Sushi lover. The California condor may owe its survival to its diverse diet.

Mexico and Florida indicate that the birds had terrestrial diets—and didn't survive there. (Food from the ocean would have been less plentiful in Florida, which lacks the currents that bring nutrients up from the sea floor off California.)

"It's a novel study," says paleontologist John Alroy of the National Center for Ecological Analysis and Synthesis in Santa Barbara, California. "As far as paleontological evidence goes, it's pretty convincing." The broader diet could explain why condors were able to survive despite the loss of many large animals. "To hang on for 12,000 years, you've got to be doing something right."

Timing Complicates History of Horses

It's a classic story of evolution. About 18 million years ago in North America, horses, camels, and other groups of herbivores independently evolved high-crowned cheek teeth. This condition, called hypsodonty, has long been considered a response to a changing environment: During this time, the Miocene Epoch, the climate was cooling, and grasses—which contain abrasive silica—began to spread and replace leafy woodlands. Tall teeth that last longer would have provided an immediate advantage.

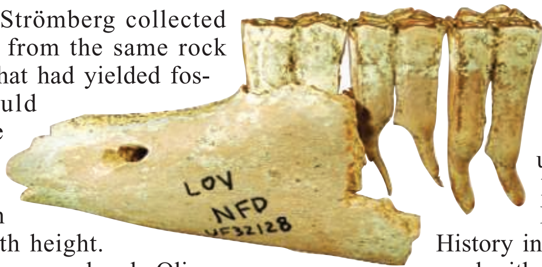
The tale is not so straightforward, it turns out. At the meeting, Caroline Strömberg of the Swedish Museum of Natural History in Stockholm reported that it took 4 million years after the grass began to dominate the Great Plains for hypsodonty to appear—a puzzling lag. "It really does raise questions," says Christine Janis of Brown University. Yet not all was quiet on the western front: Janis and colleagues presented evidence that at about this time horses were developing legs more efficient at moving, which may have allowed them to range more widely for tender grass in the open landscape. Strömberg charted changes in vegetation by examining the tiny bits of silica, called phytoliths, contained in grasses, palms, and many other kinds of plants. She collected 99 samples from rocks across the central Great Plains, spanning roughly 31 million years (from the middle Eocene, through the Oligocene and Miocene) until about 9 million years ago. The relative amounts of various kinds of phytoliths revealed whether the habitat was open grassland resembling the modern savanna, woodland, or forest. The work paints the first high-resolution picture of vegetation for this time period. "It's an excellent, well-constrained study," says Bruce MacFadden of the University of Florida, Gainesville.

Because Strömberg collected the samples from the same rock formations that had yielded fossils, she could compare the changes in vegetation with known shifts in tooth height. In the late Eocene and early Oligocene, the area was forested. Grasses replaced the trees in the central Great Plains by at least 22 million years ago, but full-blown hypsodonty didn't take root in horses for another 4 million years. "This is a significant lag," Strömberg says. "It weakens the argument for coevolution, in lockstep, of horses and grasses."

Then why the lag? One possible reason could be that there was weak or no pressure to adapt to the new vegetation. But Strömberg points out that when the savanna first appeared, the closest relative to hypsodont horses, which belong to the genus *Parahippus*, evolved slightly higher teeth than its ancestors had. It may also be that some animals compensated by learning new behaviors to cope, such as feeding on grasses only in the spring, when they are tender, as red deer do.

Clues may come from elsewhere in the skeleton. Janis and Manuel Mendoza and Paul Errico of the University of Rhode Island have examined horses' limbs, for example. During the Miocene, horses and camels were evolving longer limbs, but apparently not to escape accelerating predators—which evolved longer limbs some 20 million years later. Instead, Janis proposed, the limbs first evolved to be more efficient at walking. In a preliminary analysis, Janis measured the limbs of fossil horses at the American Museum of Natural History in New York City. Compared with their ancestors, the advanced horses of the Miocene had knees and ankles with features suggesting that the limbs would have been more constrained to move in a fore and aft plane and hence more efficiently. "I think they're increasing their foraging radius," Janis says. High-crowned teeth might not be the only way to make life on the grasslands less of a grind.

–ERIK STOKSTAD



Delayed. High-crowned teeth took a while to evolve to resist gritty food.

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Snapshots From the Meeting

Tetrapod ancestor. Researchers from the Academy of Natural Sciences in Philadelphia, Pennsylvania, the University of Chicago, Illinois, and Harvard University unveiled what may turn out to be the most significant fossil reported at the meeting: a lobe-finned fish that belongs to the group most closely related to four-legged vertebrates, known as tetrapods. "It may be an *Archaeopteryx*-quality transitional fossil," says Per Ahlberg of Uppsala University in Sweden. A complete skull and shoulder girdle, as well as two partial skulls, were found in roughly 380-million-year-old rocks on southern Ellesmere Island, Canada. It is only the third member known from this group, called the elpistostegids. The specimen will likely yield important insights in the evolution of tetrapods, Ahlberg predicts.

Precocious flyers. Birds and bats don't start flying until they're almost full grown. At the meeting, researchers from Humboldt University in Berlin and the University of London argued that pterosaurs were different, taking to wing at just 5% of adult mass. The pair studied variously sized individuals of *Pterodactylus kochi* and found that young ones had about the same aerodynamic proportions as adults, presumably suitable for takeoff. A recently described pterosaur embryo, complete with wing membranes, has also been interpreted as ready to fly. This could indicate that pterosaurs didn't need parental care.

–E.S.