Letters

Late Pleistocene Extinctions

Paul S. Martin, in his article "The discovery of America" (9 Mar., p. 969), puts forward a persuasive scenario. He argues that Paleolithic man, after he crossed the Bering platform, encountered a vast population of "inexperienced prey"—the American megafauna; that the human population underwent an explosive growth as it swept from the North American ice fields to Tierra del Fuego, consuming the large animal population; and that, after the overkill of the megafauna, the human population underwent a crash. He advances this scenario to explain the disappearance of the megafauna in the Americas in the late Pleistocene, but he points out that there remain the problems of the relative absence of kill sites and of a trail of evidence of a Paleolithic culture, both of which exist in Europe.

A slight modification of his scenario will render it even more plausible and can explain its deficiencies. Suppose that the megafauna population had developed in relative isolation from the Old World and that the real perturbation caused by the opening of the Bering platform was the introduction of new diseases into the Americas against which the local fauna were not resistant. (As Martin points out, hominid diseases endemic to the Old World tropics were unknown to the New World at that time, and of course the subsequent development of the human population in the Americas was in isolation from the Old World to the extent that the white man could, with a devastating effect, introduce diseases such as smallpox.) The disease carrier could have crossed the Bering platform at about the same time Martin indicates (11,700 years ago). The result would have been a plague which swept the Americas from north to south. If the disease was carried by man or his train (for example, dogs) the effect would have been the same as envisioned by Martin, with the game dying off before the advancing human population. The result would be no major kill sites, and because the human population would not necessarily have undergone an explosion and crash, there would also be no major trail of evidence of a Paleolithic culture. The plague scenario also escapes the question of whether any fauna population kept in check by their natural predators could be classified as "inexperienced" with respect to the human predators. If the disease carrier was simply one of the many predators that crossed the Bering platform, and not just man, that leaves the more conventional model of human migration, in which various "tribes" came across the Bering platform, pushing other tribes in front of them, as the pattern of linguistic diversity in the Americas suggests.

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Information contained in reports made by don Félix de Azara, a Spanish naturalist and geographer who lived in South America from 1781 to 1801, confirms Martin's contention that extermination of an extraordinarily abundant animal resource can occur within a few years, with no kill sites involved (*1*). In this case, it was the animals that were the recent arrivals, rather than the humans, but the effect was the same.

Horses were introduced into South America at the time of the first founding of Buenos Aires in 1536. The city was permanently reestablished in 1580 and the local Indians, the Pampas, driven off. Shortly thereafter, herds of feral horses had increased to such a degree that the Pampas Indians, in a change of habits, began to make use of them for food and other purposes.

Cattle were introduced somewhat later (1556) and were much slower in becoming feral. Even when they became numerous, however, the Pampas Indians, already well supplied with horses and horsemeat, ignored them. Tribes on the outskirts of the area soon took to trading in cattle as well as using them for food, but the sanctuary in the pampas remained. In addition, European trade in skins and animal fats was prohibited for a time.

According to Azara's best estimate, by about 1700, wild cattle had increased to 48 million head, inhabiting the campos and pampas from 26°S to 41°S latitude, an area of 42,000 square leagues or approximately 1.7 million square kilometers. Before the middle of the century, wild cattle had been all but exterminated. How was such a slaughter possible when the human population of this area, even including the wild Indian tribes, probably did not exceed 300,000 (*2*)?

Indians (including the Pampas, who joined in the trade) and Spaniards, as well as marauding Portuguese, made intensive forays against the cattle, principally to obtain skins from the bulls and fat from the cows. The roundups, which lasted for several months, customarily took place in the spring, at the time of calving. Young calves were unable to follow their mothers and perished; pregnant cows aborted from fatigue. In addition, each Indian killed two pregnant cows a day in order to eat the unborn calves, which were considered a delicacy. As for the Spanish, throughout the year each gaucho killed a cow for every meal. Such profligate use of a seemingly boundless resource soon brought it to an end.

Azara concluded his account by remarking, "it is a matter of surprise that all this took place in plain view, without anyone's having complained or even raised a voice at such a scandalous destruction."

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References and Notes

1. F. de Azara, "Memoria sobre el estado rural del Río de la Plata en 1801," in E. Alvarez López, *Félix de Azara, Siglo XVIII* (Aguilar, Madrid, 1935), pp. 230–251; see particularly pp. 239–240.
2. ———, *Viajes por la América Meridional* (Espasa-Calpe, Madrid, 1969), pp. 301, 308. Many of the Indian tribes were very small, the Pampas, for instance, numbering about 400 families (p. 199); others were smaller still. Although these figures are for a slightly later period, they give some idea of the density of population; in fact, from his perusal of old records, Azara was convinced that the Indians were more numerous then than at the time of the conquest (*1*, p. 200).

Paul Martin argues persuasively that the American continent could have been peopled in about 1000 years by a small body of hunters (about 100 people)

that crossed the Bering land bridge toward the end of the last Ice Age. However, there is evidence of a different kind which surely implies that two small bodies of invaders crossed the Bering Bridge in succession, one a substantial time after the other.

The evidence is the unusual distribution of blood groups (*1*) in the surviving Indian tribes of America. There is no native blood group B on the American continent, and blood group A occurs only north of a line that runs across the continent roughly between latitudes 32°N and 33°N. No plausible form of selection could have produced this distribution from a heterogeneous population in the time available—about 30,000 years at most.

The only tenable explanation seems to be that the Indians of Central and South America are descended from a single kinship, all of blood-group O, that crossed the Bering Bridge during the last Ice Age and found conditions to the south that favored the growth and spread of population. However, this is not enough. A second group must have followed substantially later, and found the north now more hospitable and perhaps sparsely populated. The second group must also have been rather homogeneous and small, containing only blood groups O and A —perhaps mostly A, for there are two northern Indian tribes that have the highest concentration of the gene for A in the world (*2*).

The first invasion fits Martin's hypothesis well; but does he have room in his time scale for a second invasion?

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References

1. A. E. Mourant, A. Kopéc, K. Domaniewska-Sobczak, *The ABO Blood Groups* (Blackwell, Oxford, 1958).
2. Th. Dobzhansky, *Mankind Evolving* (Yale Univ. Press, New Haven, 1962), pp. 260–261.

In reply to Corbett, "There is, however, no known instance in which an animal population has been entirely eliminated by a new disease . . ." (*1*), including the attempt at exterminating European rabbits in Australia by the introduction of myxomatosis. Possibly a virulent disease like rinderpest played a part in the late Pleistocene extinctions. I see no way to test the idea through study of the fossils.

My attempt at modeling overkill by predation alone led to the conclusion that it was not necessary to postulate side effects. A brief but intense episode of hunting and killing of innocent prey is enough. The historical account conveniently offered by Beddall makes it possible to consider much more rapid rates of killing than the one animal unit per hunter per week which I found could eliminate a high biomass in a few years. Her letter also contributes to the neglected subject of kill site visibility. We know so little about it that I cannot agree with Corbett that there are too few associations between man and extinct mammals for overkill to be the only cause of New World extinction.

In reply to Bronowski, I see no need for concern about multiple invasions, as long as a first invasion of big game hunters 12,000 years ago is not disproved.

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References

1. R. Fiennes, *Man, Nature and Disease* (Signet, New York, 1964), p. 160.

The Power Wastrels

In a comment by Shannon (Letters, 6 Apr., p. 9) an accusing finger is leveled at the female. It is her "unanalyzable, unscientific, uncontrolled . . . power consumption" which makes the author pessimistic about "retarding the growth of the residential power demand."

Bearing in mind the relation between the size of a population, its material affluence, and the energy it consumes, I would like to pose one question to this concerned citizen. "Were your children, Mr. Shannon, found under cabbage leaves, or was it the stork who brought them?" The matter of biological paternity aside, Shannon's remarks are all too typical of the "buckpassing" which pervades our society. We are seldom responsible; it is the other sex, race, generation, country—whatever. Who is responsible for the upbringing of Shannon's daughters, the power wastrels, and the stocking of their comfortable home with multiple television sets and electrical gadgets? One is left with the impression that their father has washed his hands of any domestic responsibility. If one views household purchasing and the raising of daughters as "women's work," however, Shannon is permitted to go scot-free. Under a thin guise of humor, it