



KILLER SAVER

Eco-friendly aquatic predators



This freshwater stickleback can keep in check the tiny animals in stream water that graze on plants and algae.

In ecosystems around the world, big guys eat littler guys, who in turn eat plants and other organisms at the base of the food web. A study now finds that removing top predators in freshwater environments allows their prey to flourish and overgraze on plants and algae. The result of the missing plant matter: a 90 percent reduction in uptake and storage of carbon dioxide.

Several research teams have explored the importance of predators in protecting organisms that store carbon, notes ecologist James Estes of the University of California, Santa Cruz, who was not involved in the new research. The new study is particularly strong, he says, because it demonstrates predators' influence across a broad range of ecosystems. It therefore suggests "that the phenomenon may be fairly general."

When pesticide runoff, overfishing or other human activities impact ecosystems, the first species to disappear are usually the bigger, top predators, notes freshwater ecologist John Richardson of the University of British Columbia in Vancouver and coauthor of the study, published online February 17 in *Nature Geoscience*. The new work shows that predator losses have effects beyond the loss of biodiversity: "We can see climate effects as well," he says. "We start seeing a higher flux of carbon dioxide into the atmosphere."

Study leader Trisha Atwood, then at the University of British Columbia, and colleagues simulated three freshwater ecosystems outdoors to study the effects lower in the food web of predator loss at the top. They diverted water from streams near Vancouver into six channels they had constructed. Those channels accumulated critters and debris for about six weeks.

Source: Science News



OLD NEW WORLD

Ancient temple in Peru

ARCHAEOLOGISTS in Peru have uncovered what they believe is a temple, estimated to be up to 5,000 years old, at the site of El Paraíso, north of Lima.

Inside the ruins of the ancient room, which measures about 23 feet by 26 feet (7 meters by 8 meters), there's evidence of a ceremonial hearth, where offerings may have been burned, archaeologists say. The temple also had a narrow entrance and stone walls covered with yellow clay, on which traces of red paint were found, according to a statement from Peru's Ministry of Culture.

El Paraíso, located on the central coast of Peru, just north of Lima, is a site made up of 10 buildings stretching over 123 acres (50 hectares). It's one of the earliest known examples of monumental stone architecture in the Americas, dating back to the Late Pre-ceramic period (3500-1800 B.C.). The newly found building is thought to date back to 3000 B.C., which should be confirmed with a radiocarbon analysis.

Rafael Varón, Peru's deputy minister for culture, said in a statement that the discovery of the temple "has particular importance because it is the first structure of this type found on the central coast." It suggests that the Lima region had more religious, economic and political importance during this early period than previously thought, Varón added.

Previously, man-made mounds shaped like ovals, conchoids and even a duck were discovered in Peru's coastal valleys, including at El Paraíso, by anthropologist Robert Benfer, professor emeritus of the University of Missouri, who spotted the mounds in satellite photos.

Source: Live Science



The ruins of El Paraíso in Peru.

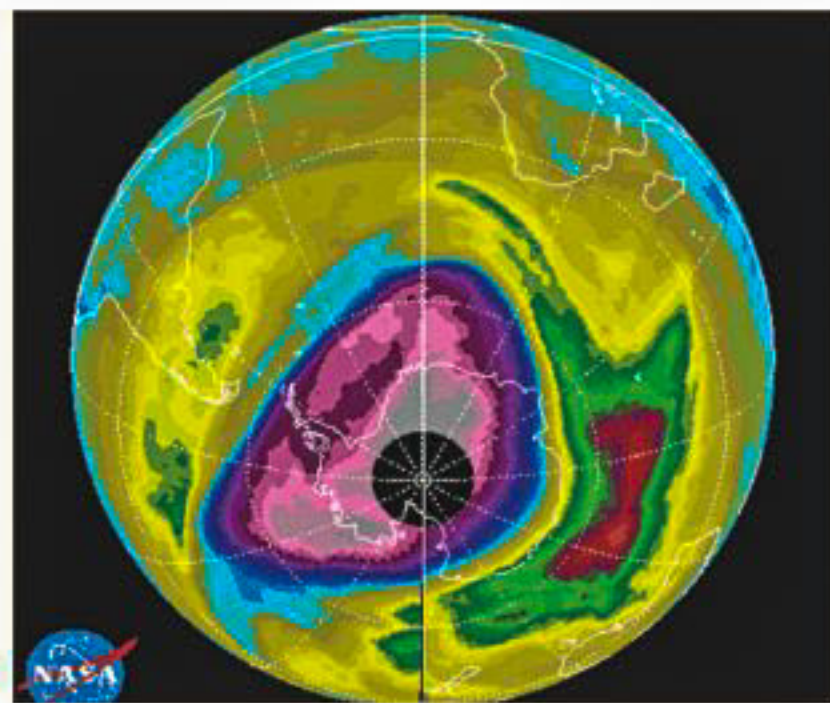
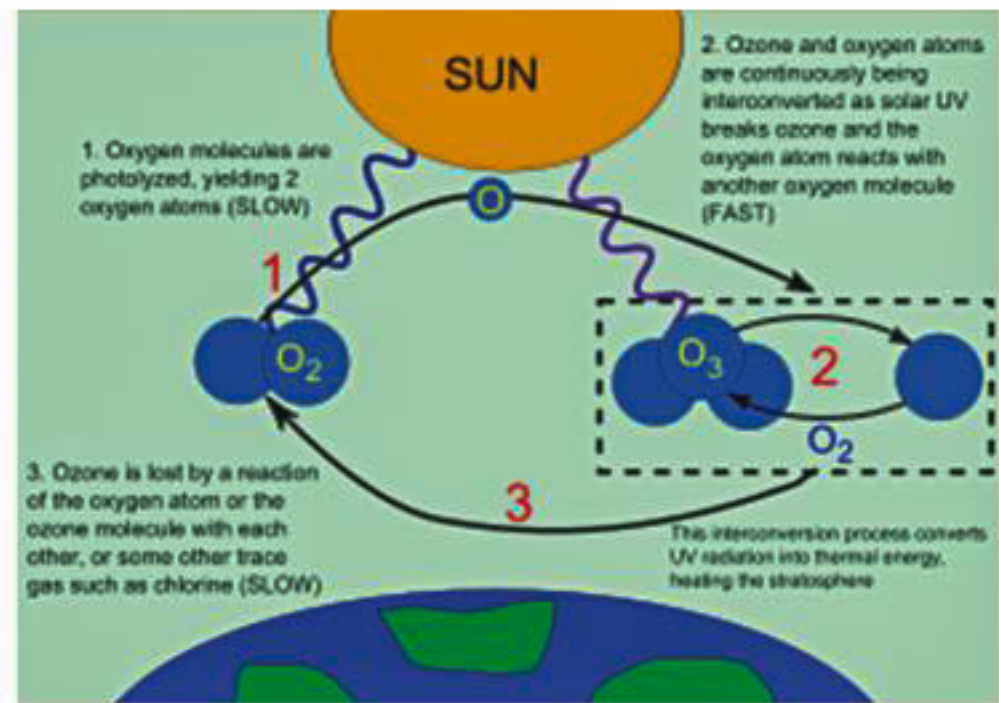
Holes in our planet's "safe zone"

QUAMRUL HAIDER, Ph.D

OZONE is a form of molecular oxygen containing three oxygen atoms. It plays a dual role in the atmosphere, sometimes good and sometimes bad. In the lower atmosphere known as troposphere, it is a noxious pollutant - a greenhouse gas and a major component of smog. At altitudes of 12 to 30 miles in the stratosphere, ozone acts as a savior by forming a protective blanket, shielding us from deadly solar ultraviolet (UV) radiation.

In reasonable amounts, UV rays tan skin and stimulate vitamin D production in the skin. In large amounts they are carcinogenic. They would cause melanoma skin cancer, serious burns, and lethal mutations. Besides, they can cause the skin to thicken, wrinkle, develop dark spots, and become leathery. This will lead to premature skin aging, a phenomenon known as photoaging. Eyes are also damaged by UV rays. Harmful effects include cataracts, retinal injury, age-related macular degeneration, and snow blindness (temporary blindness caused by exposure to sunlight reflected from snow or ice.). They also suppress the immune system, reducing our ability to fight off these and other maladies. The UV rays could damage crops and aquatic ecosystems too.

The amount of UV rays that will reach the Earth's surface is influenced by concentration of ozone in the stratosphere. When UV rays strike an ozone molecule, it is split into oxygen



atom and oxygen molecule. The reaction products quickly recombine to form ozone and the harmful UV radiation is converted into thermal energy. Thus ozone is continually depleted and regenerated in a natural cycle, restoring the equilibrium concentration of the molecule. It is a renewable form of invisible filter that protects all forms of life from the Sun's harmful UV radiation. It is believed life would not have evolved the way it is, had it not been for ozone, our planet's "safe zone."

Human interference with the atmosphere is systematically reducing the concentration of ozone. The depletion is caused by the controversial chlorofluorocarbons (CFC). These were used in industrial solvents, refrigerators, air conditioners, coolants, anti-freeze, and as propellants in spray cans. The CFCs are extremely stable, inert, and insoluble in rain water. They quickly disperse into the atmosphere and eventually migrate to the stratosphere where UV rays dissociate them into chlorine oxide and other molecular fragments. Chlorine oxide

reacts with ozone and destroys it, thereby creating the so-called "hole" in the ozone layer. Since ozone layer is our primary shield against UV rays from the Sun, less ozone means higher UV levels on the Earth's surface.

To protect the ozone layer, production and use of CFCs have been phased out about two decades ago. Though a prudent move, it was too little too late. A sobering word is in order here. The CFCs last from 75 to 110 years. Thus the ones that were released before the phase-out are still alive and kicking. They are continuing with their ozone-destruction activity and will keep on doing so till they are neutralized by other reactions.

While much attention has been focused on CFCs, little mention has been made of other gas molecules that have potential impact on the ozone layer. These gases, particularly different oxides of nitrogen with a lifespan from weeks to 170 years, when vented into the atmosphere are as potent an ozone-destroyer as the CFCs. In fact, they are now the largest ozone-depleting

substance emitted through human activities, and is expected to remain the largest throughout the 21st century

Natural sources of oxides of nitrogen are volcanoes, lightning, solar flares, and forest fires. Among the man-made sources, burning of fossil fuels and nitrogen based fertilizers are the principal ones. But emission from fertilizers is in balance with ozone replenishment. Other sources are the injection of nitric oxide from the exhaust of supersonic jets and military aircrafts flying at high altitudes. Another surprising and not oft discussed source is leftover nitric oxides produced during atmospheric nuclear tests in the 1950s. It is estimated that for each megaton of nuclear explosive power, 5000 tons of nitric oxide is produced.

It seems depletion of the ozone layer is continuing unabated by the remnant CFCs and oxides of nitrogen. In fact, one of the biggest holes in the ozone layer was discovered in 2006! The good news is if emission of these oxides of nitrogen from human activities can be curtailed, then together with the ban on CFCs, the natural ozone production process will heal the ozone layer in about 75 years. "Earth without ozone is like a house without roof."

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MAN MEETS BIRD



SUDDEN VISITOR

Language rooted in life



Zebra finches. Gene products produced for speech in the cortical and basal ganglia regions of the human brain.

THE genes activated for human speech are similar to the ones used by singing songbirds, new experiments suggest.

These results, which are not yet published, show that gene products produced for speech in the cortical and basal ganglia regions of the human brain correspond to similar molecules in the vocal communication areas of the brains of zebra finches and budgerigars. But these molecules aren't found in the brains of doves and quails -- vocal birds that do not learn their sounds.

"The results suggest that similar behavior and neural connectivity for a convergent complex trait like speech and song are associated with many similar genetic changes," said Duke neurobiologist Erich Jarvis, a Howard Hughes Medical Institute investigator.

Jarvis studies the molecular pathways that songbirds use while learning to sing. In past experiments, he and his collaborators found that songbirds have a connection between the front part of their brain and nerves in the brainstem that control movement in muscles that make songs in birds. They've seen this circuit in a more primitive form related to ultrasonic mating calls in mice. Humans also have this motor learning pathway for speech.

Source: Science Daily

What are asteroids, meteors ...

THE terms asteroid, meteor, meteorite and meteoroid get tossed around recklessly, especially when two of them threaten the Earth on the same day. Here's a quick explainer:

An asteroid is a rocky object in space that's smaller than a planet they're sometimes called minor planets or planetoids, according to NASA. Other sources refer to them loosely as "space debris," or leftover fragments from the formation of the solar system (like the extra pieces that remain after constructing a build-it-yourself bookcase from IKEA).

There are millions of asteroids orbiting the sun, some 750,000 of which are found in the asteroid belt, a vast ring of asteroids located between the orbits of Mars and Jupiter. Asteroids can be as large as hundreds of kilometers wide: The asteroid Ceres, sometimes referred to as a dwarf planet, is 940 km (584 miles) wide.

Asteroids have no atmosphere, but many are large enough to exert a gravitational pull some, in fact, have one or two companion moons, or they form binary systems, in which two similarly sized asteroids orbit each other.

Scientists are eager to study asteroids because they reveal so much information about the early formation of our solar system some 4.6 billion years ago. One way to study them is to observe them when they come close to Earth, as 2012 DA14 will today (Feb. 15).



A meteor streaks across the sky in eastern Russia in this picture released by the Russian Emergency Ministry.

A meteor is an asteroid or other object that burns and vaporizes upon entry into the Earth's atmosphere; meteors are commonly known as "shooting stars." If a meteor survives the plunge through the atmosphere and lands on the surface, it's known as a meteorite.

Meteorites are usually categorized as iron or stony. As the name implies, iron meteorites are composed of about 90 percent iron; stony meteorites are made up of oxygen, iron, silicon, magnesium and other elements.

And meteoroids? That's a general term describing small particles of comets or asteroids that are in orbit

around the sun. There's no universally accepted, hard-and-fast definition (based on size or any other characteristic) that distinguishes a meteoroid from an asteroid they're simply smaller than asteroids.

Only when these objects enter the atmosphere are they referred to as meteors, like the meteor that was seen over Russia today. Because that meteor exploded in the atmosphere, the resulting fireball is known as a bolide. Again, there's no precise definition of a bolide most astronomers understand a bolide as simply a very bright fireball.

Source: Live Science



EQUALISED



DO YOU KNOW?

Uncertainty in 'Big' things

The Uncertainty principle, described by physicist Werner Heisenberg nearly a century ago, states that the mere act of measuring the position of a particle, such as an electron, necessarily disturbs its momentum. That means the more precisely you try to measure its location, the less you know about how fast it's moving, and vice versa.

While in theory this principle operates on all objects, in practice its effects were thought to be measurable only in the tiny realm where the rules of quantum mechanics are important.

In a new experiment, described in the Feb. 15 issue of the journal *Science*, physicists have shown that the uncertainty principle effects can be detected in a tiny drum visible to the naked eye.

What is Synchronicity?

Synchronicity is the experience of two or more events that are apparently causally unrelated or unlikely to occur together by chance, yet are experienced as occurring together in a meaningful manner. The concept of synchronicity was first described in this terminology by Carl Gustav Jung, a Swiss psychologist, in the 1920s.

The concept does not ques-

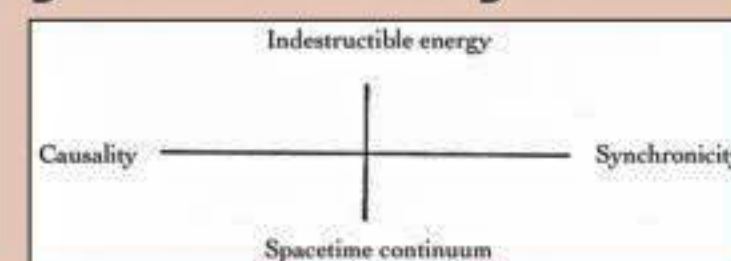
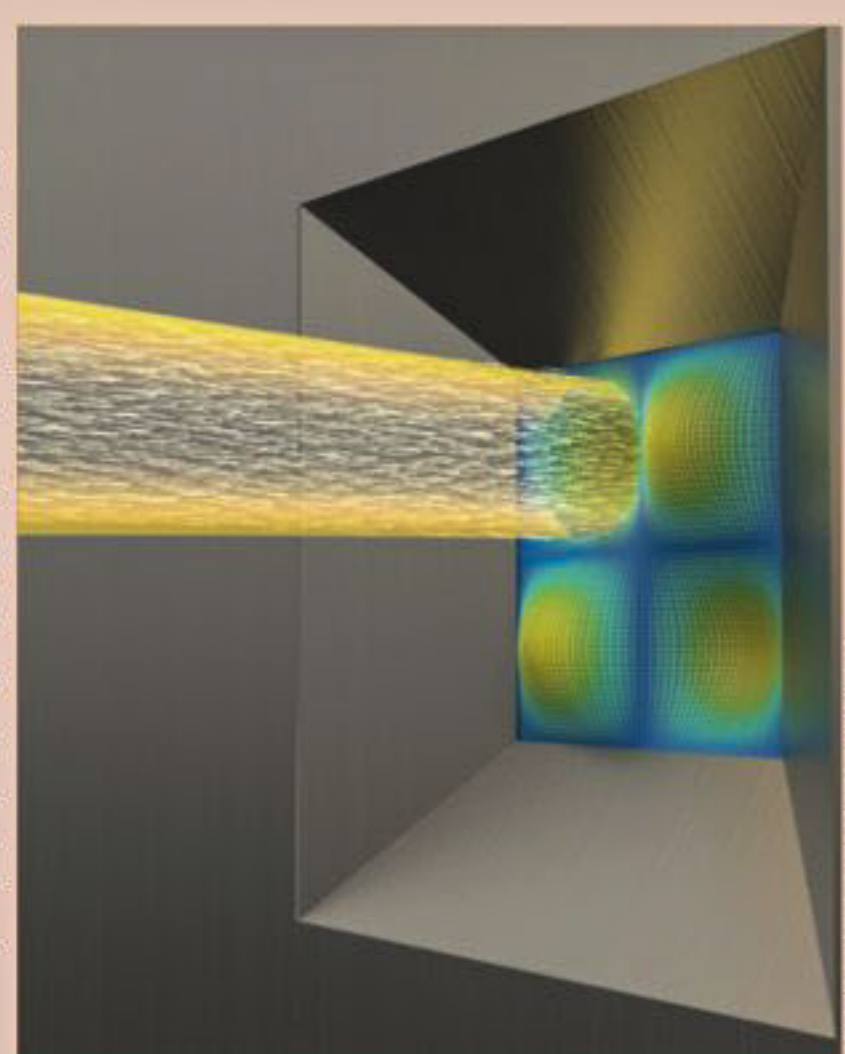


Diagram illustrating concept of synchronicity

tion, or compete with, the notion of causality. Instead, it maintains that just as events may be grouped by cause, they may also be grouped by meaning. A grouping of events by meaning need not have an explanation in terms of cause and effect.

In addition to Jung, Arthur Koestler wrote extensively on synchronicity in *The Roots of Coincidence*.

Scientists detected the uncertainty principle in measurements of a tiny drum about 0.02 inches across, big enough for the naked eye to see.



SOURCE: LIVE SCIENCE