INTRODUCTION

Perspective provides a way of regarding situations, facts, etc., and judging their relative importance. To the archaeozoologist, animals are of utmost significance, especially when viewed in connection with ourselves. This means that the specific aim of archaeozoology is studying the historical development of animal/human interactions on the basis of archaeological finds, predominantly animal remains.

In order to reconstruct medieval environments, archaeozoologists rely on bone finds as a primary source of information. From a technical point of view, archaeozoology is the identification, analysis and interpretation of animal remains from archaeological sites, that is, past cultural contexts.

In fact, the general definition of this field covers a complex discipline whose position varies depending on the definition of archaeology itself:

- in the Central European tradition (esp. German speaking territories), where archaeology was regarded a technical aspect of historical sciences, zoologists, paleontologists, veterinarians etc. have been trained in it as a form of applied zoology.

- in Western Europe and North America, where archaeology is usually regarded as a branch of cultural anthropology lato sensu, it tends to be such anthropologists who are taught to analyze faunal remains as well.

Originally, archaeozoology was also aimed at reconstructing the fauna and natural environment from ancient settlements. In the study of anthropogenic deposits, however, human activity has always biased this picture. Therefore, regardless of the difference between these two scholarly dispositions, it would be very difficult to make viable statements concerning the historical development of animal/human interactions (and their scene, the human ecosystem) without a focused emphasis on the cultural element. In reality, the question of whether zoological or archaeological issues should be emphasized in archaeozoological research reflects the diverse functions of animals in human ecosystems, as well as the rich variability of information provided by animal remains from archaeological sites.¹ Archaeozoology, as practiced in Hungary (and, in fact, most of continental Europe) traditionally relies on a broad basis of empirical/scientific i.e. zoological data. It has been a widely accepted tool
in archaeological inquiry for some fifty years and could be smoothly integrated into both early palaeo-economic studies and the so-called “New Archaeology” within which a systemic approach as well as an array of new techniques were developed.

Animal remains from medieval sites are indirect indicators of the general environment and of the immediate landscape regarded as being visually distinct today. One of the implicit hypotheses in studying ancient environments is fundamentally processual: it is assumed that different landscapes represent different functions and that reconstructing a previous situation would be instrumental in understanding past forms of land use. The role of animal remains, that is, archaeozoological finds in creating a reliable overall picture, however, is extremely complex.

The fundamental question of how people decided what they could do with the surrounding landscape is partly answered by the various kinds of animals they exploited. On the largest scale, animal remains from an archaeological site inform us whether people hunted or kept domestic animals. Species of the greatest importance can usually be recognised by the abundance of their bones in the archaeological assemblage.

The need to view excavated animal remains within a cultural context distinguishes archaeozoology from palaeontology. While the Ancient Greek words ἀρχαιός (primordial, ancient) and πάλατος (old) are indeed synonymous, since the seventeenth century, the Latin term “archaeologia” has meant the study of the past using the material remains of cultures. Meanwhile “palaeontology” conventionally refers to the analysis of fossils to determine the structure and evolution of extinct animals and plants, most of whom disappeared before the emergence of human society. Animal remains from archaeological sites, on the other hand, are usually products of human ecosystems, and to various degrees reflect people’s interaction with nature. While ecosystems, in general, involve interactions between a living community and its environment, human ecosystems, even in ancient times, have usually born disproportionately strong marks of human cultural behaviour.

**EVOLUTION, ENVIRONMENT AND ARCHAEOZOLOGY**

The intellectual precursors of archaeozoology may be traced back to the Enlightenment, when modern zoology, palaeontology and numerous other relevant disciplines emerged. A brief review of major intellectual trends will help to elucidate the path that has lead to the emergence of this highly specialized multi-disciplinary subject.

**EARLY TAXONOMIC RESEARCH**

Karl Linneé (1707–1773) in Sweden published the “Systema naturæ”, a series with the ambitious task of inventoring all living creatures known at that time. The 1758 volume is still the basis of the most widely used biological nomenclature. As a cleric, he had built his system on the foundations of a static world view. The immense precision of his work was not in contradiction with the fact that he considered all species created once and forever. In France, his contemporary Georges Louis Leclerc, Comte de Buffon (1707–1778) pursued similar scientific aims in creating a collection of animals, as principal author of the 36 volumes entitled “Histoire naturelle” (1749–89). In keeping with the stereotype of a flamboyant aristocrat, however, his scientific views were much more dynamic and he placed a great emphasis on gradual change in his work, explained by a “system of laws, elements and forces”. The volume “Époques de la nature” (1777) foreshadowed later theories of evolution.

**EVOLUTIONARY THOUGHT**

A generation later, Erasmus Darwin (1731–1802), the little known grandfather of Charles, recognized many important zoological principles including heredity and differential selection by ses. Working as a doctor in the English countryside, this self-made polyhistorian, had not yet arrived at the theory of natural selection that was to make his grandson so famous.

Jean Baptiste Pierre Antoine de Monet, Chevalier de Lamarck (1744–1829) further developed the ingredients of evolutionary thought. He outlined his theory of organic evolution (Lamarckism) in “Philosophie zooloIgique” (1809), asserting that change was brought about by the effort the form (the phenotype) makes in order to adapt to environmental conditions. He presumed that such changes could be directly inherited, the only outdated idea in his otherwise important evolutionary concept.

Georges Jean-Leopold-Nicolas-Frédéric Cuvier (1769–1832), French zoologist and statesman, was an opponent of Lamarck’s evolutionary views and insisted on the fixity of species, changed only by extinctions and catastrophes. In spite of his presentation of species as being constant, he won acclaim as the “Pope of bones” for his groundbreaking palaeontological work and as a founder of the sciences of comparative anatomy and palaeontology.

Charles Darwin (1809–1882) has been very influential as the scholar who synthesized many of these views in his “On the Origin of the Species” (1859), a work built on decades of meticulous research. The idea, however, must have been “in the air” after a century of evolutionary research, since the principles of natural selection were also recognized by Alfred Russell Wallace (1823–1913) approximately at the same time.
In archaeology, evolutionary theory has inspired typological studies by outstanding scholars of the time such as Oscar Montelius (1843–1921) in Sweden and Augustus Lane-Fox Pitt-Rivers (1827–1900) in Britain. They postulated that artifacts could be arranged in developmental series, similar to those of plants and animals. These systems, however, were aimed at providing relative chronological sequences, without the very dynamic aspect of evolution introduced by the idea of natural selection.

ARCHAEOZOOLOGY

From the viewpoint of archaeozoology, another work by Charles Darwin, "The Variation of Plants and Animals under Domestication" (1868) is of special importance. The topic of this book itself was the ultimate effect of human ecosystems on animals and plants in developing traits that may be considered culturally allosyncratic. It was also published at the time when most outstanding archaeologists in Europe (e.g. Pitt-Rivers in Britain, or Dezső and Rómer in the Austro-Hungarian Monarchy) had started to recognize the importance of studying animal bones from archaeological sites.

By then the identification, analysis and interpretation of animal remains had already started. In 1851, at the January 10 meeting of the Scientific Society in Copenhagen, it was Japetus Steenstrup who first used the term kokken middel (kitchen midden) for marine shell deposits that equally included archaeological artifacts and animal bone. For the first time, explicit distinction had been made between palaeontological and archaeological bone deposits. Very soon, parallel research along the East Coast of the United States was carried out along very similar lines.5

In Central Europe, the first target-oriented work, specialized in archaeozoology was published by Ludwig Rütimeyer in 1861,6 following the excavations of prehistoric settlements from Swiss lakes which had been exposed following lowering of lake levels as the result of a major drought in 1865. Oswald Heer published a related, pioneering archaeobotanical analysis as well. These works discussed both ancient environments and the evolution of domestic plants and animals.

MULTIDISCIPLINARITY AND INTERPRETATION IN ARCHAEOZOOLOGY

This somewhat lengthy historical review was presented here to provide an in-depth support to the point that archaeozoology is, by definition, a multidisciplinary subject that includes several research areas even beyond zoology and archaeology. In light of its brief history and recent development, archaeozoology is closely related to at least eight disciplines:

1. palaeontology (biostratigraphic interpretations, evolutionary thought)
2. zoology (taxonomy, nomenclature)
3. anatomy (nomenclature of body parts and bones)
4. physical anthropology (standardized osteometry)
5. archaeology (spatial and chronological, functional identification of faunal finds)
6. history (supporting written documents, iconography)
7. ethnography (cultural interpretations, analogies)
8. biochemistry, -physics etc. (isotope studies, DNA analysis etc.)

The parenthesized methodological aspects all have bearing on modern archaeozoological research. In theory both inductive and deductive reasoning are used in archaeozoology, depending on the ruling principles in related archaeological research.

ARCHAEOZOOLOGICAL INFORMATION

Archaeozoology can help in the interpretation of ancient environments through the analysis of animal remains. The main types of information were summarized by Benecke (1994) as follows:

<table>
<thead>
<tr>
<th>Phenomena observed</th>
<th>Possible interpretations</th>
</tr>
</thead>
<tbody>
<tr>
<td>species identification</td>
<td>exploited portion of the available fauna</td>
</tr>
<tr>
<td>absolute and relative numbers of bones</td>
<td>proportion between hunting/herding etc.</td>
</tr>
<tr>
<td>frequency of skeletal elements</td>
<td>modes of exploitation</td>
</tr>
<tr>
<td>butchering and cutmarks</td>
<td>technical level of processing</td>
</tr>
<tr>
<td>identification of age and sex</td>
<td>animal keeping, &quot;breeding&quot;</td>
</tr>
<tr>
<td>bone measurements</td>
<td>appearance, size, production capacity</td>
</tr>
<tr>
<td>pathological phenomena</td>
<td>keeping, nutrition, animal diseases</td>
</tr>
</tbody>
</table>

In reality, however, interpretations of these phenomena should not be carried out without the critical evaluation of our sources of information. The complete, original animal skeleton is eroded by a sequence of post mortem changes that define the final character and composition of zoological assemblages and which are studied within the framework of taphonomic research.7 Most importantly, in archaeozoology, taphonomic loss is related to ancient human activity, natural effects and even the activities of the archaeologists themselves.
Ancient human effects themselves are a source of bias, but offer perspectives on other important archaeological questions as well:

1. mode of procurement (selective hunting or culling)
2. age and sex criteria (choice of animals killed within the available population)
3. differential deposition (dismemberment and transport of body parts)
4. carcass processing (loss due to differential bone structure and degrees of butchering)
5. mode of deposition (protected features vs. scattered surface finds, exposure to weather, trampling, scavengers etc.)

Natural effects on the bone deposited this way are described by the generic term fossil diagenesis, including:

1. soil pH (acidic soils tend to destroy bone completely)
2. exposure to and transport by water (leaching, rolling, surface erosion)
3. heat fluctuations – cryoturbation (cracking, crumbling and re-deposition)
4. mechanical damage (soil pressure, erosion)
5. damage by animals (gnawing by scavengers and burrowing animals)

Excavator’s decisions act as the last filter of information:

1. choice of excavated area (partial excavation, rescue work etc.)
2. sampling (contiguous surfaces, trenches, test pits)
3. recovery techniques (hand-collection, screening, flotation/water-sieving)
4. data management (documentation, storage and publication)

The last four sources of loss need to be minimized, since each excavation is unique and cannot be repeated. The site itself is usually destroyed during the process of excavation. The registration and evaluation of complex taphonomic processes effects not only zoological conclusions: it may also shed light on the site formation process that is of direct interest to the archaeologist as well. In spite of limitations of time and money, all possible information should be considered, in the same way as in a criminal investigation. Archaeozoological data represent only one, albeit important, piece in the mosaic of past human behavior.

MEDIEVAL ANIMALS – THE MEDIEVAL LANDSCAPE

Although archaeological applications of natural science are reputed to have been “objective”, an inevitable cultural distortion in zoological analyses becomes all too evident during the scientific evaluation of biological remains accumulated through past human behavior. As has been pointed out, however, it is exactly this anthropogenic noise that should be documented and under-

PEOPLE AND ANIMALS: THE ARCHAEOZOOLOGIST’S PERSPECTIVE

stood as more-or-less direct evidence that helps in understanding medieval life in a variety of environmental settings.

Factors shaping the fauna represent a relatively high level of complexity and may be summarized by the following list:

1. climate (considered “constant” on short term)
2. hydrology and soil formation (define the environment for plant cover)
3. natural vegetation (develops through localised adaptation, subject to direct natural selection)
4. natural fauna (changes through mobile adaptation, subject to direct natural selection)
5. human ecosystem (changes through altering its environment consciously, including altering the vegetation by moving around domestic animals)

The neat, somewhat Hegelian hierarchy of these elements, however, is difficult to recognize in real life situations. In an archaeological context especially, they are hopelessly intertwined in multiple mechanisms of feedback.

Of the animals, simple organisms (land snails, insects etc.) are most directly dependent on their microenvironments, herbivores depend on the flora owing to their dietary preferences, while carnivores tend to be cosmopolitan in their tastes. Domestication brought about the concentration and artificial displacement (i.e. herding) of animals that has often led to deforestation as grazing and browsing sheep and goat ate offshoots and saplings thereby preventing the reproduction of trees. The selective destruction of edible plants tends to first change plant associations, which relatively soon alters the microenvironment in grazed areas.

As the landscape opened up, its capacity to retain heat in the winter and humidity during the summer also changed, affecting the local climate. Deforestation in the plains, for example may lead to a severe drop in temperature during windy winter months. Windchill temperatures (°C) rapidly decline relative to actual temperatures (°C) at various levels of wind speed:

<table>
<thead>
<tr>
<th>Wind speed (km/h)</th>
<th>Equation</th>
<th>Actual temperature= 10 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>(y = 1.1x - 3.5)</td>
<td>windchill temperature= 7.5 °C</td>
</tr>
<tr>
<td>20</td>
<td>(y = 1.3x - 9.7)</td>
<td>windchill temperature= 3.5 °C</td>
</tr>
<tr>
<td>30</td>
<td>(y = 1.4x - 13.5)</td>
<td>windchill temperature= 0.5 °C</td>
</tr>
<tr>
<td>40</td>
<td>(y = 1.5x - 16.0)</td>
<td>windchill temperature= -1.0 °C</td>
</tr>
</tbody>
</table>

The increasing coefficients of actual temperature (°C) in these equations show that the stronger the wind, the steeper the drop in windchill temperatures. A relatively mild, +10 °C temperature thus, may be close to freezing
when the speed of wind reaches 30 km/h in the open plain. In addition, the albedo i.e. the ratio of the intensity of insolation reflected from the denuded surface also increases during the winter. These effects are countered by higher summer temperatures and intensive desiccation of the soil during the summer in deforested areas. Climatic extremes will inevitably modify the development of plant cover, further modifying the natural fauna and exerting a feedback effect on human adaptation. Such isolated phenomena can add up and contribute actively to long-term climatic tendencies.

The most dramatic manifestations of this mechanism have been known from the Near East since prehistoric times\(^a\) until the twentieth century. More subtle changes, however, also shaped medieval environments in innumerable ways.

The environmental situation in the Carpathian Basin is less extreme than that in the Near East, the “cradle of domestication.” After the Ice Age, the environment of present-day Hungary has become mosaic-like in this region, located at the interface of three major climatic zones. Continental effects follow an east to westcline while Atlantic influences decrease in the opposite direction. Sub-Mediterranean effects decrease from south to north. Moreover, local factors of topography and hydrography exert a strong local influence that has contributed to a mosaic pattern in vegetation since the early Holocene.\(^b\) The increasing impact of human activity modified this pattern: some features, such as salination have been exacerbated, some were reinforced by human adaptation. Others merged into artificial landscapes. Therefore the overall, gross faunal picture is rather homogeneous with only little detectable environmental change during the Middle Ages.

**Changes in the Medieval Fauna**

By the Middle Ages, the development of Holocene faunas in Hungary had evidently become the history of increasing human interference with the natural environment. In fact, even as early as the Bronze Age, subsistence hunting had lost its significance. Thus, the presence of wild animals is difficult to appraise in the increasingly agricultural landscape. Since the bones of domestic animals form the bulk of archaeozoological finds from medieval sites, it must be born in mind that differences between the presence of sheep and pig, two domestic animal species with different habitat preferences, may be indicative of the differential exploitation of micro-environments (such as river banks and fields after harvest) or dietary preferences (e.g. Christian vs. Islamic households). Owing to a chain of human decisions that influenced their roles in the ecosystem, the presence of these domestic animals in the archaeological record, are of very little use in reconstructing environmental change in a broad sense.

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**People and Animals: The Archaeozoologist’s Perspective**

Remains of the wild fauna tend to better lend themselves to environmental interpretations. While most game animals simply withdrew from cultivated areas, others became extinct. This latter trend is clearly marked by the accelerating decline and eventual extinction of aurochs populations. Aurochs, the wild ancestor of domestic cattle, is thought to have been an animal of open grassland and parkland habitats. Multiple cultural bias (coseal lack of hunting as well as selective reporting by authors) in association with the heterogeneity of archaeological data sets make the study of late Holocene aurochs remains increasingly difficult in later periods. Horn dimensions of Holocene aurochs did not significantly decrease through time in the Carpathian Basin. Extinction due to the rapid loss of natural habitats and possibly overhunting meant that, in these traits, the long-term effects of genetic isolation were never manifested.\(^c\) Aurochs was also apparently extinct in Hungary by the thirteenth century.\(^d\) Although its bones were found in ninth-century Zalavár and eleventh-thirteenth century Csongrád,\(^e\) aurochs finds had already become rare on archaeological sites by the Roman Period.\(^f\)

Recent reports on the discovery of early medieval European bison\(^g\) are consistent with the observation that this species prefers mountainous areas with deciduous forests. It remains questionable, however, whether these “preferences” were shaped or reinforced by agricultural lands having replaced most lowland forests. Written references to bison from the early seventeenth century\(^h\) support the observation that the aforementioned medieval finds coincide with high status administrative centers (hunting privileges) in the northern piedmont area. Bison survived until the end of the eighteenth century in mountainous Transylvania. The last specimen from that region died in the Schönbrunn Zoo in 1809.\(^i\)

The remaining changes in the medieval fauna appear largely inseparable from direct anthropogenic effects, usually resulting in extinction. Modern age introductions of game species such as mouflon and fallow deer are among the rare exceptions. Camel (Camelus cf. dromedarius), first introduced by the Romans, reached the Carpathian Basin regularly during the sixteenth-seventeenth century Ottoman Period, mostly through military mediation. Similarly to other European countries, however, dromedaries have never been incorporated within the local fauna for both environmental and cultural reasons.\(^j\) A clear illustration of the previous point is that numerous dromedary bones at the Turkish timber fort of Szekszárd-Palánk came to light together with beaver remains, a species most unlikely to have shared the natural habitat of this desert domesticate.\(^k\)

Of the surviving large game species, it is perhaps red deer which best illustrates recent human effects on the wild fauna. Gross tendencies of relative antler growth obviously reflect a basic evolutionary pattern. Upper Pleis-
tocene antlers seem to be stouter but less regularly shaped than those of modern individuals. The evolutionary pattern of antler change has been influenced by deliberate selection related to isolation in game parks and royal hunting grounds and, subsequently, trophy hunting that imposed evident mental templates of "ideal" antler shape. Great concern with antler formation is already clearly illustrated by antler abnormalities depicted in the eighteenth century.

Recently, a more subtle, indirect effect of cultural landscapes has been shown by the emergence of a new ecological subspecies among roe deer (Capreolus capreolus). In the plains of Hungary, populations of this species have adapted to large-scale land cultivation by becoming smaller in size and taking on gazelle-like behavioral traits that offered a selective advantage in artificial "grassland" habitats (originally, roe deer preferred gallery forests with undergrowth). A unique archaeozoological find, best illustrating medieval "tampering" with zoological evidence, is a leopard skull fragment from the medieval city of Segedn. This animal has never been a member of the Holocene fauna in Hungary, which makes the interpretation of this object as part of the local ecosystem senseless. As the result of an extreme "taphonomic incident," however, the long distance transport or trade of this precious trophy carries important cultural information on how elites symbolised prestige, something difficult to interpret without the proper identification of this isolated skeletal part.

CONCLUSIONS

Similarly to most other disciplines involved in the study of environmental history, archaeozoology in itself could elucidate only a limited segment of the complex relationships that formed past human ecosystems. Familiarity with site history and sources of taphonomic loss, however, makes the critical evaluation of animal remains possible. Medieval domestic animals were already significantly manipulated by their owners. The most reliable environmental conclusions may be expected from the analysis of wild animal remains. Even these latter, however, were influenced by cultural factors, their representation in archaeozoological assemblages being determined by the importance of hunting, as well as selection by hunters.

A detailed overall picture, as well as fortunate finds of special animals from medieval sites, on the other hand, are instrumental in shedding light on the symbolic roles certain animals played in medieval culture as well as the place they occupied within the human ecosystems of the time. While shifts in these ecosystems would seldom have been dramatic enough to raise the question of sustainability in a modern sense, the presence of certain animal remains from medieval archaeological sites frequently do reflect major environmental changes.

ACKNOWLEDGEMENTS

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Béla Szalay, “A magyar őstulok. Az őstulok (Bos primigenius Bojanus) magyarországi története” (The Hungarian aurochs. History of the aurochs (Bos primigenius Bojanus) in Hungary), Nagyszeben, manuscript, 1917.


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