# Frog defense: Make snakes yawn

The Chinese say it's the year of the rabbit, but for medicine and biology it may be the year of the African clawed frog. In August, one researcher showed that this frog's skin contains a previously unidentified class of microbe-killing peptides, a finding that might lead to better treatment of burns, cystic fibrosis and other human ills (SN: 8/8/87, p.85). Now, two zoologists report that other compounds excreted by the frog's skin appear to trigger uncontrollable fits of yawning and gaping in snakes that try to eat the frogs.

Imbalances in these peptide and indoleamine compounds have in the past been linked to human nervous system disorders, say George T. Barthalmus and William J. Zielinski at North Carolina State University in Raleigh, who did the work with American northern water snakes. And because the snakes' behavior resembles the involuntary muscle contractions of people suffering from Parkinson's disease and tardive dyskinesia, which is caused by the long-term administration of antipsychotic drugs, they believe their discovery could improve the understanding and treatment of these problems.

Scientists have known for some time that frogs produce chemicals in their skin that are usually found only in the nervous systems of other vertebrates. "What's so bizarre," says Barthalmus, "is that no one's ever wondered what in the world these [neurochemicals] are doing in the skin of the frog."

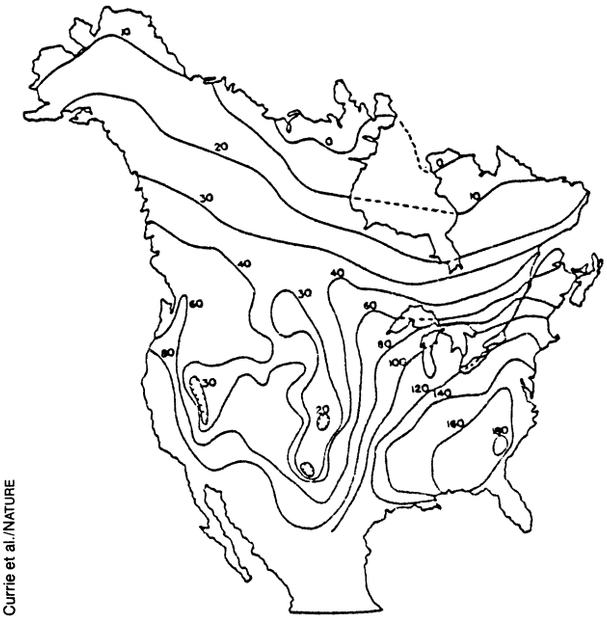
Because the African clawed frog is one of the oldest frog species, he suspects that its skin neurochemicals, like the antimicrobial peptides found this summer, represent a primitive chemical defense system against predators. More advanced amphibians, he notes, use complex mixtures of similar chemicals, but these either taste awful or make their predators sick. The evolutionary advantage of the more advanced compounds, he says, may have been that they act faster and have more enduring effects than do the neurotoxins: Once a predator bites an advanced amphibian, it leaves the amphibian alone, whereas the water snakes in Barthalmus's lab repeatedly attack the African clawed frogs even though the snakes are seized with mouth-wrenching contractions each time.

Barthalmus would like to see whether snakes living near the clawed frogs in Africa are resistant to the frogs' neurotoxins. If so, he says, their resistance could suggest ways to "formulate antipsychotic drugs that don't produce side effects or even ways to treat tardive dyskinesia, which has been basically untreatable."

*– S. Weisburd*

# Can only evapotranspiration make a tree?

*Biologists have been unable to explain fully why some locales have numerous plant or animal species, while others do not. Theories to explain this variability include climate and glacial movement preventing the spread of species. But the single most important reason, say scientists from Ontario's University of Ottawa, is evapotranspiration – the total amount of water that passes through a given biological system, including evaporation and moisture released from plants during photosynthesis. David J. Currie and Viviane Paquin used U.S. Forest Service information to determine the numbers of tree species in various locations in North America (see map). By comparing the map with data on climate and other factors, the scientists conclude in the Sept. 24 NATURE that, although individual species may come and go in a specific area, the amount of available water will keep that area's total number of species quite constant. Currie told SCIENCE NEWS that other data suggest animal diversity is correlated with the amount of solar radiation, which, like evapotranspiration, is a measure of energy available for growth.*



Currie et al./NATURE

# Prehistoric tusk: Early boomerang?

Scientists who found a curved piece of mammoth tusk in a cave in southern Poland have dubbed it the world's oldest known boomerang, dating to about 23,000 years ago.

The claim is based on the artifact's shape, curvature and flattening at both ends, report Pawel Valde-Nowak and his colleagues of the Polish Academy of Sciences in Krakow. It spans about 27 inches and is up to 2.3 inches wide and 0.6 inches thick. One side preserves the external, rounded surface of the tusk, while the other has been polished almost flat.

The age of the purported boomerang could be estimated, say the investigators in the Sept. 30 NATURE, because it was found in a layer of sediment containing stone and bone tools belonging to a known culture of prehistoric central Europe. Although the teeth and bones of a variety of amphibians, birds, reptiles and mammals were also excavated, human food remains appear to be mainly split reindeer bones. Amid the tools and animal bones, the researchers also found a human thumb bone.

The mammoth tusk "certainly makes a plausible boomerang," writes English archaeologist Paul G. Bahn in the same NATURE, but not all curved objects are necessarily boomerangs. Versions of the boomerang have been found on five continents, he says, but "killing sticks" that did not return after being thrown are more numerous in both prehistoric and historic times. The aerodynamic properties of sticks that happened to be curved may have been exploited on occasion.

The true test of the artifact would be to hurl it into space and see if it comes back, says Bahn, but researchers are unlikely to take such a risk with a delicate prehistoric object. It may be possible, he explains, to experiment with a cast or replica, although warping or other damage to the long-buried artifact may interfere with such reenactments.

Nevertheless, the Polish scientists say that their discovery is "the oldest definite find" of a boomerang. They add that the range of human artifacts and the geographic location of the cave suggest that the site may have been a temporary shelter for human groups migrating northeast through central Europe.

*– B. Bower*