Science Video

Lightning: Fact or Fiction?
Physicists, Engineers Capture Lightning with Tethered Rockets

April 1, 2006 — To study lightning, scientists use rockets connected to the ground by wires. They fire the rockets into clouds, triggering electrical discharges, and storing their power. They have found that lightning doesn't come straight down to the ground, but it instead takes a series of steps.

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GAINESVILLE, Fla.--We've all been caught in the middle of a storm, but what you don't know about lightning may surprise you! Lightning kills, on average, about as many people each year as tornadoes do, and more than 500 people are injured each year. What else do you need to know about lightning?

First you see it ... Then you hear it! But how much do you know about it?

Storm chaser Lee Nichols, says, "Every now and then you see one that just starts from the middle of the sky and completely covers everything. Fascinating." When he sees clouds roll in, he rolls out! "We have punched a core of a storm, which means driving right through it -- in what's called a bear cage -- and lightning is just bouncing around all over the place," he tells Ivanhoe. "You're inside like looking out of lightning bars," he says.

But as close as we can get to it, there's still a lot we don't know about it. Martin Uman, a professor at University of Florida Lightning Research Group in Gainesville, Fla., says, "One of things we're trying to do now is understand how it strikes the ground -- how it strikes what it strikes."

Engineer Martin Uman and physicist Joe Dwyer are trying to crack the code and increase safety. Joe Dwyer, a physicist at University of Florida Lightning Research Group, says: "If you are a power company, you've got to make sure that lightning is not going to strike one of your poles and cause a blackout. You got to make sure that if lightning strikes your aircraft that you're not going to get people killed."

The two are literally capturing lightning. They launch a rocket with a wire connected to it out of tubes and into the sky. The rocket snakes its way up to the cloud, finds the charges in the cloud, and then brings the lightning down to the researchers.

Dwyer says they've learned lightning doesn't come straight down to the ground. It does so in a series of discrete steps.

There are many lightning misconceptions. First, car tires don't protect you -- a couple inches of rubber won't stop a burning bolt, but the metal frame does protect you because the current flows through the metal frame, leaving the occupants unharmed.

Also, did you know lightning could strike 15 miles from rainfall, so it's not safe until 30 minutes after you hear the last thunderclap?

The more facts we learn about lightning, the more we can strike fiction from the flashes.

Another myth: If you touch a lightning victim you'll be electrocuted. The human body doesn't store electricity, so if someone is hit help them immediately.

BACKGROUND: Lightning is a common phenomenon but there are still a lot of things scientists don't know about it. A pair of modern Ben Franklins -- a physicist and an electrical engineer -- are studying lightning at the Florida Institute of Technology by sending rockets into the air to seek out and capture lightning.

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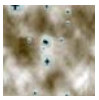

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charges are balanced; that is, there is the same number of protons and electrons. But some atoms have electrons that are more loosely attached and can be knocked free, flowing between atoms of matter to create a current of electricity. For instance, the atoms that make up the dry asphalt are stable and non-conductive, and the electron charges from a downed power line cant' travel very far. But what if the road is wet? Water is highly conductive, and the electric charge can easily travel from the power line to your feet. Unless you happen to be wearing thick rubber soles (rubber is also non-conductive), you'll likely be electrocuted.

WHAT IS LIGHTNING? Lightning is a form of static electricity. We experience static electricity every time we drag our feet on the carpet and then touch a conducting surface, like a metal doorknob. The shuffling causes our bodies to pick up extra electrons. Touching something with a positive charge, like metal, causes the electrons to "jump" across the small gap from our fingers to the object, and we experience a tiny electric shock. Similarly, lightning occurs because clouds become negatively charged as the water droplets inside rub up against each other during the natural process of evaporation and condensation, when moisture accumulates in the clouds. This charge seeks out something with a positive charge -- the ground, ideally -- and the lightning is the "spark" closing the gap between the two.

As more and more water droplets collide inside a cloud, the friction between them produces enough extra energy to knock off electrons. The ousted electrons gather at the lower portion of the cloud, giving it a negative charge. Eventually the charge becomes so intense that electrons on the Earth's surface are repelled by the growing negative charge and burrow deeper into the Earth. The Earth's surface becomes positively charged, and hence very attractive to the negative charge accumulating in the bottom of the cloud. All that is needed is a conductive path between cloud and Earth, in the form of ionized air -- another byproduct of the collision process. When the two charges finally meet, current jumps between the earth and the cloud, producing lightning.

EYE ON HISTORY: Benjamin Franklin reportedly performed his famous kite experiment during a thunderstorm in June 1752, on the outskirts of Philadelphia. But he wasn't the first to do so. One month earlier, a Frenchman named Thomas Francois D'Alibard had read Franklin's published paper, and used a 50-foot-long vertical rod to draw down lightning in Paris on May 10, 1752.

The American Meteorological Society contributed to the information contained in the TV portion of this report.