Mammoths and the Environment

The study of fossilized remains of herbivorous animals, particularly those rare findings with well-preserved gastrointestinal tracts filled with plant remains, is crucial to our understanding of the environment in which they lived.

Summarizing over 30 years of research, this book presents evidence on the plants once eaten by Siberia's major herbivorous mammals. The collection of pollen and plant spores from food remains sheds light on the vegetation of these ancient habitats, enabling researchers to reconstruct local floras of the "age of mammoths." This also promotes further insight into the causes of the extinction of various species due to changing environmental conditions and food availability. Providing a history of the research undertaken on Siberian mammoths, the book also includes chapters on the Cherskiy horse and late Pleistocene bison, along with the vegetation and climate of Siberia in the late Pleistocene, making it a lasting reference tool for graduate students and researchers in the field.

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To my son Nikita B. Kul'tin

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Preface

This book summarizes more than 30 years of active and detailed research carried out by me and several colleagues, in Russia and in other countries, on mammoths, the other animals of the mammoth fauna, and the environment of the age of mammoths. During these many years I have from time to time been asked, "What is the point in studying those mammoths?" or "What in fact caused the extinction of mammoths?" Many questions have been answered by us in the course of our investigations, but nevertheless a number of problems concerning mammoths and their environment remain unsolved. Finding the answers to these remaining questions, and the new ones that undoubtedly will arise, will involve many different researchers – and it is important that anyone embarking on such a study has a thorough understanding of the research that has been carried out to date, as well as knowing how to undertake this kind of scientific work. I hope that when you reach the last page of this book you will have a clear appreciation of the subject, and that you will agree with me that there is indeed much to be gained from studying the mammoths and the other representatives of the mammoth fauna.

A better understanding of the present status of ecosystems of the far north and a number of poorly studied areas of Siberia can be gained through going back a few thousand years to see what the environment was like in that remote time when herds of mammoths and other large mammals, namely, horses, bisons, rhinoceros, muskoxen, yaks, and others, wandered about Siberia and adjacent areas of Mongolia, northern China, and North America. The food remains of a few specific fossil animals, preserved in permafrost in some areas of Siberia, have provided a unique opportunity to return to the remote past and gain a more thorough knowledge of the habitats of those individuals, as well as the

environment of the mammoth fauna as a whole, and especially to decipher the last dramatic pages of the "age of mammoths."

This book deals with the integrated study of: (1) the gastrointestinal contents of a number of fossilized herbivorous mammals, representatives of the "mammoth faunal complex" (mammoths, bison, horse), which died in various areas of Siberia during the past 55 000 years; (2) the deposits enclosing the remains of those animals; and (3) sediments of synchronous age.

Food remains from the fossil herbivores are shown to be a source of valuable information about the ecosystems of the past, including key elements such as flora, vegetation, and climate. The composition of floras, reliably dated to the Karginskiy Interglacial (50 000–25 000 years BP) and the Holocene, is given. The character of the vegetation of the late Quaternary is traced over the three areas where the above-mentioned fossil animals were found – the Indigirka–Kolyma river basins, the Taymyr Peninsula, and the Gydan Peninsula – and throughout Siberia as a whole. A reconstruction of climates and climate change for the three areas is presented.

The paleobotanical and paleoclimatic data presented for the first time in this book substantiate a new hypothesis concerning the causes of the relatively rapid extinction of some species of animals, especially the woolly mammoth. I hope also that the materials and methods presented in Chapter 2 will act as a useful guide for those who have the opportunity to study paleontological finds of this kind.

Acknowledgments

It is my pleasure to thank Professor Boris A. Tikhomirov, the understanding botanist and explorer of Arctic, who in 1972 invited me to northern Siberia to undertake research on the forage of the Selerikan horse, and who has continued to provide support over many years. I am also pleased to thank Professor Constantin C. Flerov, the understanding paleontologist and artist, for his kind and very fruitful help, and for many discussions concerning the mammoth fauna and the environment of the age of mammoths. Professor Nikolay V. Lovelius has been a constant source of support and encouragement, both in my scientific aspirations and in my travels to different regions of the far north of Siberia. I am also grateful to the many individuals who helped me in my fieldwork over the years 1973–1998.

I am very grateful to my reviewers, Professor Gary Haynes of the University of Nevada and Dr. Alexei Tikhonov of the Zoological Institute of the Russian Academy of Sciences. My thanks also go to Professor Fred Rich of Georgia Southern University, who helped me with the manuscript some years ago, and to Larisa B. Tsoy for her help during the preparation of the manuscript.

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I would like to thank Dick Mol for permission to publish ^{14}C dates for the Jarkov mammoth. Finally, I am grateful to several colleagues and friends who kindly allowed me to use some figures for this book[1].

[1] Every effort has been made to source high-quality copies of original photographs and other illustrations. The figures reproduced in this book represent the highest image quality available.