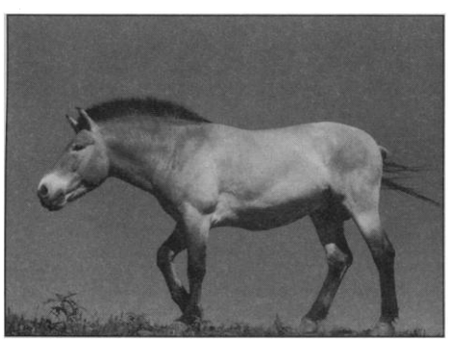
The Return of the Takh

Przewalski's Horse. The History and Biology of an Endangered Species. LEE BOYD and KATHERINE A. HOUPT, Eds. State University of New York Press, Albany, 1994. xviii, 313 pp., illus. $19.95. SUNY Series in Endangered Species.

Among the most frequent questions asked by conservation biologists two stand out—How should biological diversity be retained, and, when lost, how should it be restored? The answers depend on perspective. Ecologists will target ecosystems, population geneticists might champion individual species, and zoo biologists will support captive propagation. Inevitably, the lay public will be confused.

So what does public opinion have to do with conservation? Almost everything. *National Geographic* specials bring biodiversity into the living room. Zoos attract more yearly visitors than professional baseball and football combined. Eye-popping species like pandas and elephants shape attitudes and have even occasioned Congressional appropriations for conservation.

Few of the mammals that have gone extinct in the wild have been rescued solely through propagation in zoos; even fewer have been returned to native habitats. Black-footed ferrets and Arabian oryx are among the best-known examples, but the textbook success may well be the takh, to use the Mongolian term for the wild horse better known to us westerners as Przewalski's horse. There were 31 individuals of the species in captivity at the end of World War II, of which nine reproduced. Today there are more than 1000. Individuals have now been reintroduced into small reserves in their native haunts of Mongolia, Russia, and China. The process has been anything but straightforward, and the world's population is distributed across 129 institutions in 33 countries. For this we have to thank the unwavering commitment and complicated networking of inhabitants of three continents, people ranging from zoo-keeper to geneticist, semi-nomad to veterinarian, horseman to administrator.



The Mongolian takh, or Przewalski's horse, *Equus przewalskii*. [From the cover of *Przewalski's Horse*]

A Przewalski's horse foal grooming itself by chewing, while its mother grooms herself by rubbing. [From *Przewalski's Horse*]

Whereas many conservation books emphasize generalizations and principles, *Przewalski's Horse* does just the opposite, filling its pages with a bonanza of facts. Chapters about horse morphology, nutrition and feeding, husbandry and behavior, and veterinary care are illustrative. A fascinating piece by Inge and Jan Bouman spans the historical spectrum, pointing to some 610 European cave illustrations from 20,000 to 9000 years ago, reporting that the Tibetan monk Bodowa wrote the first account of wild horses more than 1000 years ago, and recounting that Nikolai Michailovich Przewalski was credited with bringing the horse to the attention of western zoologists.

The chapters most geared toward restoration are those on population biology, genetics, reproduction, and social behavior. Any sound conservation program can be traced to two types of founders—human and animal—and in this regard readers unfamiliar with the "studbooks" begun in eastern Europe are exposed to the writings of Jiri Volf. Oliver Ryder reports four surviving mitochondrial DNA lineages, and together he and, in the next chapter, Jonathan Ballou carry us through the unusual make-up of Przewalski's horses, whose 13 founders carried contributions from a domestic mare. Ballou points to the genetic costs of subdividing an already small population, demonstrates inbreeding effects linked with a specific founder, and argues that selection against this ancestor would "only further reduce the levels of genetic variation in the population." A practical chapter by Monfort *et al.* describes the criticality of non-invasive monitoring of pregnancy profiles, particularly because of the potential for peri- or neonatal mortality when new males are introduced.

Like feral horses and both plains and mountain zebras, Przewalski's horses live in year-round bands with a good deal of male-male competition. While zoo-keepers, geneticists, and soon-to-be observers of unmanaged populations in historic habitats may rely on the conventional wisdom that the maintenance of high levels of genetic diversity is good, all will face a common dilemma. In habitats where wolves may kill newborns and where male-male competition will inevitably distort the desired parity of male genetic contributions through differential access to females, at what point should we humans intervene to manipulate the resultant demographic infrastructure along the lines predicted by genetic models?

Boyd and Houpt have done an admirable job of summarizing the long and winding road traveled to propagate the takh. But this compilation is not without problems. Differing values for the size of the "current" horse population abound, and some chapters have summaries and conclusions whereas others do not. Still, this is an integrative book that spans global issues. Anyone interested in the nuts and bolts of species conservation ought to read it.

Joel Berger
Program in Ecology, Evolution, and Conservation Biology, University of Nevada, Reno, NV 89512, USA

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Other Books of Interest

Atomic Transport in Solids. A. R. ALLNAT and A. B. LIDIARD. Cambridge University Press, New York, 1994. xxiv, 572 pp., illus. $135 or £80.

This book is a thorough and critical treatise centered on the thermodynamics and kinetics of atomic transport in ionic and metallic solids, a field in which both authors have been leading contributors for many years. The authors confine their treatment to bulk crystalline solids, omitting, for the most part, the role of extended imperfections, such as intercrystalline boundaries, dislocations, and free surfaces in the transport, as well as transport in amorphous solids. There is only a sketchy presentation of transport in semiconductors—reflecting the authors' view that this area is more complex and less well developed than those pertaining to metal and ionic crystals. Non-equilibrium thermodynamics is thoroughly developed and provides the framework for much of the discussion of the kinetic processes treated. The structure and statistical thermodynamics of the various point defects and their transport roles are thoroughly reviewed. The kinetics and mechanisms of diffusive and ionic transport and of various relaxation (for example, mechanical and dielec-