

Ancient American marine scene

Many archaeologists assume that before the end of the Stone Age 10,000 years ago, prehistoric New World settlers stayed inland, where they could exploit hunting and foraging skills developed in Asia. Even if some early arrivals migrated down the coast from the Bering Strait and favored fish over big game, rising seas presumably covered signs of their presence.

Now, scientists have discovered two coastal outposts in southern Peru, described in the Sept. 18 *SCIENCE*, and they suggest that the first South Americans lived off the sea as much as off the land. The sites date to as early as 11,100 years ago and offer the oldest solid evidence of maritime occupations in South America.

"These important new sites show that the first settlement of South America occurred along the [Pacific] coast as well as in the highlands," comments Thomas F. Lynch of Texas A&M University in College Station. Until now, Lynch championed the influential theory that inland hunters headed for the coast sometime after 10,000 years ago, as game populations dwindled.

Excavation at Quebrada Jaguay, directed by Daniel H. Sandweiss of the University of Maine in Orono, uncovered abundant evidence of human activity, including stone tools, flakes produced during toolmaking, and 30 pieces of obsidian, which could only have been brought from far away. Remains of fish known as drums—probably caught in large nets—and clams also turned up. A series of circular holes may have held wooden posts for a building. Radiocarbon analysis of charcoal at the site dates it to between 11,100 and 10,000 years old.

At nearby Quebrada Tacahuay, investigators led by David K. Keefer of the U.S. Geological Survey in Menlo Park, Calif., found remains of a hearth, stone tools and flakes, bones of seabirds and fish, and shellfish leftovers. Radiocarbon dating of charcoal yielded an age of between 10,770 and 10,530 years for this material. Evidence of flooding and water-borne debris in the ancient sediment may have resulted from El Niño-induced rains during the Stone Age, Keefer's team proposes.

The sites now lie less than 1 mile from the beach; 11,000 years ago, they would have been a few miles inland. Prehistoric inhabitants of this area spent part of their time each year on the coast and the rest in the highlands, Sandweiss theorizes. —B.B.

Trailing Lewis and Clark

After 12 years of work at a spot on the Missouri River near Great Falls, Mont., archaeologists announced last week the discovery of a possible campsite used by 19th-century explorers Meriwether Lewis and William Clark. Although they made camp more than 600 times while seeking a Northwest passage to the Pacific, no campsite has been found until now.

Discoveries at the Great Falls campsite include three stone-ringed fire pits, an iron pushpin, a wooden tent stake, a gun flint, and many bison bones bearing the butchery marks of metal tools. The location and military-style arrangement of the encampment, as well as radiocarbon dating of objects, are consistent with the explorers' written accounts, says project director Kenneth W. Karsmizki of Montana State University in Bozeman. Lewis and Clark's records show that their 33-member team set up camp in the vicinity for 12 days in

1805. No other major expeditions that would have followed military procedures traveled so far up the Missouri River until 1832. —B.B.

Fire pit remains at proposed Lewis and Clark campsite.



Ken Karsmizki/©Museum of the Rockies

Deep rock gives lift to Africa

In the world of geophysics, southern Africa stands out as a puzzle. All continents have a geologically stable heartland, called a craton, which usually forms a flat, low-lying plain. The craton of southern Africa, however, hovers as a vast plateau about a kilometer above sea level. Two researchers now propose that the reason for this unusual height lies deep inside the planet.

In the past, geoscientists studying Africa's elevation have searched for answers in the lithosphere, the planet's outermost shell, which is broken up into large plates. But these efforts have come up dry. "This has been a long-standing mystery in plate tectonics," says Carolina Lithgow-Bertelloni of the University of Michigan in Ann Arbor.

She and Paul G. Silver of the Carnegie Institution of Washington (D.C.) decided to take a deeper look. They studied images of Earth's mantle that seismologists produce from recordings of earthquake waves. For many years, these images have shown that the mantle—the thick rocky layer beneath Earth's crust—is warmer and less dense than normal under Africa.

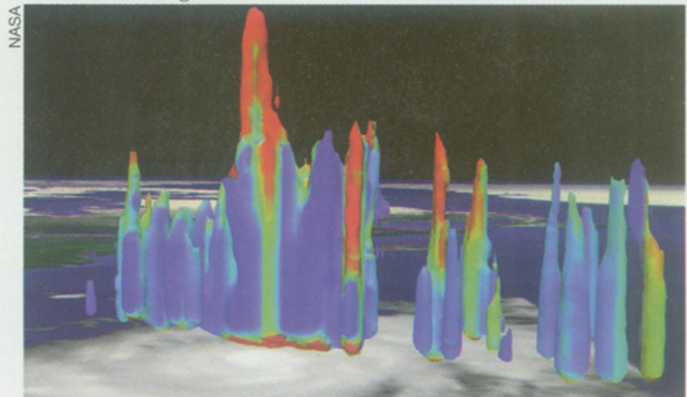
Although rock in the mantle is solid, it can flow slowly because of the extreme temperatures. Lithgow-Bertelloni and Silver used the seismic images to calculate how the mantle should flow under Africa and how that movement would affect the surface elevation. According to their analysis, the buoyant rock deep in the mantle rises at a rate of a few centimeters per year, forcing the surface upward by about a kilometer, the researchers report in the Sept. 17 *NATURE*.

Their conclusions have swayed some geoscientists who have studied the elevated African terrain. "It makes a lot of sense, given what we are learning about the structure of the lower mantle," says Andrew A. Nyblade of Pennsylvania State University in State College. In 1994, Nyblade noted that the seafloor around southern Africa was also unusually high. He called the entire region the African superswell. —R.M.

Bonnie's clouds pierced stratosphere

Thunderstorm clouds in hurricane Bonnie punched their way up to dizzying heights, according to images collected by a rain-sensing satellite. The radar on the craft, which was launched last fall, detected a narrow chimney of rain clouds reaching up to an altitude of 18 kilometers. Thunderstorm clouds in the Atlantic typically do not extend higher than 15 to 16 km, the top of the troposphere, says Christian Kummerow of NASA's Goddard Space Flight Center in Greenbelt, Md.

Above the troposphere lies the stratosphere, where rain clouds cannot normally exist. The chimney clouds from Bonnie soared so quickly that they temporarily projected into the stratosphere, says Kummerow. Meteorologists think that such behavior may precede the intensification of a storm, a pattern followed during Bonnie. —R.M.



Hurricane Bonnie sprouted towering clouds (red) on Aug. 22.