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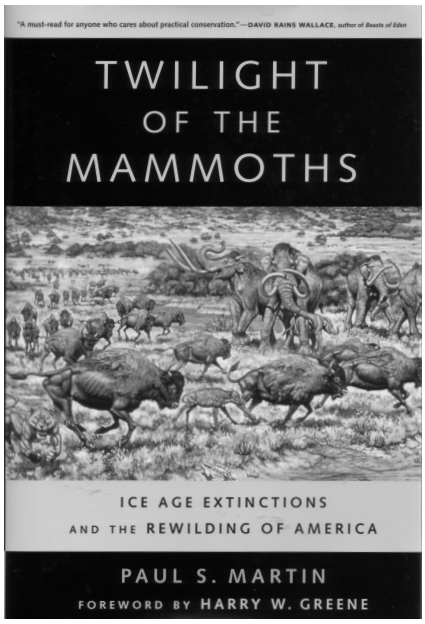
BOOK REVIEW



The Quaternary extinctions in the Americas from a Siberian perspective: Review of Paul S Martin. *Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America*. 2005. Berkeley and Los Angeles: University of California Press. ISBN: 0-520-23141-4; 250 pages with 29 figures and plates and 7 tables. List price $30 US (hardback).

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This volume is the quintessence of the scientific "life-long" study of mammal extinctions in the Americas by Paul S Martin, a scholar who has been enthusiastically devoted to this subject since early adulthood and continues until now. Prof Martin is not only a distinguished scientist but also a strong character with an ability to look on real health problems with a good sense of humor (one of the reviewers, Y Kuzmin, once took part in a daylong tour of Clovis sites in southern Arizona with Paul). The first responses to the volume have already been released (Koch 2005; Shabel 2006); here, we would like to address the extinction issues raised by Martin from a Siberian perspective.

Extinctions, their causes, and mechanisms are the major subject of the book. As perhaps the strongest advocate of the overkill concept and the pattern that humans caused the extinction of big game at the end of the Pleistocene, Martin nevertheless does not reject the possibility of a combination of factors that led to extinction, and gives an overview of the main alternative paradigm, which accepts climatic changes as the main driving force of animal extinction at the end of the Pleistocene. In an important observation (p. 29, Figure 3, caption) about the discordant character of climatic events and extinction episodes, Martin argues these two patterns do not match well. One note should be

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made regarding Figure 3, where Holocene mammoths are shown only for Wrangel Island (original publication of this figure was in 1999). Since this time, one more Holocene refugium was discovered on St. Paul Island, one of the Pribilof Islands in the Bering Sea. Here, normal-size mammoths survived until at least 5700 ^{14}C yr ago (hereafter BP) (Yesner et al. 2005); Martin cites an earlier paper by Guthrie (2004) on p. 50, with a mammoth's age from St. Paul Island of 7900 BP. Some updates should be made also in terms of giant deer (*Megaloceros giganteus*) (p. 168). As has been shown recently, this species survived on the border between Europe and Asia, in the Ural Mountains and around them, until about 6800 BP (Stuart et al. 2004), compared with about 9200 BP for the British Isles.

The explanation of the reservoir age effect in marine environments (p. 45–6) by the supply of "dead" carbon to the oceans along with water draining limestone rocks lacking the radioactive carbon isotope ^{14}C is not the only mechanism of relatively "old" ^{14}C age of marine organisms compared with contemporaneous terrestrial ones. It is well known that the slow pace of carbon appearance in marine water compared with terrestrial plants and animals, and upwelling of deep waters depleted in ^{14}C are 2 major factors responsible for the "reservoir effect."

We completely agree with the important methodological issue of ^{14}C date replications in case(s) of important (usually very late) age determinations (p. 47). Now it is obvious that only thorough age control by parallel dating in several laboratories can give reliable estimates as to when the extinction of particular species took place. Good examples are the Holocene mammoths from St. Paul Island (Guthrie 2004; Yesner et al. 2005) and Wrangel Island (Vartanyan et al. 1995; see also Kuzmin and Orlova 2004:135).

The Siberian view on Martin's overkill theory is the main subject of this review. Judging from the view of the Northern Hemisphere, it is clear that the overkill mechanism cannot be used in the case of northern Eurasian extinctions. Humans penetrated into southern and central parts of the Siberian plains at least about 125,000 yr ago (e.g. Chlachula et al. 2003), and inhabited this area continuously since at least 40,000 BP. This long-term occupation did not cause the extinction of several megafaunal representatives, such as woolly mammoth and rhinoceros, bison, horse, and some other species (e.g. Orlova et al. 2004a). Known data for the upper part of the Yenisei River basin show that Pleistocene megafauna (mainly mammoth) and Paleolithic humans coexisted for at least 10,000 yr (Kuzmin and Orlova 2004; Orlova et al. 2004b). Despite human impact, mammoths disappeared from this region at about 12,000 BP, similar to other parts of central and northern Siberia that were very sparsely occupied or almost unoccupied by humans. In other words, the melody of "deadly syncopation" (p. 51) was not playing on the vast Siberian grounds, and the view that "Extinctions in other parts of the planet, too, are suspiciously close to the time of first human arrival" (p. 51) does not work in northern Eurasia and northwestern North America, particularly in the Alaska and Yukon regions (Guthrie 2006). Martin points out the pattern of smaller terminal Pleistocene extinction losses in Africa and Asia compared with the Americas (p. 52).

The statement "…human invasion of empty lands, a unique event in different parts of the world in near time, is an overriding variable that explains much more than these other factors" (p. 167) may be correct for North and South America, but it is known that humans were present in Siberia for a long time *prior to* mass extinctions at the end of the Pleistocene. Therefore, different kinds of human-megafauna interrelations are observed in northern Eurasia compared with the Americas.

Being a brilliant polemicist, Martin was arguing for years in favor of the crucial role of humans in the big-game extinction not only in the New World but also in other parts of the planet. His arguments seem very reasonable, and more and more scholars agree that in North America humans

might play the decisive role in the megafauna extinction. At the same time, the attempt to "globalize" the overkill model was less successful. If we take the whole Eurasian continent into consideration, it is possible that only in western and central Europe, with its relatively dense Paleolithic population (e.g. Bocquet-Appel and Demars 2000), was the human impact on megafauna significant. In northern Asia, with its sparse population in the Paleolithic (e.g. Kuzmin and Keates 2005), however, it is hard to assume that hunting severely affected mammoth and other megafaunal species. The discovery of several Holocene refugia, such as the southern Urals for giant deer (Stuart et al. 2004) and northeastern Siberia for muskox and horse (see Orlova et al. 2004a), testify in favor of a gradual extinction in totally different geographic regions, without humans as an important factor in the disappearance of megafauna.

If we look at the extinction process from a regional perspective (p. 118–28), 2 principal types of spatiotemporal relationships between Paleolithic humans and megafauna can be distinguished. In Australia, New Zealand, and the Americas, human arrival coincides with mass extinctions. In Africa, Europe, and Asia, human presence did not cause immediate extinctions, and somehow both people and animals coexisted for many thousands of years. Thus, the overkill model put forward by Martin may not have worldwide applicability.

The issue of mammoth hunting by Paleolithic humans, widely described by Martin for the Americas (e.g. p. 104), is still open to question in Siberia. Butchering of carcasses was common, but *direct* evidence of killing, such as pieces of stone and/or bone weapon embedded in mammoth bones, are extremely rare. Only recently, mammoth thoracic vertebrae with a hole made by a spear with microblade insets were found at the Lugovskoe site in central West Siberian Plain, and directly dated to about 13,470 BP (Orlova et al. 2004c; Zenin et al. 2006). Besides this find, no other reliable traces of human hunting of mammoths in Siberia are known.

The importance of direct ^{14}C dating of extinct taxa highlighted by Martin (p. 122) is very timely, and in fact is the only way to establish firmly the precise age of animal extinction. Several studies have shown that dating of associated charcoal and/or other species remains does not necessarily correspond to the age of extinct species, due to possible human scavenging, redeposition, disturbance, etc. With accelerator mass spectrometry (AMS) technology, it is now easy to get direct ^{14}C dates of small pieces of bone belonging to extinct species.

Without challenging the great achievements made by Martin in his thorough collection and analysis of factual data on species extinction in the Late Pleistocene, we should note that the most complete and comprehensive view in the book is given for North America. It still does not convince us entirely that humans were responsible for the diminution and final demise of the Pleistocene "giants." More probably, there were several causes for the megafauna extinction, and humans were not the major one; however, humans were not a minor cause.

Paul Martin's book revives some known ideas and encourages readers to generate their own views; this is perhaps the book's most important and promising message to the international scholar community.

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