

Antarctic microbes live on previously unsuspected edge

National Science Foundation

An unmapped reservoir of briny liquid chemically similar to sea water, but buried under an inland Antarctic glacier, appears to support unusual microbial life in a place where cold, darkness, and lack of oxygen would previously have led scientists to believe nothing could survive, according to newly published research.

After sampling and analyzing the outflow from below the Taylor Glacier, an outlet glacier of the East Antarctic Ice Sheet in the otherwise ice-free McMurdo Dry Valleys of Antarctica, researchers believe that, lacking enough light to make food through photosynthesis, the microbes have adapted over the past 1.5 million years to manipulate sulfur and iron compounds to survive.

The microbes also are remarkably similar in nature to species found in marine environments, leading to the conclusion that the populations under the glacier are the remnants of a larger population of microbes that once occupied a fjord or sea that received sunlight. Many of these marine lineages likely declined, while others adapted to the changing conditions when the Taylor Glacier advanced, sealing off the system under a thick ice cap.

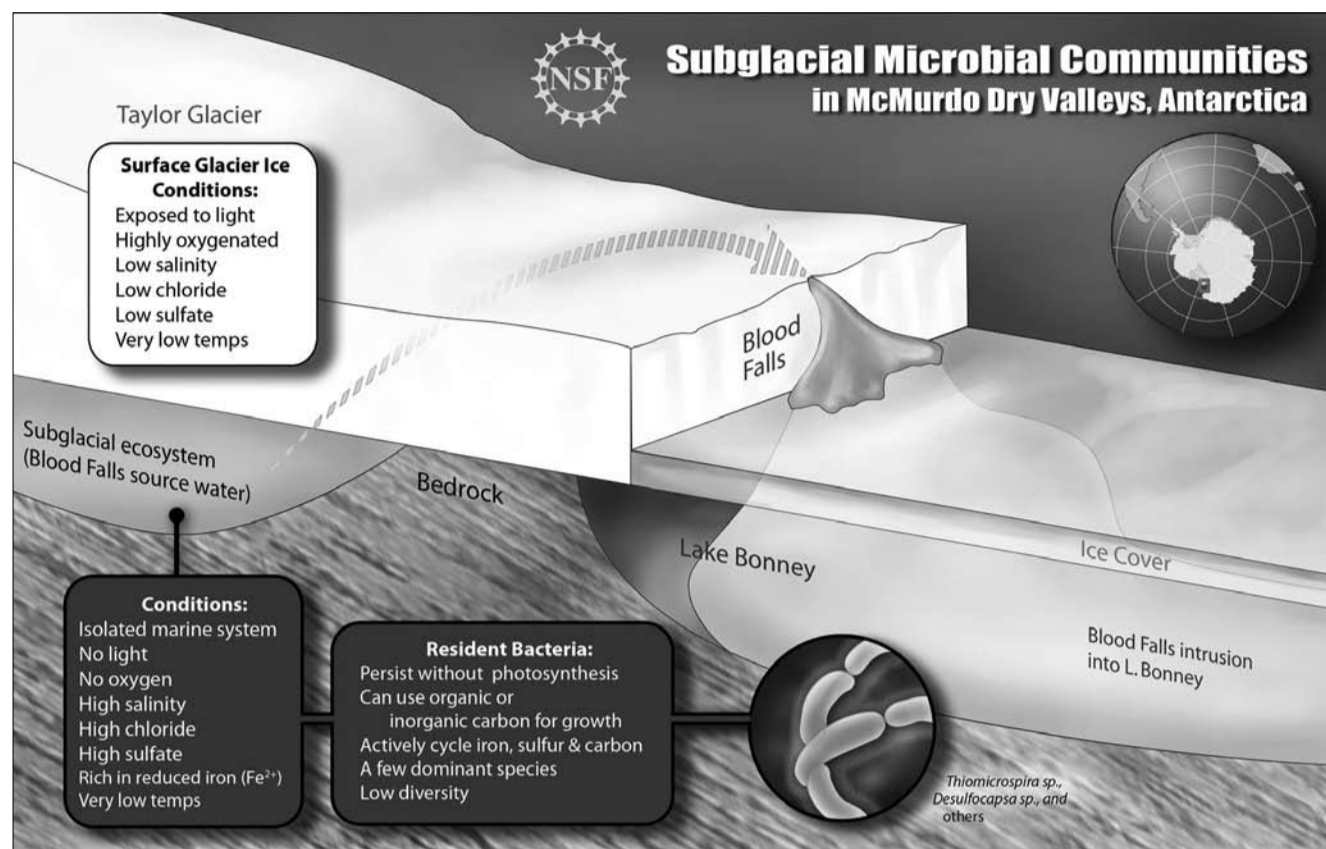
The research was published in the April 17 edition of the journal *Science*.

The research answers some questions and raises others about the persistence of life in extreme environments such as under glaciers, or even in liquid lakes trapped miles under the Antarctic ice sheet—environments that until recently scientists would not have believed could support living creatures.

“Among the big questions here are: ‘How does an ecosystem function below glaciers?’ ‘How are they able to persist below hundreds of meters of ice and live in permanently cold and dark conditions for extended periods of time, in the case of Blood Falls, over millions of years?’” said Jill Mikucki, the lead author on the paper.

Mikucki is a National Science Foundation-funded researcher at Dartmouth College in the Department of Earth Sciences and a Visiting Fellow at the Dickey Center for International Understanding and its Institute of Arctic Studies.

The Dry Valleys are completely devoid of animals and complex plants, and scientists consider them to be one of Earth’s most extreme deserts.



PERSISTENT MICROBIALS: A cross-section of Blood Falls showing how microbial communities survive. ZINA DERETSKY/NSF

The valleys receive, on average, only 3.93 inches of snow each year. Despite the lack of precipitation, during the Antarctic summer, temperatures rise just enough for glaciers protruding into the valleys to begin melting. The meltwater forms streams that enter lakes covered by ice that is two to three stories thick.

Mikucki and her colleagues based their analysis on samples taken at the ominously—but aptly—named Blood Falls, a waterfall-like feature at the edge of the glacier that flows irregularly but often has a strikingly bright red appearance in stark contrast to the icy background.

The Dry Valleys have been the target of scientific inquiry since the early days of Antarctic exploration in the so-called Heroic Age early in the 20th century. Even the earliest explorers noted the massive stain at the snout of the glacier and speculated as to what may have caused it.

“The original explorers thought that red alga was responsible for the bright color,” Mikucki said.

More than a century later, the Dry Valleys remain a source of immense scientific curiosity. One of NSF’s Long-Term Ecological Research projects network of 26 sites worldwide is located there. And, as part of its research program during the International Polar Year (IPY), NSF supported an extended research

season in the Dry Valleys, allowing scientists for the first time to stay in the field as six months of darkness descended to study how the microscopic creatures there reacted.

NSF administers the U.S. Antarctic Program and was the lead U.S. agency for IPY.

In the paper, however, Mikucki and her colleagues argue that the creatures that survive under the Taylor Glacier are both far more exotic and far more adaptable than the early explorers thought.

Because the outflow from the glacier follows no clear pattern, it took a number of years to obtain the samples needed to conduct an analysis. Finally she obtained a sample of an extremely salty and clear liquid for analysis.

“When I started running the chemical analysis on it, there was no oxygen,” she said. “That was when this got really interesting, it was a real ‘eureka’ moment.”

Further genetic analysis suggests that of the relatively small numbers of microorganisms found in the brine, “the majority of these organisms are from marine lineages,” she said.

In other words, the microorganisms are more similar to those found in an ocean than on land, but capable of surviving without the food and light sources available in the

open ocean.

“The salts associated with these features are marine salts, and given the history of marine water in the Dry Valleys, it made sense that subglacial microbial communities might retain some of their marine heritage,” she added.

This led to the conclusion that the ancestors of the microbes beneath the Taylor Glacier probably lived in the ocean many millions of years ago. When the floor of the valleys rose more than 1.5 million years ago, a pool of seawater from the fjord that penetrated the area was trapped. The pool was eventually capped by the flow of the glacier.

The briny pond, whatever its size, “is a unique sort of time capsule from a period in Earth’s history,” Mikucki said. “I don’t know of another environment quite like this on Earth.”

Life below the Taylor Glacier may help scientist address questions about life on “Snowball Earth,” the period of geological time when large ice sheets covered Earth’s surface. But it’s also a rich laboratory for studying life in other hostile environments, including the subglacial lakes of Antarctica and perhaps even on other icy planets in the solar system such as below the Martian ice caps or in the ice-covered oceans of Europa, a moon of Jupiter.

oxide in a reduction reaction. This carbon dioxide reduction is efficiently catalyzed by NHCs even at room temperature,” Zhang said in the statement.

“Methanol can be easily obtained from the product of the carbon dioxide reaction,” Zhang added.

Previous attempts to turn CO₂ into more useful products have required more energy input and a much longer reaction time, the team said.

But they didn’t say how the process could be scaled up to fight climate change by capturing and transforming some of the billions of tons of CO₂ produced annually by burning fossil fuels.

Acámbaro figures

By LEONARDO VINTIÑI
Epoch Times Staff

An Oopart (Out Of Place ARTifact) is a term applied to dozens of prehistoric objects found in various places around the world that, given their level of technology, are completely at odds with their determined age based on physical, chemical, and/or geological evidence. Ooparts often are frustrating to conventional scientists and a delight to adventurous investigators and individuals interested in alternative scientific theories.

In 1944, German entrepreneur Waldemar Julsrud found a clay figure near the banks of Cerro del Toro in Acámbaro, Guanajuato, Mexico. No stranger to the area, Julsrud had contributed to the discovery of Chupicuaro culture in 1923. Yet as he continued to find similar figures, Julsrud began to wonder whether they corresponded to the same ancient people he helped discover more than 20 years before.

According to Julsrud, a more in-depth search revealed that similar figures were quite plentiful so he employed assistants (mostly local farmers) to help him collect the artifacts. Julsrud paid \$1 for every piece found and soon gathered an impressive collection. In a short time, the entrepreneur’s rare assortment grew to an enviable size—about 32,000 figures.

While the figures appeared to be of ancient origin, their depictions were quite controversial and began to attract attention among skeptics in the scientific community. The Acámbaro figures portrayed not only dinosaurs but also unknown animals as well as those that had long been extinct. The figures also included camels and other animals not known to the area, as well as depictions of faraway cultures.

Because it directly challenged the contemporary scientific understanding of man’s evolutionary development, many researchers began to take a closer look at Julsrud’s clay figures. Archeologist Dr. Charles Di Peso is perhaps the most well-known skeptic of the Acámbaro finds. He notes that the pieces look too well preserved to have been buried in the ground for as long as Julsrud and others claim. He published a detailed criticism of the artifacts in the journal *American Antiquity*.

In 1972, carbon-14 analysis was made of various figures kept at the Museum of Pennsylvania, in Philadelphia. Laboratory tests showed that the objects were 5,000 years old. Four years beforehand at Isotopes Inc. in New Jersey, thermo-luminescence tests revealed that the approximate age was around 6,000 to 1,500 years old.

Whether these figures are the product of fraud or a genuine testimony of prehistoric civilizations, the Acámbaro figures continue to intrigue a number of researchers who are searching for the true origin and development of man.

The archeologist and the regional director of the Acámbaro National Museum of Archeology enlisted various authorities to testify to the authenticity of the figures, including the paleontologist at the EUA Natural History Museum, naturalist Dr. Gaylord Simpson; Ivan T. Sanderson; and attorney/criminologist Erle Gardner.

As the popularity of the collection grew, so did the number of people who questioned the authenticity of the pieces. It was proposed that Julsrud was scammed by his assistants, who crafted the figures just to make money. While those who believe in Julsrud’s claim insist that making thousands of figures with such minuscule detail in such a short amount of time wouldn’t have been possible, critics counter that poor villagers were recruited to create exactly the kind of sculpture that Julsrud was looking for.

Critics also note that the figures are found in only one archeological site. However, those supporting the validity of the clay statues surmise that they may have been strategically buried by their creators, in a place considered religious or sacred.

While some argue that much more recent aboriginals could have crafted the pieces based on prehistoric animal bones found in the area, other researchers suggest that a civilization with an advanced culture sculpted the figures based on recorded history from an epoch when their ancestors coexisted with enormous reptiles.

Among the strange contents of the Acámbaro collection, there is a depiction of an extinct species of rhinoceros, a horse not seen since the Ice Age, extinct South American monkeys, plesiosaurs, and brachiosaurus. Unidentified species include some that are part bird and part reptile, combinations of reptiles and marsupials, reptiles with spoon-shaped beaks, and reptiles with horns. Among the human figures, a culture dedicated to hunting, without knowledge of agriculture, can clearly be seen. There are also some that show domestication of reptiles as well as other depictions.

The case of the Acámbaro figures shares striking similarities with stones found in Ica, Peru. Both supposed relics show scenes of dinosaurs alongside humans (among other rarities) and both have been labeled hoaxes by many in the scientific community.

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Singapore scientists say they can turn CO₂ into biofuel

SINGAPORE (Reuters)—Scientists in Singapore say they have found a way to turn planet-warming carbon dioxide into clean-burning methanol using a process that uses less energy than previous attempts.

The scientists at the state-backed Institute of Bioengineering and Nanotechnology said they used

nontoxic organocatalysts to make ethanol, a biofuel that is also used as an industrial feedstock.

In a statement, the institute said that the team, led by Yugen Zhang, used N-heterocyclic carbenes (NHCs), an organocatalyst in the chemical reaction with carbon dioxide.

NHCs are stable and the reaction

between NHCs and carbon dioxide can take place under mild conditions in dry air, the statement said, adding that only a small amount of the catalyst was needed.

The process also used hydrosilane, a combination of silica and hydrogen.

“Hydrosilane provides hydro-

Australia union warns of nanotech health risks

CANBERRA (Reuters)—Advanced nanotechnologies, shrinking manufacturing to the molecular level, could bring with them a human health catastrophe to rival past use of cancer-linked asbestos, said Australia’s top union group.

‘There should be an abundance of caution with nanotechnology to make sure that we’re not going to reap a similar awful harvest in years to come.’

—Geoff Fary, ACTU Assistant Secretary

The Australian Council of Trade Unions (ACTU) said there was little protection for workers exposed to so-called nanotech, or the science of building either machines or simple structures at a scale too small for



REPEATING HISTORY? An Australian union group is concerned that, like asbestos, nanotechnologies could also bring unforeseen health risks. ROBERT CIANFLONE/GETTY IMAGES

even a light microscope to pick up.

“Remember when asbestos was introduced, it was considered to be a miracle product, and it wasn’t until many years later that we found the devastating effect it had,” ACTU Assistant Secretary Geoff Fary told state radio.

“There should be an abundance of caution with nanotechnology to make sure that we’re not going to reap a similar awful harvest in years to come,” Fary said.

Asbestos fibers, resistant to heat, fire, and chemicals, were widely used

in construction and insulation before being linked to asbestosis, lung cancer, mesothelioma, and other cancers.

Nanoscale technologies, 100,000 times smaller than the width of a human hair, are now used in hundreds of ordinary items from car fuel lines, bed sheets, cosmetics, and even sunscreens, where tiny zinc oxide particles are used to absorb dangerous UV light.

Nanotechnologies are fast evolving into a multimillion-dollar market around the globe, with research

stretching from diamond production to use in food and health.

Fary said nanoparticles were so small that they could be inhaled or absorbed through the skin, potentially causing diseases in years to come, as some forms of asbestos had done.

The unions called for Australia’s center-left government to begin a register of companies using nanotechnology, while introducing new safety tests and product labeling for consumers and workers using nanotech products.

Europe’s Parliament last month passed food regulation amendments forcing food manufacturers to state explicitly on labeling if products contained nanoparticles.

A European Union agency, the European Food Safety Authority, has also called for new testing to gauge the toxicity and stability of nanoparticles in food, putting at the top of the list of substances from which workers need protection.

The French government is currently looking at laws to regulate manufacture, import, and marketing of nanotech products.

How to save earth from an asteroid

WASHINGTON (Reuters)—An asteroid is hurtling toward the planet and threatens to destroy life as we know it. What can humankind do, other than cower?

Tie the thing down, suggests aerospace engineer David French of North Carolina State University.

He has proposed a way to divert asteroids and other threatening objects by attaching a long tether and ballast.

Done right, “you change the object’s center of mass, effectively changing the object’s orbit and allowing it to pass by the Earth, rather than impacting it,” French said in a statement.

In March, an asteroid passed by Earth at a distance of just about 49,000 miles (79,000 kms).

NASA’s Near Earth Object Program has identified more than 1,000 “potentially hazardous asteroids.” None is on a collision course with Earth, but asteroids have struck before and almost certainly will again, scientists agree.

“For example, about 65 million years ago, a very large asteroid is thought to have hit the Earth in

the southern Gulf of Mexico, wiping out the dinosaurs, and, in 1907, a very small airburst of a comet over Siberia flattened a forest over an area equal in size to New York City,” French said.

“The scale of our solution is similarly hard to imagine.”

His idea, to be presented in September at an American Institute of Aeronautics and Astronautics conference, calls for using a tether somewhere between 600 miles (1,000 km) and 60,000 miles (100,000 kms) long to change the trajectory of any object headed toward Earth.

“Nuclear weapons are an intriguing possibility, but have considerable political and technical obstacles. Would the rest of the world trust us to nuke an asteroid? Would we trust anyone else?” French asked. “And would the asteroid break into multiple asteroids, giving us more problems to solve?”

Other solutions that have been proposed include crashing a spacecraft into the asteroid, focusing the Sun’s energy to deflect it, or using a laser to break it up.