enriched environment, but so does a part of their brain involved in learning and memory, a new study finds.

Compared to adult mice living in cages containing simply food and water, grown mice living in the above conditions—as well as receiving treats such as cheese and popcorn—exhibit many more nerve cells in one portion of the hippocampus, contend neuroscientist Fred H. Gage of the Salk Institute for Biological Studies in La Jolla, Calif., and his coworkers.

That enrichment translates into an average of 40,000 more neurons in tissue that serves as an entryway for information from the brain's outer layer into the hippocampus and its adjoining structures, Gage's team reports in the April 3 NATURE. Neuron production typically continues in this part of the rodent hippocampus throughout adulthood.

"We were overwhelmed by the magnitude of the increase, which represents a gain of 15 percent in the number of these nerve cells," Gage remarks.

Researchers have already noted that adult rodents in enriched surroundings perform better on tests of learning and memory. Attempts to explain this effect have focused on possible increases in the number and strength of connections between neurons, whereas the new data also implicate cell proliferation in at least one brain region.

The scientists randomly assigned 24 mice to a standard or an enriched cage at the age of weaning, 21 days, when the animals are ready to live independently. Forty days later, the enriched group performed better on a maze task.

At that time, microscopic analyses of the brains of five animals from each group showed no differences in number of hippocampal cells. Four weeks later, however, the remaining enriched mice had more of these cells than the other mice.

An enriched environment may foster the survival of new hippocampal cells rather than simply generating more of them, Gage theorizes.

"This study is a breakthrough in our knowledge of what can go on in adult animal brains," says neuroscientist William T. Greenough of the University of Illinois at Urbana-Champaign.

However, he adds, the significance of the findings for humans is unclear. Some investigators suspect that in primates, the hippocampus generates no new neurons after birth. *—B. Bower*