Fossil soil has the dirt on early microbes

Researchers looking for signs of ancient life have hit pay dirt in South Africa. Fossilized soil deposits there indicate that simple organisms may have colonized the continents as many as 2 billion years ago—a find that dramatically pushes back the history of life on land, report two South African geologists.

The record of ocean life reaches back 3.5 billion years, but firm evidence of life on the harsh, wind-scoured landscape does not appear in the first 3 billion years. "People say there was life in the oceans and shallow seas but no life on land [during that time]. We think we can give indirect evidence that there were some sort of algal mats or microbial colonies on land," says Jens Gutzmer of the Rand Afrikaans University in Auckland Park. Gutzmer and Nicolas J. Beukes describe their work in the March GEOLOGY.

The two scientists made their discovery in a manganese mine in the Gamagara rock formation of central South Africa. They noticed a hardened and compacted layer of ancient soil, several centimeters thick, that contained balls of hematite and pod-shaped masses of clay. Such structures are found today in a type of soil that forms in hot, humid, vegetation-rich environments.

With an estimated age of 2.0 to 2.2 billion years, the South African soil layer does not contain fossilized microbes, which are too fragile to survive in such rocks, the researchers say. Instead, it holds chemical clues to the presence of microbes in the past.

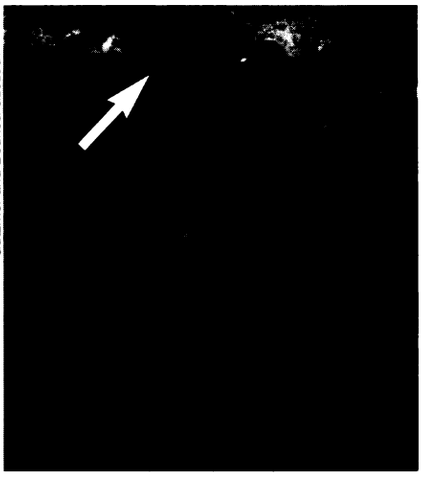
The top of the hardened soil layer appears bleached because it lacks red iron minerals, which were stripped from the upper layers and deposited in the lower ones. The researchers suggest that organic matter in the upper part of the soil reacted chemically with the iron, making it soluble. Rainwater then carried the iron into deeper layers.

The source of the organic matter was bacteria, algae, or other simple organisms inhabiting the soil and the ground surface, the researchers suggest.

The oldest widely accepted fossils of land organisms hail from the Ordovician period, 475 million years ago. Several scientists have reported circumstantial evidence of earlier land life but have yet to convince most researchers.

The South African find comes as welcome news for Gregory J. Retallack, a paleobotanist at the University of Oregon in Eugene, who contends that life on Earth may have originated in soils and later spread into the oceans. "Life on land, I think, has had big effects all throughout Earth history," says Retallack.

Other researchers view the South African finding as muddy. "It's a teaser," says Heinrich D. Holland, who studies ancient soils at Harvard University. "It could be true, but I consider it a weak straw in a strong wind."



Gutzmer and Beukes/GEOLOGY

In 2-billion-year-old soil, the light-colored top layer (arrow) hints at early land life.

Holland notes that swamps covered parts of the South African landscape around the time these soils formed. Gutzmer and Beukes agree that the organic matter responsible for the iron leaching could have come from aquatic organisms in these bodies of water.

For conclusive evidence of early land life, researchers will need to find fossils of ancient microbes, says Holland.

—R. Monastersky

Heterosexual women have noisy ears

Faint, echolike noises generated by the inner ear are louder in heterosexual women than in homosexual or bisexual women, report researchers from the University of Texas at Austin. This finding suggests that some regions of homosexual and bisexual women's brains are different from those of heterosexual women, says neuroscientist Dennis McFadden.

McFadden postulates that differences may also exist in parts of the brain responsible for sexual orientation. The idea that structures in the brain determine sexual destiny is controversial, however (SN: 8/10/96, p. 88).

"This field has a long history of findings that were initially welcomed into the canon but subsequently discredited by their inability to be replicated," says William Byne of Mount Sinai School of Medicine in New York. "Until one of these studies, including McFadden's, is successfully replicated by an independent lab, I will remain skeptical."

McFadden and Edward G. Pasanen analyzed noises, known as click-evoked otoacoustic emissions, that people's ears make in response to brief sounds. The emissions, present from birth, are generally stronger in women and, barring damage to the ear, retain a characteristic strength throughout life, McFadden says. To measure the noises, he and Pasanen insert a small microphone into each person's outer ear, send a series of clicks into the ear, and record the ear's reply. They present their findings in the March 3 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The researchers tested the otoacoustic emissions of 237 college-age men and women. The scientists found no differences between heterosexual and homosexual or bisexual men. In contrast, the 57 heterosexual women's ears made significantly louder sounds, on average, than those of the 61 homosexual or bisexual women. McFadden cautions that the groups overlap, so "it would not be possible to predict the sexual orientation of someone by simply measuring otoacoustic emissions."

In earlier studies, McFadden and his colleagues found that women with twin brothers have quieter otoacoustic emissions. He proposes that exposure to male hormones, called androgens, during pregnancy changes the hearing systems of female fetuses that share the womb with a male. However, he adds, there is no evidence that such women are more often lesbian. Studies of other mammals have shown leakage of sex hormones from one fetus to another.

McFadden suggests that the lesbian and bisexual women in the current study were also exposed to androgens before birth. "The auditory systems of homosexual and bisexual females were being masculinized at the same time that other brain [regions] were being masculinized," McFadden says.

Bruce Parsons of the New York State Psychiatric Institute in New York doesn't buy McFadden's argument. "There's no evidence to indicate that homosexuality in our species depends on prenatal androgen levels," he says. "So far, we don't have any really good data that suggest that brain structures are responsible for sexual orientation. . . . We need data—and this [study] isn't it."

McFadden's work is part of a growing body of evidence that biological factors play a role in sexual orientation, says Simon LeVay, a researcher-turned-writer in West Hollywood, Calif. LeVay has detected differences in brain anatomy between heterosexual and homosexual men. "Biology is part of destiny—it's a part of why we are the way we are." But, he adds, "I don't think it's the whole matter—don't be ridiculous."

—M.N. Jensen