

A drop of resin is a tree's liquid bandage.

An Amber Time Warp

by Cindy Argentine

Earth is

a changeable place. Weather wavers. Trees transform. Dinosaurs disappear. But a geologist recently discovered that one aspect of nature has changed little over time — plant resin. Plant resin is remarkable stuff, and when it fossilizes, it becomes another marvelous thing — a gemstone called amber.

A Mysterious Find

Professor Ken Anderson of Southern Illinois University, Carbondale, has discovered the oldest amber ever found. His team was investigating a coal mine when a student ran to show him a piece of coal with glassy yellow bits in it. They determined it was amber.

Because of the coal's age, Anderson believes the amber is older than dinosaurs. "Amber is very common in sediments and in coal from about the age of the dinosaurs forward," says Anderson, "but no one had ever reported it as far back as we found it."

After analyzing the amber, he found its molecules strikingly similar to more recent resins. It was more like resin from modern flowering plants (angiosperms) than ancient

conifers (gymnosperms). "That was a really big surprise."

Nature's Armor

What is resin? "It's the sticky stuff you get on your hands when you trim a Christmas tree," says Anderson, who studies resin chemistry and geology. "Trees can't get up and run away, so to defend themselves from either insects that are boring into them or herbivores that may want to graze on them, they produce resin," he explains. "Herbivores, for example, just don't like that. It gets in their mouths, on their teeth, and it tastes very bitter."

If a plant is wounded, resin is its bandage. "It keeps out fungus, it keeps out bacteria, and it usually kills the insect as well," says Anderson. "If a tree is damaged in a storm it will do the same thing — it will exude this resin around the wound to seal and protect it."

How Resin Becomes Amber

Amber begins to form when liquid resin, containing chemicals called terpenes, oozes onto a plant's surface or falls to the ground. Once exposed to light and air, some of the terpenes volatilize, releasing a piney smell. Other terpenes polymerize, forming long molecular chains. These changes cause resin to harden. After the

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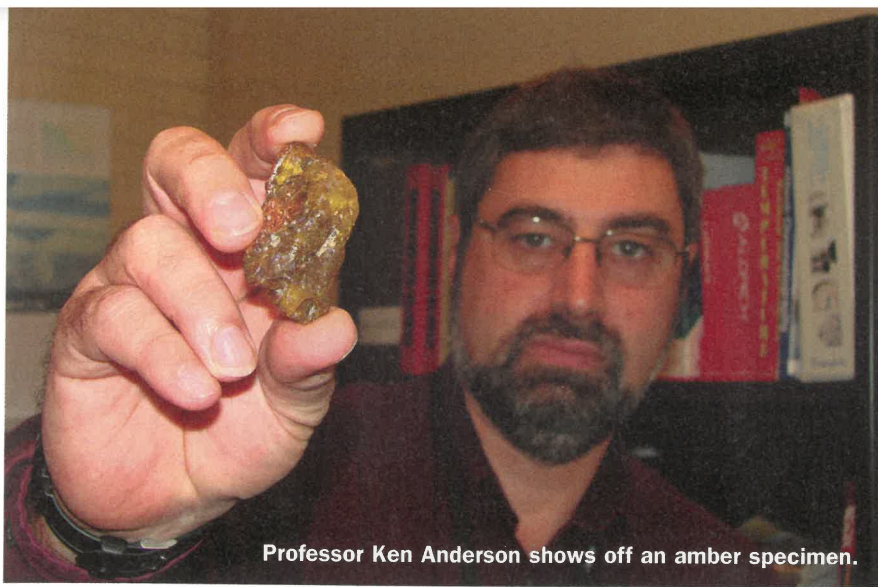
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Professor Ken Anderson shows off an amber specimen.

plant dies, heavy sediments like clay bury the exposed resin and seal out oxygen, safeguarding it.

"Resin needs that initial exposure to light and air to harden up," explains Anderson. "But if you leave it there for a long time exposed to the atmosphere, it will eventually oxidize away. So, if it's going to be preserved, it's got to get buried and protected from these things."

Fossils Within Fossils

When resin seeps out, it captures whatever it engulfs. Because it is waterproof and anti-bacterial, resin preserves trapped creatures for antiquity. And it preserves the whole creature, not just its skeleton.

Complete beetles, bees, damselflies, and a swarm of termites have been preserved in amber. The oldest spider web in the world has been found in it. Unlucky scorpions, geckos, and frogs have been caught too.

For historical plant research, amber is invaluable. By examining pollen found on a bee trapped in amber, biologists learned of an ancient orchid. Leaves and flowers are fixed in it. And as Anderson can attest, the chemistry of the resins themselves

helps characterize ancient plants.

Even microbes have been preserved. Scientists have studied bacteria and fungi from amber. Whole amoebas have been found, almost identical to ones existing today.

Attractive in Many Ways

Amber is often honey-colored, but it can range from milky white to almost black. Anderson has seen clear, yellow, orange, red, and greenish samples. Some samples are tiny, others huge. "The biggest piece of resin I've ever seen, I couldn't have wrapped my arms around," he said.

Ancient Greeks were familiar with amber. They discovered its electrostatic properties: After rubbing it, they noticed it could pick up paper bits. They called amber "elektron," the basis of our word "electricity."

"Amber is everywhere," says Professor Anderson. It's been found on every continent. Covered by ancient rivers and decaying plants, this glistening substance is history frozen in time. Through its golden windows we catch glimpses of a primeval world.

Cindy Argentine is a writer who studied environmental science and environmental law and now writes about it. This is her first article for *ODYSSEY*.

A Fragrant Path to Science

AFTER TALKING with Professor Anderson about amber, resin, and his current research, I asked what led him into this field in the first place.

"There's a good story behind that," he answered. "When I was a graduate student, I was studying coal. At the time — this was way back when — someone gave me a sample of coal with a little bit of resin, a little bit of amber in it. And I just thought that was cool, and I thought I'd study it for a little bit. I did a quick experiment and in the process, I basically messed up. But I had to clean my equipment, and that meant heating it up. I heated it up to clean off the excess resin, and the whole room suddenly filled with the smell of pine trees. It was just amazing! And I was hooked. Straightaway. They'd long since been extinct, but I suddenly realized — I know what that tree smelled like; I know what it was like to be standing around that tree. I have never forgotten that moment, and I've been interested in ambers ever since." C.A.



Caught!