

11 December 2011 | voaspecialenglish.com

Melting Permafrost and Climate Change; the Moon's Magnetism; 'Lucid Dreamers'



AP

An undated photo from the University of Florida shows erosion in the Noatak National Preserve in Alaska from increased thawing of permafrost

(You can download an MP3 of this story at voaspecialenglish.com)

FAITH LAPIDUS: This is SCIENCE IN THE NEWS in VOA Special English. I'm Faith Lapidus.

BOB DOUGHTY: And I'm Bob Doughty. Today, we tell how warmer weather in the Arctic could speed up climate change around the world. We offer two possible explanations for a magnetic field on the moon. And we tell about a new study of dreams.

(MUSIC)

FAITH LAPIDUS: As Earth warms, the higher temperatures are melting ice in places like the North Pole. But ice is not all that is changing. The increased warmth is also melting permafrost -- frozen ground that stays at or below zero degrees Celsius for an extended period.

A new American report says melting permafrost can free microbes that produce methane gas. Methane is considered more threatening to the environment than carbon dioxide.

Janet Jansson of the Lawrence Berkeley National Laboratory in California led the study. She worked with researchers from the United States Department of Energy, the Joint Genome Institute and the Earth Sciences Division within the Berkeley lab.

BOB DOUGHTY: Her team studied microbes in soil from a forest of black spruce trees in the state of Alaska. A report describing the study was published last month in the journal Nature.

The researchers say one gram of the soil could contain thousands of different kinds of microbes and billions of cells. They say these organisms had never before been cultured in a laboratory.

JANET JANSSON: "So more than ninety percent of those bacteria and other microorganisms in permafrost, we had no idea what they were."

FAITH LAPIDUS: Janet Jansson says it was hard to study the microbes without laboratory examination. To deal with that problem, the researchers removed the DNA from pieces of the permafrost. DNA is the genetic material of which all living things are formed.

Professor Jansson says the DNA provided information about the identities of the microorganisms. It also showed all the biological and chemical reactions that the microbes experienced in the permafrost. That was true both before and after the permafrost melted.

The researchers found single-celled organisms that produce methane and eat organic material in the soil. Ms. Jansson says they also found microbes that eat methane in thawed permafrost.

JANET JANSSON: "Some of the methane was being consumed by other microorganisms in the samples, and they in turn would release CO₂, carbon dioxide."

BOB DOUGHTY: The researchers inspected soil samples from the upper permafrost layer. This level melts and refreezes with the seasons. The scientists also studied permanently frozen permafrost. In the permanently frozen material, some of the microbes had been trapped for thousands of years.

Janet Jansson says the two soils were very different at first. But she says those differences decreased after they melted.

(MUSIC)

BOB DOUGHTY: In the nineteen sixties, American astronauts began returning to Earth with rocks they had collected from the moon. Scientists who examined the rocks were surprised to discover that some of them were magnetic. And they were surprised by how the rocks had been magnetized. It appeared they had cooled over time near a magnetic field.

FAITH LAPIDUS: The idea of a magnetic field on the moon has puzzled scientists ever since. On Earth, a magnetic field is produced by the great heat from the planet's inner core. The heat makes the liquid iron outer core move around creating the magnetic field.

But scientists know the moon is too small to create and continue this kind of heat and force.

BOB DOUGHTY: Now, two researchers are offering possible explanations for how the moon got a magnetic field.

Christina Dwyer is a graduate student in Earth and planetary sciences at the University of California, Santa Cruz. She thinks the magnetic field developed when the moon and Earth were thousands of kilometers closer to each other.

She says the Earth's gravity at that distance created a stronger tidal force. It pulled the hard rock part of the moon, its mantle, around its liquid iron center, or core. This movement stirred the liquid iron core strongly enough to create a magnetic field.

Ms. Dwyer's research suggests that the magnetic field existed for about a billion years. During that time, the Earth moved further from the moon. The moon's core and rock layer began to rotate more smoothly together. As a result, the magnetic field disappeared. The scientists say that happened at least 2.7 billion years ago, if not longer.

FAITH LAPIDUS: Another possible explanation comes from Michael Le Bars at the Research Institute for Out-of-Equilibrium Phenomena in France. His theory also suggests the moon's mantle may have been involved in the stirring of the liquid core. But, he says huge space objects were also involved.

Mr. Le Bars' research suggests that a number of meteors, asteroids and other objects hit the moon almost four billion years ago. He says each strike shook the moon enough to cause a ten-thousand-year-long magnetic field.

Either theory could be correct. And, the two theories could also work together as an explanation of the magnetic rocks from the moon. But as Christina Dwyer has noted, additional higher level tests are needed to see if either theory really works.

(MUSIC)



Reuters

Artist Vasily Slonov lies on his installation artwork called "The Terrible Chinese Dream: Death of Mao" in the Russian city of Krasnoyarsk last year

JIM TEDDER: I think there is an elephant in my room. What is it doing here? I'll ask that lady sitting next to me. She is my grandmother. She died forty years ago. She smiles at me and I hear her say, "Let's eat." Suddenly hundreds of bowls of rice appear on a table. But I cannot eat because I have to fly in an airplane. I am high up in the sky, looking down on my house. I'm too close to the door. Please don't let me fall. Why is this happening to me? How can this be happening to me? Then I hear the words that calm my fears. A voice says, "Wake up. Wake up! You're dreaming."

BOB DOUGHTY: Why do we dream? Why are dreams so strange? What happens to our brains while we are dreaming? Those questions have been a mystery to psychologists, medical doctors and scientists for years. Now, a new study may provide a few answers. The results were published on the Current Biology website.

Martin Dresler works at the Max Planck Institute of Psychiatry in Munich, Germany. He and his team searched for people who are called "lucid dreamers." These are people who know when they are dreaming. They also can control their dreams as if they are awake. Scientists think that many people are lucid dreamers, at least part of the time. But there are fewer people who can control their dreams, from one day to the next.

FAITH LAPIDUS: People have been writing about lucid dreams for nearly sixteen hundred years. In nineteen sixty-eight, British psychologist Celia Green wrote a major book on the subject. She thought that lucid dreams happened most during rapid-eye-movement, or REM, sleep.

During REM sleep, our bodies become stiff, and our muscles do not move. Our eyelids move or flutter rapidly as the eyeball seems to be looking in many different directions.

Researchers are not sure why most people have REM sleep for an hour or so each night. Some believe that this activity helps our memory. Others think that REM sleep helps to keep our brain chemicals healthy. For most people, this deep REM sleep is a necessary part of life. People who are repeatedly awakened during the night usually do not get enough REM sleep, and do not feel they have enough energy the next day.

BOB DOUGHTY: The researchers at the Max Planck Institute asked six lucid dreamers to try falling asleep inside a functional magnetic-resonance imaging machine. This device enabled the researchers to see on a computer screen what was happening to the brains of these individuals while they slept.

The sleepers were told to begin the test by quickly moving their eyes from left to right two times as a sign that they knew they were asleep. Then the subjects were asked to dream that they were squeezing their hands into a fist. First they dreamed of doing this with their left hand, and then the right. They did this ten times for each hand. Then they were told to again move their eyes quickly to show that they had finished with the test.

The researchers found that the human brain acts the same when dreaming as it does when a person is awake. In other words, the computer screen showed that the same areas of the brain "light up" and become active in either situation. When a man dreams that he is moving his hand, his brain looks the same on the computer as when he is actually making the motion. And this, the researchers think, is an important discovery.

(MUSIC)

FAITH LAPIDUS: This SCIENCE IN THE NEWS was written by Brianna Blake, Jim Tedder and Jerilyn Watson. Our producer was June Simms. I'm Faith Lapidus.

BOB DOUGHTY: And I'm Bob Doughty. Join us again next week for more news about science in Special English on the Voice of America.