

# Dinosaur DNA: Is the Race Finally Over?

In the frenzied hunt for ancient DNA, microbiologist Scott R. Woodward may have bagged the biggest quarry. Drawing on lessons learned while growing up among the fossil-rich rocks of eastern Utah, Woodward and his team became the first people to find genetic material belonging to a dinosaur, they report this week in the Nov. 18 SCIENCE.

"Yes, you can get DNA from 80-million-year-old bones. This is just the beginning," says Woodward of Brigham Young University in Provo, Utah.

DNA — the basic blueprint for life — degrades quickly after an animal dies, so researchers once believed it impossible to find ancient genetic material. The search for old DNA took off in the late 1980s after the development of a technique called polymerase chain reaction (PCR), which copies minute quantities of DNA. Armed with PCR, scientists could look for tiny fragments of DNA that might have weathered the millennia unharmed.

In recent years, researchers have isolated DNA from 20-million-year-old magnolia leaves and from insects entombed in amber. Raúl J. Cano of the California Polytechnic State University in San Luis Obispo last year extracted DNA from a 135-million-year-old weevil found in amber. Woodward's team is the first to extract DNA from bone dating back millions of years.

Cano, a competitor in the race to isolate dinosaur DNA, applauds the new work. "I am impressed by what they were able to accomplish. We've tried and we've never been successful," he says.

Woodward, whose grandfather was a coal miner, knew that mines in the area often contained dinosaur traces. At the start of his search, Woodward enlisted former high school classmate Mark Bunnell, an engineering geologist for a coal-mining company. After 6 months of looking, Bunnell and Woodward pulled two bone fragments from a Cretaceous siltstone layer directly atop a coal seam. The unstable mine roof prevented recovery of other bone samples.

The siltstone apparently inhibited fossilization and preserved much of the original cell structure in the bone. The researchers isolated strands of DNA from both fragments and used PCR to copy a segment that codes for a protein called cytochrome b. Once they had made many copies, they could determine the DNA sequence. Throughout their work, the biologists took precautions to avoid contaminating the samples with modern DNA or ancient material in the coal.

According to Woodward, circumstantial evidence indicates that the bone

fragments belong to one or two species of dinosaurs. Dinosaur tracks are abundant in this coal formation, and the bones visible in the mine were larger than those of a crocodile — the biggest nondinosaur known in these rocks.

David D. Gillette, Utah's state paleontologist, examined Woodward's fragments and says, "it's certainly reasonable to say that they're dinosaur in origin."

Cano, however, questions the identity of the DNA strands. Because the copies of the cytochrome b sequence varied considerably, he wonders whether the DNA comes from several organisms. Woodward explains the variation as a result of damage to the ancient DNA, which caused the PCR technique to alter the original sequence.

Scientists have hoped to use DNA to resolve a debate about the relationship among birds, dinosaurs, and other reptiles. But the cytochrome b fragments



Fragments of dinosaur bone.

were too short to offer meaningful phylogenetic information, says Woodward. For that, the dinosaur hunt must continue.

— R. Monastersky

## Women drinking alcohol: When less is more

Conventional wisdom holds that women who drink don't, as a group, down as much alcohol as men. The fact that women generally have smaller bodies than men, thus limiting their tolerance for alcohol, provides the most frequently given explanation for the difference.

A new study now challenges this view, suggesting that women consume nearly as much alcohol as men, relative to the volume of fluids in their bodies. Indeed, researchers find, it is the body's fluid content, rather than weight, that more accurately reflects one's drinking capacity.

Even for people of the same weight, men's bodies generally contain more fluids than women's. With less blood and other fluids in which the alcohol can dissolve, women may end up with the same or higher concentrations of alcohol in the blood as men, even if they have fewer alcoholic drinks.

"The brain doesn't count the number of drinks," explains James L. York, a pharmacologist at the Research Institute on Addictions (RIA) in Buffalo, N.Y., who led the study. "The brain counts only the molecules of alcohol reaching it." York and his RIA colleague John W. Welte published their findings in the November JOURNAL OF STUDIES ON ALCOHOL.

York and Welte interviewed 273 alcoholics who had stopped drinking. For comparison purposes, 133 moderate, or "social drinkers," served as a control group. The researchers asked participants about their drinking habits, including how often they drank, the type of alcohol consumed, and how much they

drank. Using a technique called bioelectric impedance, the researchers measured the total volume of fluids in each volunteer's body.

Men and women in the control group reported having an average of 3.8 drinks and 2.4 drinks, respectively, on the days they drank. However, when the researchers considered differences in body fluid content, the women's intake nearly equaled the men's — women consumed an average of 1.05 grams of alcohol per kilogram of body fluids, compared to 1.16 g for the men.

Similar findings showed up among the alcoholics. On the days they drank, alcoholic men averaged 23.3 drinks; alcoholic women averaged 17.8. Adjusted for body composition, however, alcohol concentration in the women averaged 7.83 g per kg of body fluids, while that for men averaged 7.65 g.

To test these findings further, York and Welte matched their results with data from an earlier study of drinking habits among New York State residents. Calculating body fluid content, the researchers found that the women in that study achieved near equality with men, consuming 1 g of alcohol per kg of body fluid per day compared to the men's 1.1 g.

"Women who believe they are protected from alcohol-related illnesses by drinking less than their male counterparts should heed this warning," says Kenneth R. Warren, director of the National Institute on Alcohol Abuse and Alcoholism in Rockville, Md., which funded the study.

— A.C. Brooks