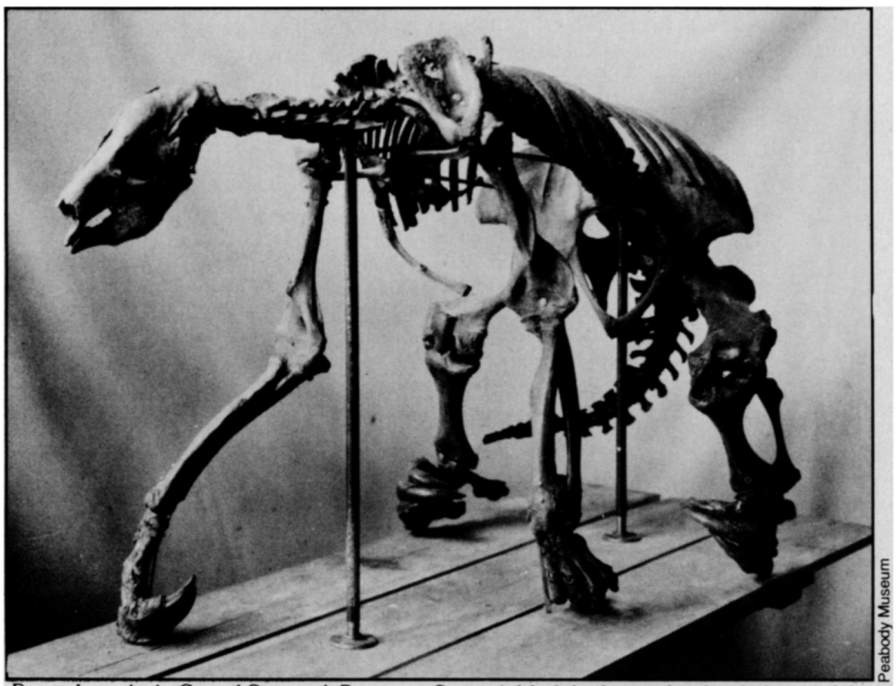
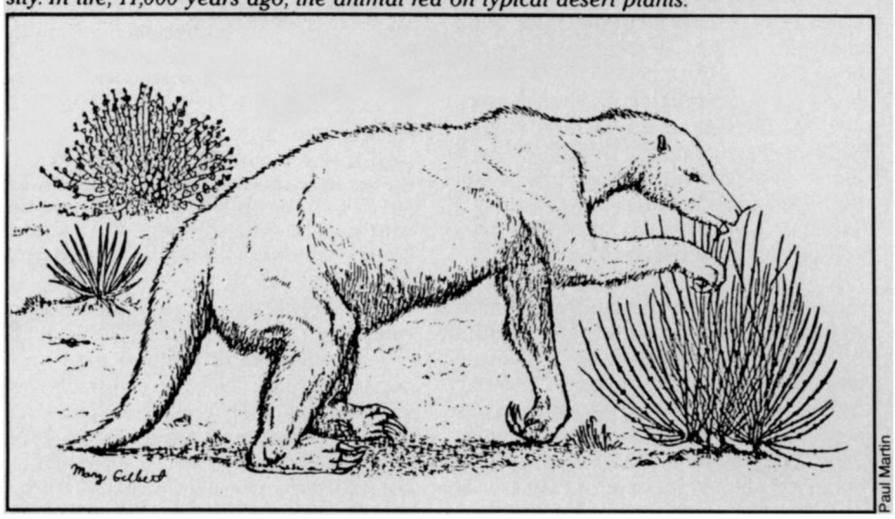
# THE GREAT LATE PLEISTOCENE EXTINCTION: A SLOTHFUL TALE



Peabody Museum

*Dung deposits in Grand Canyon's Rampart Cave yielded the bones for the skeleton of the extinct Shasta sloth displayed at the Peabody Museum of Natural History at Yale University. In life, 11,000 years ago, the animal fed on typical desert plants.*



Paul Martin

**Humanity has been responsible for the extinction of numerous animal species. The process may have started tens of thousands of years ago.**

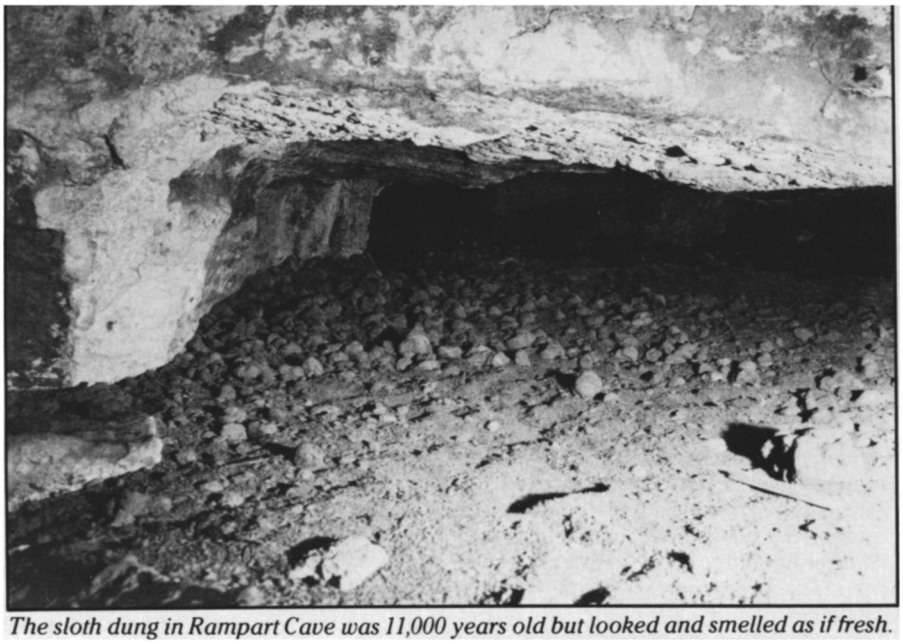
BY DIETRICK E. THOMSEN

Fires in caves and mines tend to burn for a long time. They are hard for people to reach and extinguish. The fire of 1976 in the Rampart Cave in the Grand Canyon burned for about a year. The fuel it fed on was ancient sloth dung, and as it burned, the fire damaged or destroyed a unique paleontological record, the value of which, according to Paul S. Martin of the University of Arizona (writing in the August-September 1975 NATURAL HISTORY) "can only be compared with such other paleontological treasures as fossil insects preserved in amber or the frozen mammoths of Siberia."

The dung in Rampart Cave was stratified. It preserved a datable record of the diet and some other habits of the Shasta ground sloth over a period of about 30,000 years. The oldest deposits dated from about 40,000 years ago; the newest were deposited about 11,000 years ago, at which time it appears the species was dying out. The date, 11,000 years ago, is significant for more than ground sloths. A number of species of large mammals died out in North America at the same time. Martin proposes that this "late Pleistocene extinction" was caused by humanity's earliest disturbance of the North American ecology.

The animal that left such neatly layered traces of its presence in Rampart Cave was one of several species of prehistoric ground sloths that lived in North and South America at the time. Some of these were giants, standing taller than an elephant and weighing more. The one represented in Rampart, the Shasta ground sloth *(Nothrotheriops shastense)*, was about the size of a pony and weighed perhaps 300 or 400 pounds. At its most extensive, it ranged from northern California and the Texas panhandle into northern Mexico. It was a browsing vegetarian, munching away on a number of the plants that are still representative of the flora of the Grand Canyon region.

In North and South America there are only nine other cave deposits of sloth



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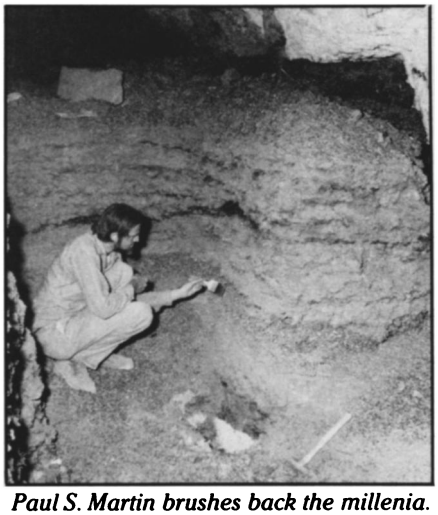
*The sloth dung in Rampart Cave was 11,000 years old but looked and smelled as if fresh.*



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*Paul S. Martin brushes back the millenia.*

dung known. "Rampart was the best," says Martin, "but the better part of it was destroyed." It contained something on the order of 200 cubic meters of dung. In that mass, paleontologists had hoped they might find a whole sloth or at least half of one, perhaps the mummified remains of a baby. Sloth bones and some pieces of skin have been found, but not a whole animal. Animal physiologists would have welcomed such a find, because they are curious about how the sloth managed to survive in the desert. They would like to study the skin thickness and pore spacing to find out how it stood the heat. "Did it work as a heat pump the way a dog does, or did it sweat a lot the way a camel does?" Martin asks. To have that kind of evidence of an extinct animal is invaluable, says Martin. "It's like having George Washington's first suit of clothes." You couldn't put a price on it.

Of course there may be other sloth caves yet to be found. One of the puzzles is the apparent rarity of sloth remains. Martin says he asks cave explorers in the Mojave Desert "to keep your eye open for chunks of sloth [dung]."

The rarity of sloth remains indicates that the species was by no means the dominant one of the region at the time. In its heyday, it shared the territory with other large mammals: early horses, early camels, mammoths, etc. Several of these species died out at about the same time as the sloths. It seems that some kind of serious disaster overtook the fauna of North America at that time. The record that the sloths left before their disappearance may give some clues as to what that was.

This great late Pleistocene extinction happened curiously fast, Martin points out. It wasn't like the Cenozoic extinction, in which the giant reptiles gradually died out over millions of years and were replaced by mammals that went gradually from little horses to big ones. All at once a lot of different species went together.

Some scientists have suggested that there might have been some catastrophic climate change that killed them off, but

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*Austin Long and Donna Larocca face burnt dung. Unburnt dung is behind them.*

Martin objects that that would have left traces on other continents, and there are none. Indeed, some have suggested that in the days of the Shasta sloth the Grand Canyon region was more jungle-like, arguing that because present day sloths are jungle animals, the ancient ones should have been too. But the fossil plant record, especially that which went through the bowels of the sloths themselves, does not support such an argument. Richard M. Hansen of Colorado State University examined plant remains in the sloth dung and found that 11,000 years ago and earlier the sloths were eating cat's claw, Mormon tea, globe mallow, saltbush, mesquite and succulents such as opuntia, yucca and agave. These are desert plants found in the region today. "Ground sloth extinction cannot be attributed to loss of their favorite browse," conclude Hansen, Martin and Richard Long of the University of Arizona in the December 1974 GEOLOGICAL SOCIETY OF AMERICA BULLETIN.

Martin's theory is that human hunters were responsible for the extinction of the large mammal species that went out 11,000 years ago. "Some people think my idea is pretty wild," he admits, but he argues that this curious extinction cannot "be swept under the rug," even though

more conventional kinds of paleontological modeling are "either unable to explain it or unwilling to deal with it."

There is evidence of human hunters having been in the Arizona-California area 11,000 years ago, but there is no direct evidence of their having hunted sloths. Nevertheless, they might have done so without necessarily leaving evidence for archeologists to pick up. Furthermore, it is not necessary for humans to have hunted every species that disappeared in order to have unbalanced existence for all of them. In the case of the sabertooth tiger, for example, it may be that humans hunted the sabertooth's favorite prey. As a result, the sabertooth would have found less food and would have reproduced less efficiently. If humans kept up the pressure for long enough, the sabertooth would have died out.

There is evidence that suggests extinction by hunting for mammoths in the Ukraine, Martin points out. There is a region in that country where 30,000 years ago people built their habitations out of mammoth bones. To the south of this area is territory that was then inhabited by humans but where the mammoth was extinct. To the north is territory where mammoths were then plentiful but humans rare or nonresident. Martin suggests that the region where people were exploiting mammoth bones represents a forward wave of human occupation that was gradually sweeping northeastward, extinguishing the mammoths as it went.

Martin proposes that a similar wave of hunting people passed across the Bering Sea land bridge that existed about 11,500 years ago and swept southward across North America. There is a good deal of dispute about the earliest date of human occupation of North America. Some evidence for human occupation that seems much older than 12,000 years ago has been found, but those anthropologists who still maintain that the first people came to America 12,000 years ago tend to reject it as mistaken. Martin's argument about the cause of the great extinction can still be maintained by proposing that humans who lived in North America before this wave of 11,000 or so years ago were too few in number to affect the balance of large mammal species or were not big game hunters.

Martin says that even if he's wrong, the answer to the question of the late Pleistocene extinction is going to be interesting. If he's right, then people have been disturbing the ecology for a long time. Environmentalists often praise primitive people for their ability to live in harmony with the environment. Indeed, since at least the time of Jean Jacques Rousseau, the Noble Savage has been praised for adopting a natural style of life. It may be that the Noble Savage was not so noble after all. □

## . . . Stress

thing else — we can't focus on just one thing."

Syme adds that the search for contributing forces "should not be limited only to factors associated with socioeconomic status. People who are married have lower death rates than those who are single, widowed or divorced for a wide variety of conditions and causes of death. States in the United States with high death rates for one cause tend to have high death rates for virtually all causes. Religious groups, such as Seventh Day Adventists and Mormons, have low death rates from all causes. Groups experiencing social and cultural mobility have higher rates of coronary heart disease, lung cancer, difficulties of pregnancy, sarcoidosis and depression. Those said to have 'stressful life events' have been reported to have higher rates of a wide variety of diseases and conditions ...."

He proposes that a "general susceptibility might be involved" and calls for "an inquiry into the common denominators among these factors."

The ultimate goal, of course, is the treatment or prevention of stress-related diseases. "The whole point is to relieve the individual," Shapiro reminds his research colleagues. An estimated $750 million was spent during the past year on drug treatment of hypertension. Biofeedback and other relaxation techniques are also being employed, although on not nearly as wide a scale as are drugs.

About 10 major studies have demonstrated that various relaxation techniques can lower blood pressure, notes Herbert Benson of Harvard Medical School and director of the hypertension section of Beth Israel Hospital in Boston. "Relaxation techniques have been shown to substantially lower blood pressure for up to six months," he says.

Some experts are impatient with the slow pace of stress/illness research efforts and feel that more than enough evidence already exists to support the existence of the connection. "We're hung up on what constitutes evidence," says Stewart Wolf, chairman of medicine and physiology at the University of Texas in Galveston. "Do we need, in order to establish the relevance of psycho-social factors, that [high] level of quantification? We know that alcohol is relevant to accidents, yet we're not hung up on the fact that there are people who drink and drive and *don't* get into accidents," he says.

"I suggest we no longer ask *if* psychosocial factors contribute to disease ... [and] act on our acceptance of the connection of life stress and illness."

Rose, however, cautions that considerably more research is needed in the field. "I'm conservative about treatment," he says. "We have to get much better data. But I'm encouraged by what's happening in the field now. Psychobiology will rise to the occasion." □

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**McGRAW-HILL ENCYCLOPEDIA OF FOOD, AGRICULTURE & NUTRITION** — Daniel N. Lapedes, Ed. — McGraw, 732 p., illus., $24.50. An overview of the world's food problem, together with 400 alphabetically-arranged articles on all aspects of agriculture: the cultivation, harvesting and processing of food crops; food manufacturing; health and nutrition.

**MATURITY AND COMPETENCE: A Transcultural View** — Douglas H. Heath — Gardner Pr (Halsted Pr), 1977, 287 p., $18. This volume tests the transcultural validity of a model of maturing or psychologically healthy development by intensive personality studies of college-age mature and immature men in the United States, Italy and Turkey.

**PUPILLOMETRY: The Psychology of the Pupillary Response** — Michel Pierre Janisse — Halsted Pr, 1977, 204 p., graphs, $22.50. An attempt to gather in a single volume the research literature on the pupillary response other than the light reflex and conditioning. A bibliography and reference list is included.

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**SCIENTISTS CONFRONT VELIKOVSKY** — Donald Goldsmith, Ed., foreword by Isaac Asimov — Cornell U Pr, 1977, 183 p., diagrams, $8.95. A critique of Velikovsky's theories by three astronomers, a sociologist and an expert on ancient astronomical records. Four of the essays are based on papers presented at the AAAS meeting in February 1974.

**STRESS AND COPING: An Anthology** — Alan Monat and Richard S. Lazarus — Columbia U Pr, 1977, 426 p., illus., $20, paper, $10. A systematic presentation of the major issues and findings in this field geared primarily to the undergraduate student.

**TECHNIQUES OF ARCHAEOLOGICAL EXCAVATION** — Philip Barker — Universe, 1977, 279 p., photographs & drawings, $18.50. Traces the development of excavation methods from the 1880s to the present, and describes the stages by which an excavation is carried out from preliminary field work to numerous processes of excavation and recording. The responsibility of the excavator is extremely heavy, says the author, since the study of a site is an unrepeatable experiment.

**TECHNOLOGY AND HUMAN VALUES: Collision and Solution** — Bruce O. Watkins and Roy Meador — Ann Arbor Science, 1977, 174 p., $12.50. A status report on the present state of technology and its continuing impact on the values of mankind.