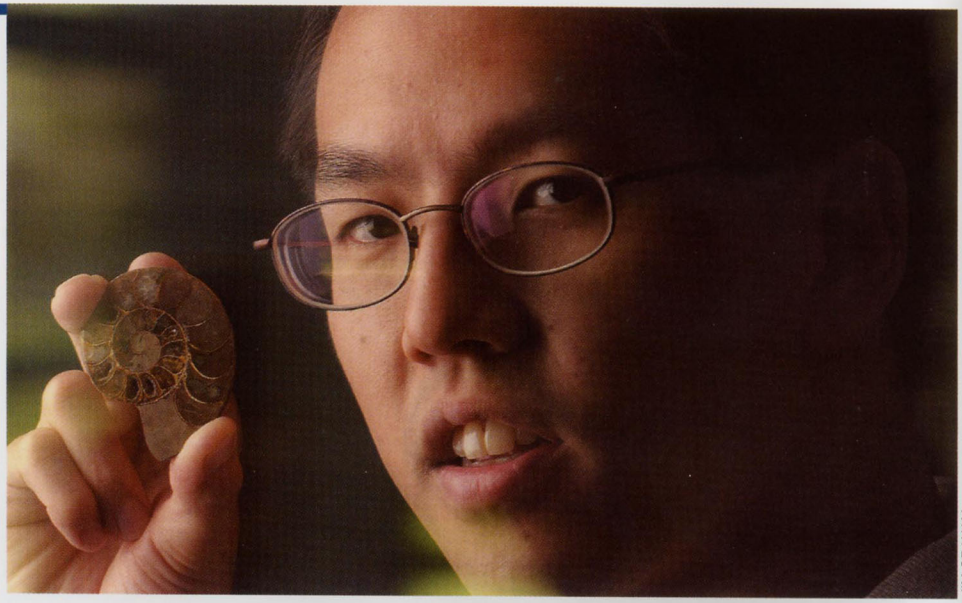
FILLING IN THE FOSSIL RECORD

When Assistant Professor of Statistics Steve Wang was a boy, he loved dinosaurs and read dinosaur books voraciously. His interest and engagement in the subject has never waned. Yet, he didn't become a paleontologist. Rather, he approaches the subject through mathematics and statistics, having developed statistical models designed to determine the causes of mass extinctions.

Though statistical paleobiology is a subfield that Harvard paleobotanist Andrew Knoll says has been around for about 40 years, he says Wang "exemplifies a new trend within the subfield—the attraction of real statisticians to the field rather than just paleontologists who can crunch a few numbers." Knoll, who has collaborated with Wang in developing his models, says the use of statistics is entirely necessary in quantifying fossil data that otherwise resists overarching concepts: "The fossil record is a huge maze of particulars. To extract generalities or trends from these data, one absolutely needs statistical analysis."

"The fossil record is incomplete. There [are] a lot of missing data," Wang explains, saying the record contains many biases, or gaps. "Statistics is useful in quantifying some of these biases in the fossil record in order to better understand the history of life." By analyzing the dates at which specific fossils are found and then creating statistical models that take patterns of gaps in the fossil record into account, Wang hopes to create a method through which time spans of mass extinctions can be estimated.



JIM GRAHAM

Wang explains that clues to the causes of extinctions can be found in the time spans over which they occur. For instance, extinctions that occur over a short span are more likely to be attributed to sudden, catastrophic events, such as an asteroid impact—the now generally accepted cause for the extinction of the dinosaurs. An extinction that occurs over a longer period, on the other hand, would more likely be the result of a gradual cause, such as climate change. Working in collaboration with several Harvard scientists, including Knoll, Wang devoted the past summer to developing models that he hopes will help answer questions that have captivated the discipline. "How is it that two-thirds of the species on earth could become extinct in one million years, which is very short in geological time?" he asks in reference to the Cretaceous Extinctions, which included the extinction of the dinosaurs approximately 66 million years ago. He further questions whether there are any patterns to mass extinctions, whether they're generally caused by similar or differing phenomena, and what kinds of species are most affected.

"These are events that have a profound impact on the world today," Wang says, citing the extinction of the dinosaurs as a particularly key event that allowed mammals—and ultimately humans—to flourish. "Yet for many of them, we don't know why they occur, or how they occur, or how often they occur. It's a mystery."

For Wang, statistics appear to be a useful tool through which any movement toward a solution to this mystery might be found.

—Elizabeth Redden '05