NEWS RELEASE

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A Lot of Hot Air: How the Dinosaurs Grew So Monstrous

FOR IMMEDIATE RELEASE

The dinosaur skeletons and fleshed-out reconstructions we see in museums tower over their viewers. How and why did these massive creatures grow so monstrous?

The answer is probably a lot of hot air. At least, that's what the research of Sara Decherd, a doctoral student in marine, earth and atmospheric sciences at North Carolina State University, suggests.

Decherd studies the ecology of the Cretaceous period, some 160 million years ago, when Earth's atmosphere contained more oxygen and more carbon dioxide and was, in her words, "a hothouse." She believes, and is working to demonstrate, that this richer atmosphere helped plants grow bigger and faster. With lots of food, herbivorous dinosaurs thrived -- and became lumbering prey for their carnivorous cousins.

Both plant-eaters and meat-eaters grew fearsome, in effect, because food was plentiful.

Decherd's research doesn't focus on the dinosaurs, though, but on the role of Earth's atmosphere on plant life. She's using one of the most ancient plants, the *Ginko biloba* tree, to test her hypothesis.

"Research has shown that elevated carbon dioxide levels result in higher productivity, faster photosynthetic and growth rates, and greater rates of carbohydrate synthesis," she says. "My work involves measuring how modern ginko trees react to Cretaceous-like atmospheres, and how the higher levels of oxygen and carbon dioxide affect the leaves' nutritive value and digestibility. We're also comparing these experimental ginko leaves with fossilized ginko leaves from the Cretaceous period to help verify our work."

Like many scientists, the doctoral student is working with a multidisciplinary team, all specialists in some aspect of the research. Her committee includes Dr. Barry Goldfarb, associate

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professor of forestry and a plant physiologist; Dr. Reese Barrick, adjunct professor in the Department of Marine, Earth and Atmospheric sciences and a dinosaur paleontologist; Dr. Dale Russell, visiting professor in the College of Physical and Mathematical Sciences, another dinosaur paleontologist; and Dr. Elisabeth Wheeler, professor of wood and paper science, a fossil woods expert. Experiments are performed at the Duke University Medical Center in collaboration with Dr. Claude Piantadosi of the Center for Hyperbaric Medicine and Environmental Physiology.

Decherd hopes her research can resolve a scientific conundrum: How could the limited North American land area of the Cretaceous period – when water in the east and mountains in the west left only a relatively narrow band of arable land – grow enough plants to support the numerous, diverse and very hungry herbivores of the time?

"I hope to demonstrate that the enriched atmosphere of that time had a profound impact on plant productivity," Decherd says. "Others have shown that oxygen was 50 percent higher and carbon dioxide was 500 percent higher in the Cretaceous atmosphere. Both of these gases affect the growth of plants, which are very sensitive to changes in oxygen and carbon dioxide levels."

The experimental ginko seedlings she's grown in Cretaceous-like atmospheres, for example, have triple the photosynthesis rates of seedlings grown in today's atmosphere. And Decherd points to other plant responses – such as carbohydrate and lignin content – that result from the richer prehistoric gases.

"Given these data and results," she says, "we think it highly probable that plant growth was substantially increased during the Cretaceous period."

Does that explain the massive size of the dinosaurs? It might, but Decherd prefers to focus on the plant-growth aspects of her research. "The larger issues my work could help illumine aren't the dinosaurs," she says, "but rather the ecology of the Cretaceous period, the addition of our data to environmental and climatic models, and perhaps some insight into current concerns about greenhouse gases and global warming."

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