Wading newts may explain enigmatic tracks

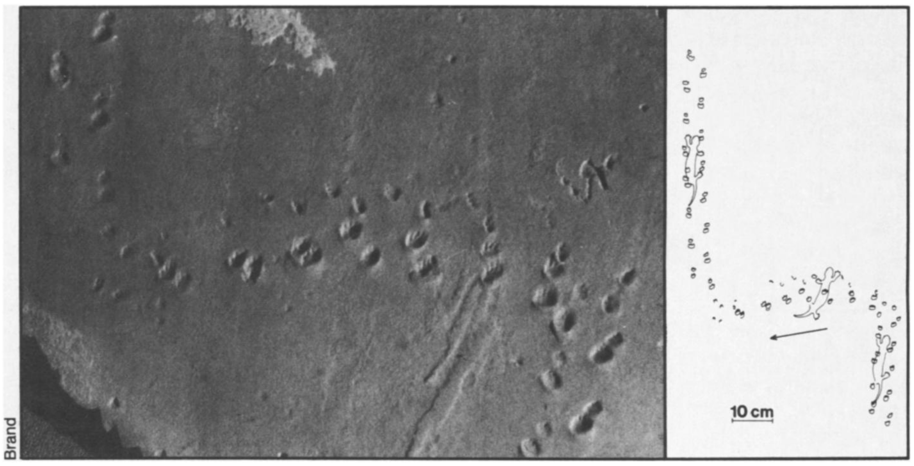
With the help of some wet newts, two California paleontologists have fashioned a theory to explain strange footprints found in sandstone layers within the Grand Canyon and nearby locations. The controversial idea challenges a half-century-old view of the origin of these rocks.

The tracks appear in the Coconino sandstone, a rock layer that forms steep white cliffs toward the top of the canyon. For decades, the Coconino has served as a quintessential example of a sandstone formed by windblown dunes that get buried as one spreads over another. According to this interpretation, the Grand Canyon region may have resembled the Arabian desert when the Coconino rocks formed roughly 270 million years ago.

But Leonard R. Brand and Thu Tang of Loma Linda (Calif.) University propose that animal tracks in the sandstone indicate that much of the Coconino developed underwater. They outline this theory in the December GEOLOGY. "Many of those tracks have characteristics that are just about impossible to explain unless the animal was underwater," Brand told SCIENCE NEWS.

In particular, he notes that these tracks often show animals moving in one direction while their feet point in a different direction. Other tracks start or stop abruptly, with no sign that the animal's missing tracks were covered by some disturbance such as shifting sediments.

Brand suggests that newt-like animals created the tracks while walking underwater and being pushed by a current. To test that theory, he and Tang videotaped living newts walking through a tank with running water. The animals produced tracks with features similar to those in the Coconino, Brand says.



Brand

Tracks in sandstone. Diagram shows how currents may have forced animal to left.

Because the underwater interpretation runs against the geologic mainstream, Brand and Tang have not found a supportive audience among geologists.

"I find it interesting, but I can't believe it. Every other signal screams out: wind deposition," says David B. Loope, a sedimentologist at the University of Nebraska in Lincoln.

Ralph Hunter of the U.S. Geological Survey in Menlo Park, Calif., agrees that evidence within the Coconino indicates it formed mainly from windblown dunes. Most important, he says, the formation has thin laminations consisting of fine sand on the bottom and coarse sand on top. "That is very distinctive and is a very reliable indicator of deposition by wind ripples," Hunter says.

He suggests that some of the tracks may indeed have formed underwater in small streams running through a field of windblown dunes. He notes that such streams and ponds develop temporarily after infrequent rains in the Namibian desert of southwest Africa.

– R. Monastersky

Haze may confound effects of ozone loss

A layer of stratospheric ozone acts as a shield that protects Earth's inhabitants from much of the sun's damaging ultraviolet radiation. With recent recognition that certain pollutants are eroding this natural radiation filter, researchers have raced against the clock to find substitutes for the chlorofluorocarbons and other compounds responsible. Adding to the urgency, the United Nations announced in October that summertime ozone levels above Earth's midlatitudes have decreased by about 3.3 percent per decade since 1979 (SN: 11/2/91, p.278).

Haze – a suspension of sulfates and other largely combustion-generated pollutants in the lower atmosphere – is best known for its ability to reduce daytime visibility. However, it can also filter out harmful ultraviolet rays. Indeed, a new theoretical study suggests that ambient haze levels in even rural areas of the United States and other developed, midlatitude nations currently filter out an amount of ultraviolet light equal to or greater than the excess now leaking through the stratosphere.

The bad news is that this balancing act should prove transitory. As industrial nations tighten controls on haze-forming pollutants and as stratospheric ozone continues to thin, both ultraviolet shields will erode further.

Using measurements collected at rural sites in the United States and Europe, Shaw C. Liu of the National Oceanic and Atmospheric Administration in Boulder, Colo., and his colleagues estimated the concentrations of the microscopic particles, or aerosols, responsible for haze. Since summertime solar heating mixes these fine, ultraviolet-scattering aerosols in the lowest kilometer or two of the atmosphere quite effectively, says Liu, "we assumed the aerosol concentration we derived from visibility measurements was constant with height throughout this mixed layer." And because aerosol blockage of ultraviolet light above this layer "is rather small," he says, "we pretty much assumed there were essentially no aerosols from the top of this boundary layer to the sun."

In the December GEOPHYSICAL RESEARCH LETTERS, Liu's team concludes that haze levels typical of northern-midlatitude rural sites have decreased ground-level exposures to damaging UV-B radiation (280- to 315-nanometer wavelengths) by 5 to 18 percent compared with preindustrial times. In urban areas such as New York City, where haze levels may be two to five times higher, "it's a safe bet that the ultraviolet – from air pollution alone – has been cut down something like 20 to 30 percent from preindustrial times," Liu told SCIENCE NEWS. Validation of these estimates must await publication of precise ultraviolet data now being collected by others, he says.

Because most ultraviolet monitoring occurs in haze-prone regions, Liu and his coauthors speculate that future reductions in both aerosols and stratospheric ozone "may result in a stronger [increase] in UV-B than expected from either constituent alone."

Atmospheric chemist F. Sherwood Rowland of the University of California, Irvine, calls the procedures used by Liu's group "quite defensible" and the team's conclusions "quite plausible."

– J. Raloff