

RUNAWAY GREENHOUSE EFFECT

Will Earth become a dead ball of rock?

QUAMRUL HAIDER, Ph.D.

OUT of the four terrestrial planets in the solar system, three are "dead balls of rock." Earth is the only dynamic planet with an atmosphere of nitrogen and oxygen, has liquid water and a temperature range conducive to life. But seldom do we pause to ponder that our planet, filled with exquisite beauty, a cornucopia of boisterous wildlife slithering, scampering, soaring, and swimming, could one day become a barren wasteland unable to support life in any form whatsoever. Unfortunately, with the current state of human activities, this nightmarish vision may not be too far off in the future, but instead a grim reality that is knocking on our front door. The cause of this calamity will be the greenhouse effect, a natural process that is critical to the existence of life on Earth. It traps infrared radiation by slowing its return to space and keeps Earth as a temperate and a habitable planet, as opposed to unforgiving tundra.

When the greenhouse effect becomes far more intense and spins out of control, it is called "runaway greenhouse effect." It happens when there is a large imbalance between energy received by a planet from the Sun and the energy radiated back to space. Venus, named as Earth's "evil twin," is an example of this effect.

Several billion years ago, Venus was cooler than what it is now and had abundance of water in oceans overlain by an oxygen-rich atmosphere. Also, most of its carbon dioxide was locked up in the rocks and in ocean water. As Venus heated up due to its proximity to the Sun, carbon dioxide in the rocks was "baked out" and ocean water evaporated into the atmosphere. The increase of atmospheric carbon dioxide and water vapor accelerated the greenhouse heating, causing more ocean evaporation



Surface of Venus

and baking out of carbon dioxide. This induced a "positive feedback loop" process that made the atmosphere opaque to infrared radiation emitted by the planet. Venus was thus snared into a vicious cycle of runaway greenhouse effect that rapidly raised its surface temperature to a blistering 480 degrees Centigrade hot enough to melt lead.

The greenhouse effect on Venus is so cogent that there is very little temperature difference between Venusian equator and poles; day and night temperatures are almost same. The hellish condition on Venus is a stark reminder of how carbon dioxide can wreak havoc as far as heating up a planet is concerned.

Unlike Venus where nature went out of control, on the cooler Earth, surface water maintains equilibrium with atmospheric water vapor limiting further evaporation. Additionally, much of the naturally occurring carbon dioxide is in the ground or in the oceans. Nonetheless, Earth has an enhanced greenhouse effect, and the synergistic feedback of continued emission of greenhouse gases is indeed capable of generating a runaway green-

house effect. We should be particularly concerned about carbon dioxide because it's concentration in the atmosphere is increasing at a prodigious rate largely from burning fossil fuels.

Is it possible for solar radiation to push Earth toward runaway greenhouse effect, just like it did to Venus? The current amount of solar radiation received by Earth is not going to drive the planet to the point where lead will melt or oceans will boil away. So, the threat of a runaway greenhouse effect due to solar radiation alone is unlikely in the foreseeable future. However, our oceans will start to boil away at a brisk rate when the Sun's luminosity will increase by about 10 percent one billion years from now. This will certainly trigger a runaway greenhouse effect.

We may not have to wait that long for the disastrous Venus syndrome to afflict Earth. Scientists already detected the signature of a runaway greenhouse effect in the Western Pacific just northeast of Australia. Moreover, it is estimated that the entire "proven" reserve of fossil fuels, including shale oil and tar sands, will be depleted in a few hundred years. The amount of carbon dioxide that will be released in the process will be enough to transform Earth into today's Venus that has possibly surpassed even Dante's vision of hell. Our planet will still keep on spinning, but as the fourth dead ball of rock.

British physician Havelock Ellis was 100 percent correct when he wrote in The Dance of Life: "The sun, the moon and the stars would have disappeared long ago had they happened to be within the reach of the predatory human hands."

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NAZCA MAZE

Tricky trails of pilgrims



An aerial view shows part of a massive labyrinth, including a spiral pathway (red box), in a Peruvian desert.

FAMOUS line drawings etched into Peru's Nazca desert plateau around 1,500 years ago are enduring puzzles. At least one of them is also a labyrinth, researchers say.

Archaeoastronomer Clive Ruggles of the University of Leicester in England discovered the labyrinth a single path leading to and from an earthen mound, with a series of disorienting twists and turns along its flat, 4.4-kilometer-long course by walking it himself. From the ground, little of the labyrinth is visible, even while ambling through it. From the air, it's difficult to recognize the array of landscape lines as a connected entity.

In the December Antiquity, Ruggles and archaeologist Nicholas Saunders of the University of Bristol in England describe and map what they regard as a carefully planned labyrinth from the ancient Nazca (sometimes spelled Nasca) culture. Nazca civilization flourished in southern coastal Peru from around 2,100 to 1,300 years ago.

"This labyrinth was meant to be walked, not seen," Ruggles says. "The element of surprise was crucial to the experience of Nazca labyrinth walking."

Those who traversed the desert path encountered 15 sharp corners that ushered them down trails leading away from and back toward a large hill. Walkers then rounded a curve in the path and negotiated two more turns before entering a spiral passageway that dumped them a mere 60 meters (65.6 yards) from the starting point. It probably took around one hour to complete the journey.

Source: **Science News**



LORIS

New primate species found

A venomous primate with two tongues would seem safe from the pet trade, but the big-eyed, teddy-bear face of the slow loris (Nycticebus sp.) has made them a target for illegal pet poachers throughout the animal's range in southeastern Asia and nearby islands. A University of Missouri doctoral student and her colleagues recently identified three new species of slow loris. The primates had originally been grouped with another species. Dividing the species into four distinct classes means the risk of extinction is greater than previously believed for the animals but could help efforts to protect the unusual primate.

"Four separate species are harder to protect than one, since each species needs to maintain its population numbers and have sufficient forest habitat," said lead author Rachel Munds, MU doctoral student in anthropology in the College of Arts and Science. "Unfortunately, in addition to habitat loss to deforestation, there is a booming black market demand for the animals. They are sold as pets, used as props for tourist photos or dismembered for use in traditional Asian medicines."

According to Munds, slow lorises are not domesticated and are protected under the Convention on International Trade in Endangered Species. She contends that keeping the animals as pets is cruel and that domesticating them is not feasible.

"Even zoos have difficulty meeting their nutritional needs for certain insects, tree gums and nectars," said Munds.

Science: **Science Daily**



One of the newly identified species of slow loris, Nycticebus kayan.



MINI PROBE

Predicting mass murder?

A "Minority Report" technology to predict murder remains wishful science fiction thinking. But a mass shooting that killed at least 20 children and 8 adults at a school in Newton, Conn. once again raises the question of what technological tools, if any, can help predict or prevent such tragedies by identifying troubled individuals.

Psychologists say that predicting the intent among individuals to commit mass murder remains incredibly difficult, if not impossible especially with mass killings having many different patterns and representing rare events. TechNewsDaily previously spoke with an expert on psychopaths who explained the challenges despite his optimism in using psychological screening.

"If you study 100,000 people, three might go out and kill someone else," said Kent Kiehl, an associate professor of psychology and neuroscience at the University of New Mexico. "There's really not a good way to predict that single individual."

Kiehl previously spoke regarding a U.S. Defense Advanced Research Projects Agency effort to predict a person's state of mind related to suicide and murder. The DARPA project focused on preventing suicides among U.S. military members, but it also considered the idea of predicting the intent to murder. [Military Wants 'Minority Report' for Suicide Prevention]

A combination of screening tools could identify people most at risk of violence and allow psychologists to begin helping them earlier, Kiehl said.

Source: **Science News**



NANOMORPHS

Thinking droplets created

UNIVERSITY of Colorado Boulder Assistant Professor Nikolaus Correll likes to think in multiples. If one robot can accomplish a singular task, think how much more could be accomplished if you had hundreds of them.

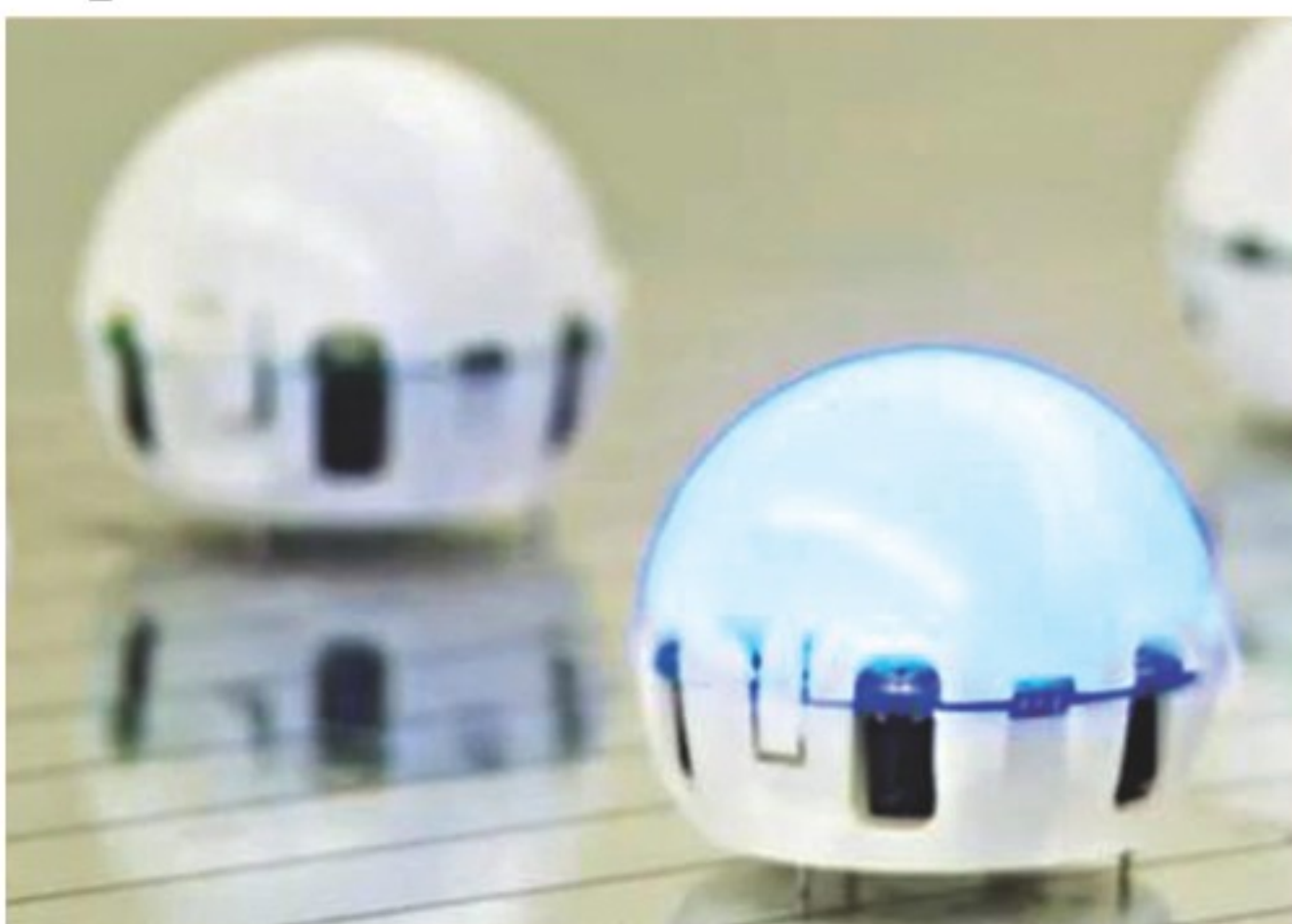
Correll and his computer science research team, including research associate Dustin Reishus and professional research assistant Nick Farrow, have developed a basic robotic building block, which he hopes to reproduce in large quantities to develop increasingly complex systems.

Recently the team created a swarm of 20 robots, each the size of a Ping Pong ball, which they call "droplets." When the droplets swarm together, Correll said, they form a "liquid that thinks."

To accelerate the pace of innovation, he has created a lab where students can explore and develop new applications of robotics with basic, inexpensive tools.

Similar to the fictional "nanomorphs" depicted in the "Terminator" films, large swarms of intelligent robotic devices could be used for a range of tasks. Swarms of robots could be unleashed to contain an oil spill or to self-assemble into a piece of hardware after being launched separately into space, Correll said.

Correll plans to use the droplets to demonstrate self-assembly and swarm-intelligent behaviors such as pattern recognition, sensor-based



Researchers are creating teams of tiny robots.

motion and adaptive shape change. These behaviors could then be transferred to large swarms for water- or air-based tasks.

Correll hopes to create a design methodology for aggregating the droplets into more complex behaviors such as assembling parts of a large space telescope or an aircraft.

In the fall, Correll received the National Science Foundation's Faculty Early Career Development award known as "CAREER." In addition, he has received support from NSF's Early Concept Grants for Exploratory Research program, as well as NASA and the U.S. Air Force.

He also is continuing work on robotic garden technology he developed at the Massachusetts Institute of Technology

in 2009. Correll has been working with Joseph Tanner in CU-Boulder's aerospace engineering sciences department to further develop the technology, involving autonomous sensors and robots that can tend gardens, in conjunction with a model of a long-term space habitat being built by students.

Correll says there is virtually no limit to what might be created through distributed intelligence systems.

"Every living organism is made from a swarm of collaborating cells," he said. "Perhaps some day, our swarms will colonize space where they will assemble habitats and lush gardens for future space explorers."

Source: **Science Daily**



SUN SPLOSION



DO YOU KNOW?

No Mayan Apocalypse

Coronal mass ejections are eruptions of solar winds and magnetic fields from the sun into space; they happen every few days to a couple times a day, depending on how active the sun is. Interactions of these "CMEs" with Earth's atmosphere can cause extra-strong auroras, or northern (and southern) lights.

CMEs and other solar activity are currently in the news because some believers in the so-called Mayan Apocalypse think that sun activity is set to destroy or damage Earth on Dec. 21. In fact, according to NASA, the sun is showing no signs of unusual activity.

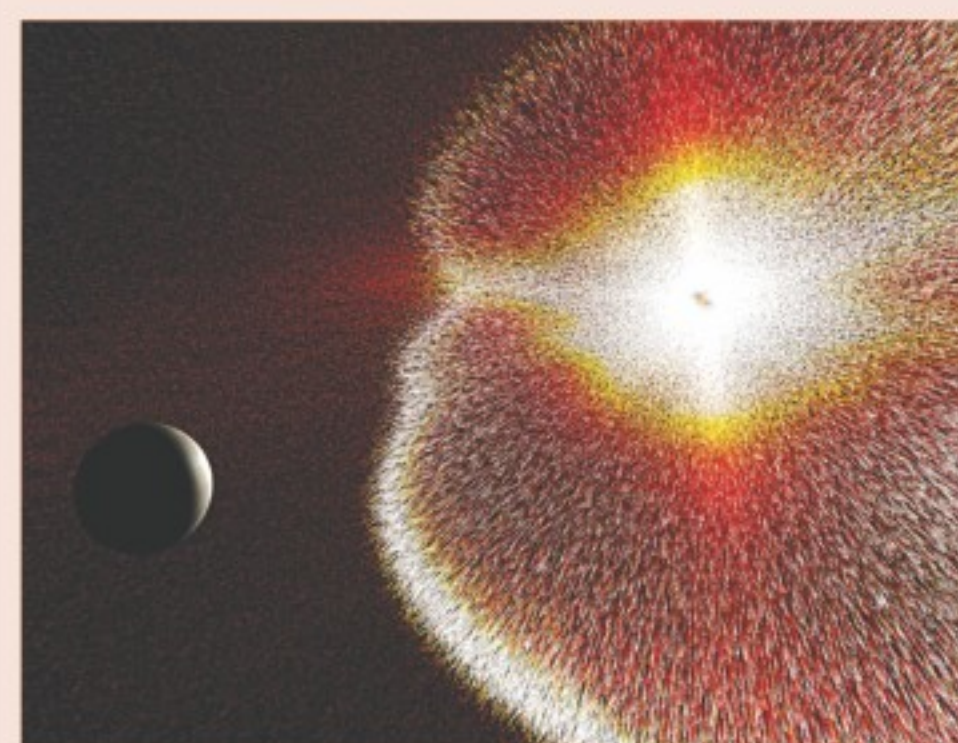
Who first recorded human voice?

Édouard-Léon Scott de Martinville, a French printer and bookseller who lived in Paris, invented the earliest known sound recording device, the phonograph. It was patented in France on 25 March 1857.

The phonograph used a horn to collect sound, attached to a diaphragm which vibrated a stiff bristle which inscribed an image on a lamp black coated,



hand-cranked cylinder. Scott built several devices with the help of acoustic instrument maker Rudolph Koenig. Unlike Edison's later invention of 1877, the phonograph, the phonautograph only created visual images of the sound and did not have the ability to play back its recordings. Scott de Martinville's device was used only for scientific investigations of sound waves.



This visualization shows a coronal mass ejection approaching Venus.

SOURCE: LIVE SCIENCE