1783

Pu229	Pu230	Pu231	Pu232	Pu233
Np228	Np229	Np230	Np231	Np232
U227	U228	U229	U230	U231

New plutonium isotope

LEAD STORY 1784

Toward the universal library

1789

Biodiversity by computer

the new plan is "not dependent" on any big increase in funding. It can be supported, he claims, within the typical budget increases NHGRI has received recently—about 10% a year. NHGRI's budget this year is $220 million. But he adds with a twinkle: "Additional resources could be used very effectively." –ELIOT MARSHALL

ARCHAEOLOGY

Traces of Ancient Mariners Found in Peru

Most immigrants to the Americas have arrived by sea, but the very first Americans simply walked in. Or so goes archaeologists' traditional view, which holds that the first inhabitants were the big game hunters called Clovis people, whose ancestors crossed the Bering land bridge and swept southward through the Americas perhaps 11,200 years ago. But dates as early as 12,500 years ago at a site in Chile have raised questions about this model, and many researchers have speculated about a shadowy alternative: that the first Americans set the pattern for later immigrants by arriving by boat, leaving few traces of their journey.

Now on page 1830 of this issue, two independent research teams report finding the first hard evidence, albeit indirect, for the maritime settlement theory. The discoveries, which reveal an ancient maritime culture in South America about 11,000 years ago, are "about the best kind of evidence that you're going to find that people familiar with the ocean were migrating down through the Americas," says geologist David Keefer of the U.S. Geological Survey in Menlo Park, California, lead author of one study.

As long ago as the mid-1970s, archaeologist Knut Fladmark of Simon Fraser University in Vancouver proposed that coastal peoples from Asia settled the Americas by paddling southward down the Pacific Coast with simple watercraft and a hefty dose of maritime savvy. Fladmark also noted that the theory would be hard to verify, because most of the clues left along the coast by these putative coastal explorers would now be underwater, drowned some 10,000 years ago by sea levels rising after the last ice age.

Along the southern coast of Peru, however, the sea floor slopes steeply away from the coast. As a result, "very little land horizontally was lost to rising sea level," says archaeologist Daniel Sandweiss of the University of Maine, Orono. "This is one of the reasons I was looking for sites in this region." There, one U.S.–Peruvian team led by Sandweiss and another led by Keefer found two ancient campsites of a maritime culture. Radiocarbon tests on charcoal indicate that Quebrada Jaguay, Sandweiss's site, is 11,100 years old, while Keefer's, Quebrada Tacahuay, dates to 10,700 years, making these cultures among the most ancient in South America. A few Andean sites are between 11,000 and 11,500 years old, and the famous Monte Verde site in central Chile has been put at 12,500 years old, although some researchers still have reservations about this date (*Science*, 28 February 1997, p. 1256).

Bones and other refuse found at the new sites show, says Keefer, that the inhabitants "were familiar with and were using the sea." At Quebrada Tacahuay, people concentrated on fishing for anchovies and hunting seabirds, particularly cormorants. "What we're seeing is really an economic specialization," says faunal analyst Susan deFrance of the University of Florida, Gainesville, a co-author of the paper on this site. "Clearly they focused on this small group of birds," she says, systematically butchering them to remove breast meat. So intently did Quebrada Tacahuay's inhabitants focus on the ocean that 99.8% of the bones at the site belong to marine creatures.

At Quebrada Jaguay, the inhabitants earned their living by gathering clams and capturing small schooling fish, chiefly species in the drum family. Moreover, at both sites the teams found remains of small, calorie-rich fish, indicating an early net fishery—a very specialized maritime occupation, notes Keefer. But the coastal dwellers at Quebrada Jaguay also had intimate connections to the Andes. Studies of trace elements in the obsidian they sometimes used for tools show that the stone came from highland sources 130 kilometers to the east, indicating that these people either traveled to the highlands themselves or traded with people who did, says Sandweiss.

Coastal finds. Campsites of an ancient maritime culture hug the Peruvian coast.

KEEFER *ET AL.*

SANDWEISS *ET AL.*

Seafarer's home? Ancient Americans may have traveled by water to the arid coastal site of Quebrada Jaguay.

Both the early dates and the maritime lifestyle make it unlikely that these people were the descendants of land-lubbing Clovis people, says Anna Roosevelt, an archaeologist at the University of Illinois, Chicago. After they reached South America, the Clovis were thought to have headed first for the Andean highlands, where the temperate, open habitat supported big game. "They weren't supposed to reach the coast … until later," says Roosevelt.

What's more, she and others have found equally old Paleoindian sites in South American rainforests, where they adopted a plant-collecting, foraging, and fishing lifestyle, again very different from that of the Clovis people (*Science*, 19 April 1996, pp. 346 and 373). Thus the ancient maritime sites "suggest that Clovis is just one of several regional early Paleoindian occupations. There's no apparent ancestral relationship between Clovis and these people in South America," says Roosevelt.

But if Clovis isn't the mother of these maritime cultures, who is—and how did the ancestral stock get there? The obvious answer is by sea, says Keefer, although such a claim is far from proven yet. In Keefer's view, the net fishery and reliance on ocean food sources indicate a sophisticated and ancient knowledge of the ocean. That means that "the most logical scenario would be for them to migrate down the coast," he says. The extreme aridity of the Peruvian coast—one of the driest places on Earth, both then

and now—argues for water travel, says Sandweiss. "If you had watercraft, then you could carry water and you could move more quickly" than traveling overland, he says.

Even researchers who have invested their careers searching for the earliest South Americans in highland sites are now giving the maritime idea serious consideration. "I've long pushed the idea of people moving down the flanks of the mountain zone all the way from the Isthmus of Panama down the Andes," says archaeologist Tom Lynch, director of the Brazo Valley Natural History Museum in Bryan, Texas. "But it may be that people actually came along the coastal fringe." **–HEATHER PRINGLE**

Heather Pringle is a writer in Vancouver, British Columbia.

ANIMAL EXPERIMENTATION

Strict Rules Rile Indian Scientists

NEW DELHI—Proposed rules to create a government-run system to regulate research using animals have triggered a fierce debate in India. Drafted by a committee chaired by social justice minister Maneka Gandhi, an outspoken animal-rights activist, they are set to go into effect on 8 October. But research groups are trying to block them, arguing that they are extreme and threaten valuable research.

PALLAVA BAGLA

Government guardian. Social justice minister Maneka Gandhi says rules are meant to protect "my animals."

Issued last week, the proposed rules would require all labs doing animal experimentation to register and obtain prior written approval from the government. They would effectively ban animal testing and other contract work for foreign institutions and companies by prohibiting any research done on behalf of unregistered institutions. Registered labs would also need to provide quarterly updates on their activities and could neither transfer nor acquire animals without permission. Gandhi describes the proposed rules "as conforming to well-established norms adhered to in the West."

The new system would be run by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), which Gandhi chairs. It would supplant voluntary guidelines issued in 1992 by the Indian National Science Academy. Last week the committee released a survey done by a private advocacy group that found that many of the country's leading research labs haven't been following even those guidelines. "Why should my animals be subjected to cruel tests for the sake of Western companies?" Gandhi said in an interview with *Science*. "I am very happy that there will be more paperwork [for the scientists]. ... They are used to doing whatever they feel like. Now they will have to fall in line."

Perhaps, but not quietly. Last week officials from the National Academy of Sciences urged Prime Minister Atal Bihari Vajpayee to prevent the implementation of the proposed rules. A dozen heads of biomedical labs and secretaries of government scientific departments also met last week and called for more discussion. "They are fraught with serious consequences to the progress of biomedical research in India toward new vaccines and new drugs," says Vulimiri Ramalingaswami, a pathologist and former chief of the Indian Council of Medical Research (ICMR). International research would also be jeopardized, says Chhitar Mal Gupta, director of the Central Drug Research Institute in Lucknow, which has a long-running project with the U.S. Walter Reed Army Institute of Research testing new therapeutics against malaria. "This collaboration will fall apart and drug development will be shattered," he says.

Each year Indian scientists at 5000 laboratories use more than 5 million animals—ranging from frogs and rats to monkeys and buffaloes—at a cost exceeding $10 million. India has traditionally been a major source for experimental Rhesus and Bonnet monkeys caught in the wild, and several international pharmaceutical companies stepped up their animal testing facilities in the country after a 1978 ban on exports. Experts say that such tests cost one-tenth as much as they would in the West.

Institutions are supposed to follow the academy's voluntary guidelines, which lay down broad policies on housing and feeding of animals and proper experimental procedures. They specify that all institutions should have animal ethics committees that must include at least one outside scientist and one member of the public. Whereas ICMR Director-General Nirmal Kumar Ganguly says that "all Indian institutes are conforming to the [academy] guidelines," a new survey carried out at the behest of the CPCSEA found otherwise.

The survey released last week found that of 30 labs sampled (including many national research institutes, pharmaceutical companies, and at least one veterinary college), only half had any form of animal ethics committee, and only two had any outside members. In fact, *Science* has learned that

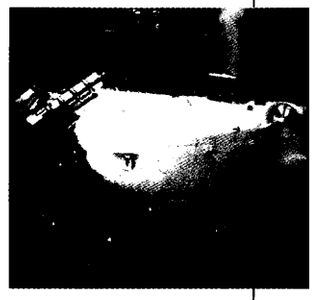
ScienceScope

VINTAGE SUB AWAITS FATE

Scientists are trying to decide whether to retool a new gift to science—a Cold War submersible—or strip it for parts. Either way, they say, U.S. oceanographers could profit.

Last month, the U.S. Navy delivered *Sea Cliff* to the Woods Hole Oceanographic Institution (WHOI) in Massachusetts. The submersible has cruised to 6000 meters below the surface—the deepest of any U.S. sub—while on military search-and-recovery operations. Now, engineers are evaluating how much it would cost to outfit the vintage-1968 craft for civilian research.

WHOI



Sea Cliff. Spare parts?

If making the switch proves too expensive, researchers may transfer the *Sea Cliff*'s sturdy lights, arms, and other gear to WHOI's underwater flagship, the *Alvin*. But the retrofit can't impair *Alvin*'s reliability, says Dick Pittenger: "In trying to make *Alvin* better, we don't want to lose what we've got."

CANADA'S UNIVERSITIES SHY AWAY FROM FASTER INTERNET

Who should be using Canada's next-generation Internet? That question is being debated in the wake of a review claiming that too few academics are taking advantage of the high-speed data pipeline.

In a report obtained by *Science*, external reviewers found that only 28 of Canada's 80 universities are linked to the CA*net II electronic backbone, which became operational in 1996 and can transmit data at speeds reaching 100 megabytes per second. The panel concluded that high hookup costs—which schools must bear by themselves—are keeping many universities off-line.

Bill St. Arnaud of the Canadian Network for the Advancement of Research, Industry & Education (CANARIE), a CA*net II architect, says the network was never intended to lure academic users. Rather, he says, it is designed to foster Internet commerce. Scant university use, however, could prove problematic when CANARIE makes its pitch later this year for $80 million in government funds to complete the third phase of its networking projects. One government official's ironic take on the issue: "We built it and no one's using it—there's a real incentive to support phase 3."