ment of acetyl-CoA to serotonin.

Cole and Khalil made their new compound by connecting the molecule tryptamine, which is very similar to serotonin, to a variant of acetyl-CoA. The enzyme AANAT should readily take up this molecule, they reasoned, because it looks so much like the serotonin–acetyl-CoA combination. "It wasn't a large leap of faith to think that . . . we could generate a structure which would be a potent inhibitor," says Cole. The synthesized compound indeed binds to AANAT 1,000 times better than its usual targets do. The team reports its findings in the June 24 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

Cole and Khalil also learned that, in test tube experiments, a molecule found naturally in cells also blocks AANAT quite well. Called a fatty acyl-CoA, it resembles the synthesized tryptamine-CoA compound. Its inhibitory action could explain two earlier observations. People who fast for one or two days experience an increase in fatty acyl-CoA levels. Also, their melatonin production drops. The Rockefeller results may be "one way to put those two unconnected observations together," Cole says, although a link between AANAT and fatty acyl-CoA in the body remains speculative.

The study is "a stepping stone toward a novel class of inhibitor compounds that could be of clinical value," says David C. Klein of the National Institute of Child Health and Human Development in Bethesda, Md. "If you want to bring melatonin synthesis to a very low level, that might enhance alertness." Klein and his colleagues are working on blocking a process that destroys AANAT—yet another approach to regulating melatonin synthesis. —*C. Wu*

Fatal skin fungus found in U.S. frogs

Chytrid skin fungi, which have devastated frogs in parts of Australia and Central America, have now turned up in the wild in the United States. Early signs hinted that U.S. species might tolerate the infection as no more than a nuisance, but new data from Arizona raise the possibility that chytrids cause die-offs in the United States.

Tissue samples from dead and dying frogs in Arizona—wild lowland leopard frogs and captive Chiricahua leopard frogs, a rare species—show chytrid infection, reports pathologist Donald K. Nichols of the National Zoological Park in Washington, D.C. Large numbers of both species have died off in the wild in the last decade, notes Philip C. Rosen of the University of Arizona in Tucson, who had collected the samples. Just what role the fungus plays is far from clear, but "we're taking it very seriously."

The chytrid fungus made headlines two weeks ago when an international team of scientists fingered it as the culprit in die-offs of 19 amphibian species in pristine tropical streams in Australia and Central America. Details will appear in the July 21 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

One of these outbreaks, in Panama last year, caught the attention of coauthor Karen R. Lips, now at Southern Illinois University in Carbondale. She collected some 50 dead amphibians during a single trip to Panama and sent samples to D. Earl Green, now at the National Institutes of Health in Bethesda, Md. He found small, round bodies in their skin. "These were quite a conundrum," he says.

Coauthor Lee Berger of the Australian Animal Health Laboratory in Geelong also found the odd structures in wild frogs and toads from Australian die-offs. DNA analysis suggested chytrid fungi, a group not previously known to attack vertebrates.

Meanwhile, another pathology team was also closing in on the fungus. Nichols first noted the fatal skin disease in 1991 in captive arroyo toads in California. In 1996, he saw it in zoo frogs in Washington, D.C., and sent electron microscopy images and samples to mycologist Joyce E. Longcore at the University of Maine in Orono. She recognized the agent as a chytrid fungus and suggested that it represents a new genus.

Nichols has since found low levels of the fungus in wild cricket frogs in Illinois. Likewise, Green found infections in several Maryland specimens of the common American toad. In neither case did the animals appear to be suffering a fatal disease like the Arizona frogs. —*S. Milius*

Jean-Marc Hero/Griffith University

A fungus is attacking frogs worldwide, such as this Australian tree frog.

Ancient North American shoes step to fore

By about 8,000 years ago, inhabitants of what is now the United States were making and wearing sophisticated sandals and slip-on shoes, according to researchers who analyzed a rare sampling of ancient footwear.

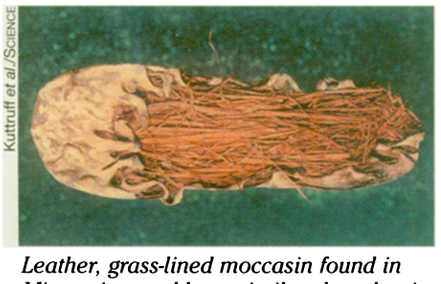
Prehistoric North Americans apparently fashioned shoes in regional styles using a variety of materials and techniques, contend archaeologist Michael J. O'Brien of the University of Missouri at Columbia and his coworkers.

O'Brien's group applied accelerator mass spectrometer (AMS) dating to 7 of 18 footwear specimens discovered more than 40 years ago in central Missouri's Arnold Research Cave.

"The design and weaving observed in the oldest specimen are about as complex as what we see in later ones that we've dated to around 1,000 years ago," O'Brien says. "These people knew exactly what they were doing."

Radiocarbon dating of sediment at the Missouri cave suggests that it was occupied as early as 11,000 years ago, O'Brien says. Researchers had not previously dated footwear at the site because the traditional radiocarbon method would have destroyed large portions of the items. The AMS technique uses tiny samples to measure the presence of different forms of carbon.

Two types of shoes appear in the Missouri collection. Most of the sandals have straps; the slip-ons generally have sides that hold the shoe on the foot. The footwear was constructed of plant fibers or, in two cases, leather.



Kuttruff *et al.*/SCIENCE

Leather, grass-lined moccasin found in Missouri resembles a similar shoe that is about 1,000 years old.

The recent dating places the oldest specimen, a nearly complete sandal, at between 8,325 and 7,675 years old, the scientists report in the July 3 SCIENCE. It features a pointed toe, a sling-like heel formed out of twisted cords, and interlaced fibers in the sole. A braided cord apparently passed through side loops and over the foot and was tied at the ankle.

Other examples of ancient footwear, such as those attributed to the Anasazi in the U.S. Southwest around 1,000 years ago, exhibit few similarities to the Missouri finds, the researchers hold. Their results add to evidence of early advances in weaving and textile production in North America and elsewhere (SN: 5/23/98, p. 331).

For example, AMS dates extend back to as early as 9,000 years ago for sandals of a different style unearthed in Colorado, says Phil R. Geib, a Navajo Nation archaeologist based in Flagstaff, Ariz. Similar analysis of intricately woven baskets previously found in Nevada, conducted by Catherine S. Fowler of the University of Nevada, Reno, places their age at about 9,400 years. —*B. Bower*

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