Archaeologia Polona, vol. 39: 2001, 75-86
PL ISSN 0066-5924

Archaeozoology or zooarchaeology?: a problem from the last century

László Bartosiewicz[a]

This paper compares the history of zoological studies in archaeology in Central/Eastern Europe and the North Atlantic region. Differences in research tradition undoubtedly have been consolidated by the division symbolized by the "Iron Curtain". However, the roots of distinction between "eastern" archaeozoology and "western" zooarchaeology had far predated this recent sub-division. The situation, therefore, calls for an approach more subtle than political categorization. Relationships between natural science and arts and humanities, as well as attitudes to scholarly authority have interacted in shaping the present-day situation. The analysis of animal remains, as well as archaeology itself, will profit from multidisciplinarity and the plurality of approaches in this field.

KEY-WORDS: academic tradition, science, anthropology, multidisciplinarity

INTRODUCTION

The identification, analysis and interpretation of animal remains has a 150 years long tradition within archaeology. At a meeting on January 10, 1851 of the Scientific Society in Copenhagen, it was Japetus Steenstrup who first used the term *køkken modding* (kitchen midden) for marine shell deposits in Denmark (Forchhammer *et al.* 1851-1856), a description that also 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 (Wyman 1868) was carried out along very similar lines. Meanwhile, a major drought that exposed pile dwellings in Swiss lakes, gave rise to the first archaeobiological investigations relevant to the rest of Central Europe (Rütimeyer 1861; Heer 1866).

The influence of western archaeological thought in continental Old World archaeology, on the other hand, is clearly represented by the work of Harold Peake and Herbert Fleure (1927) who re-introduced the term "Fertile Crescent" first coined by James Breasted (1916) a decade earlier. This concept has had major implications

[a] Institute of Archaeological Sciences, Loránd Eötvös University, Budapest

for investigations concerning early domestication and food production in Southwest Asia. In the next decade, V. G. Childe (1928) came up with the term "Neolithic revolution", a somewhat evolutionist concept rooted in the culture-historical paradigm.

There has been concern over the possible confusion between archaeozoology and palaeontology, both being interpreted literally, as the study of ancient animal remains with no regard paid to their cultural relevance (Olsen and Olsen 1981: 193). The Ancient Greek words *arkhaios* (primordial, ancient) and *palaios* (old) are indeed synonymous. Since the 17th century, however, the Late Latin term *archaeologia* has meant the study of the past using the material remains of cultures. Meanwhile *palaeontologia* conventionally refers to the analysis of fossils to determine the structure and evolution of extinct animals and plants.

THE "DIVIDE"

During its first century, our discipline developed quietly as a form of applied zoology, an auxiliary to archaeological investigations. After World War II, however, target-oriented theoretical work has been pursued to integrate zoological information with "proper" archaeological data. This discipline has been termed "archaeozoology" in Central and Eastern Europe and "zooarchaeology" in the Atlantic region. Actually, should the ratio of archaeologists to natural scientists in this discipline be quantified, a hypothetical geographical cline from west to east could be tested. In fact, many of the early archeologists in the Austro-Hungarian Empire were trained as natural scientists in the first place. Dežman, the first excavator of pile dwellings in the Ljubljana Marshland in Slovenia, for example, carried out all the archaeozoological identification himself (Bartosiewicz 1999).

A less testable hypothesis, is the apparently decreasing respect for individual authority as one moves west across Europe. Indeed, the tendency as one moves east has been for students to rather closely follow the methodology and ideas of their professors leaving less room for change and innovation. It would be even more interesting to see how this trend may have interacted with the dwindling influence of natural scientists on archaeology which has increasingly become art history and culture-history oriented with the onset of the 20th century in Central and Eastern Europe. In Hungarian, this trend has a tangible semantic aspect. The realm of "Sciences" is sub-divided into "real" and "human" sciences. Archaeology should unquestionably be classified with the latter as a sub-discipline of the historical sciences. When translated into English, this terminology tends to blur the difference between "hard" science and arts/humanities. The official English name of my own institution, The Institute of Archaeological Sciences, would suggest a major affinity with natural sciences, while its history, theory and method are firmly bound to a faculty of arts and humanities, whose name would be best translated

as "Faculty of Philosophical Sciences" (also a home for archaeological departments, *e. g.*, at universities in the former Yugoslavia). This semantic difference, among other things, makes archaeologists complacent as practitioners of a "science" without any tedious involvement with the disciplines termed "scientific" in English. Varieties of this problem exist in many Central European countries, depending on the local language and academic tradition and may have a variety of effects on the attitudes of archaeologists.

By now, both archaeozoology and zooarchaeology have come to be used to mean the analysis of animal remains from archaeological sites. The hierarchical classification by Bobrowsky (1982: 181, fig. 1) suggests that zooarchaeology is applied archaeozoology with an archaeological emphasis. I would rather emphasize the parallel development of the two concepts as the source of difference: while in Eurasia archaeozoology is often practiced as a form of applied zoology, zooarchaeology in the New World and most English speaking countries tends to be concerned primarily with the cultural aspects of zoological data (Mengoni Goñalons 1988: 72).

In contrast to zooarchaeology, the term archaeozoology has been preferred for the identification, analysis and interpretation of animal bones from archaeological sites in Central Europe (*cf.* Bobrowsky 1982) where this discipline has traditionally been developed and practiced by natural scientists (paleontologists, veterinarians *etc.*), who added the adjective "archaeo-" when defining the specific aspect of their zoological work. Meanwhile, an empirical approach combined with inductive reasoning (stemming from the "antiquarian's approach") has dominated archaeological practice in Central Europe which remained largely isolated from shifts in archaeological theory. Roughly speaking, the more data one collects, the clearer the patterns that may be expected. This aspect coincided with the keen anatomical precision with which the identification and analysis of animal remains was carried out. As observed by Morales (1996: 183), this attitude culminated with the financial heyday of our discipline during the 1960s and 1970s, and inspired impressive monographs that exposed a hitherto unrecognized portion of the national cultural heritage as exemplified by the renowned "München School" of archaeozoology (*e.g.*, Boessneck *et al.* 1963, 1971; Boessneck and von den Driesch 1979).

ANALOGY AND ITS RELEVANCE IN HUNGARY

Archaeological research greatly relies on analogical reasoning (Wylie 1985). Analogy in archaeological interpretation means "assaying any belief about non-observed [archaeological] behavior by referral to observed behavior which is thought to be relevant" (Ascher 1961).

Especially with the onset of New Archaeology, a more deductive strategy, similar to that of experimental sciences, has become prevalent in North America as well as Western Europe. Actualistic studies, including experiments carried out using

controlled parameters and the use of ethnographic analogy played a major part in this emerging trend. In Britain, specialized palaeoeconomic studies were published (Higham 1967; Jarman 1971). Archaeological research was organized to fit the need to properly test *a priori* hypotheses. Archaeologists brought up with this way of scientific thinking are better equipped to become zooarchaeologists than archaeologists in Central Europe, who tend to rely on the expertise by the aforementioned isolated natural scientists in dealing with animal remains.

Ethnographic analogy is most frequently used in the reconstruction of past social behavior, while controlled experiments are of help in understanding technical parameters of relevance to archaeological research. In both cases, our ability to transfer the abundant information from its original framework to archaeology is of critical concern. It is to this interface, the zone of transfer and contact between disciplines, that many "western" archaeologists have directed their attention, brought up in a tradition that has viewed anthropology a holistic discipline, including all human studies, not only physical anthropology. The notion of "ethnoarchaeology", rooted in late 19th century evolutionary theory, has been developing for at least four decades. Kleindienst and Watson (1956) proposed the study of "action archaeology" of living communities. Ethnoarchaeology uses ethnographic analogy as an interpretative tool for developing appropriate research strategies in archaeology (Belcher 1994). It "investigates aspects of contemporary cultural and sociological behavior from an archaeological perspective. Ethnoarchaeologists attempt to systematically define relationships between behaviour and material culture explored by ethnologists, and to ascertain how certain features of observable behaviour may be reflected in remains which archaeologists may find" (Kramer 1979).

This type of inquiry can thus provide an interpretive/contextual framework within which relationships between ancient humans and animals may be translated into sociocultural meanings for the in-depth analysis of archaeozoological data (*cf.* Binford 1967).

The first type of analogy recognized in archaeology is **formal analogy** (if two phenomena have two or more attributes in common, they probably share other attributes as well). It is often applied in the absence of historical documents in the reconstruction of [esp. prehistoric] processes based on their modern material correlates. The pitfalls of formal analogy include anachronistic interpretation and ethnocentric reasoning.

The second type, **relational analogy** is based on inherent linkages between attributes and thus, constitutes a more robust type of reasoning (Wylie 1985). In Old World archaeology it is reinforced by the "folk culture approach" (Ascher 1961), since the long time spans involved encourage the concept of a relatively continuous passage from archaeology into history.

Communities that claim some historical relationships to archaeological cultures from the same region frequently rely on ethnoarchaeological studies. Watson's

(1979) observation that "where cultural continuity is great, (...) ethnoarchaeological research is bound to be highly productive" has indeed been the case in Hungary. While *lato sensu* anthropology has frequently employed ethnographic observation in the interpretation of early prehistoric lifeways (*e.g.*, Binford 1978), such analogies in Hungary were first applied to protohistoric and early medieval research (Móra 1932; László 1940, 1941), at a time when researchers into prehistoric archaeology in Central Europe were refining typochronologies in order to inductively extract historic conclusions largely based on ceramic style.

In spite of these early efforts, the ruling culture-historical paradigm meant that our analogies in archaeology also tended to be predominantly historical, laden with references to migrations, invasions and subjugation of all sorts. Such metaphors are especially rampant in prehistoric ceramic typochronology, where spatial and temporal changes in ceramic style have often been read directly as signatures of human population movements. In spite of decades of spoon-feed Marxist ideology, there is little room for dialectical reasoning in this type of inquiry. This tradition also tends to treat archaeozoology as a rather isolated science. Very little energy is expended on integrating taxonomic information, at least, into the main body of archaeological reasoning.

Radiocarbon dating in Hungary exemplifies this attitude more tangibly than archaeozoology. Until the mid-1970s, the ^{14}C dating of a few samples from Hungary was mostly carried out in Berlin, GDR (Quitta and Kohl 1969). Between 1977 and 1980, ^{14}C measurements were introduced gradually by researchers at the Hungarian Academy of Sciences at the Institute of Nuclear Research, under the direction of Éva Csongor who then cooperated chiefly with Ida Bognár-Kutzián of the Archaeological Institute (Csongor *et al.* 1981). For at least ten years, however, the method has divided the archaeological community, with many researchers simply rejecting rather than discussing the application of this method that (with all its inaccuracies) posed a direct threat to existing typochronological systems. Improving accuracy, however, is a technical question, while refraining from the multidisciplinary (in fact any) testing of theoretical systems is ethically unacceptable in research. Since poorly integrated archaeozoological studies have not jeopardized the foundations of archaeological research in our region, with a few respectable exceptions, they developed in quiet isolation.

Ethnoarchaeology is extended to include ethnographic experiments, in which behavior is manipulated in a field setting. Such ethnoarchaeological research, however, potentially triples the hermeneutic system by imposing cultural filters between the phenomena and the observer of archaeological as well as ethnographic "facts" and between the interpretations of chronologically and often geographically distant parallels (Bartosiewicz 1997).

As a reaction to this intellectual pitfall, experimental archaeology in Hungary has been linked more to environmental research (Jerem and Poroszlai 1999), relying

on the direct interpretation of controlled experiments, rather than large-scale, direct involvement of traditional groups. This is, in part, the result of personal working contacts between "alternative" archaeologists and environmental scientists, in their search for a more holistic approach to our discipline. Naturally, the expertise of rural craftspeople has been indispensable in the experimental reconstructions. The welcome participation of such ethnographic informants, however, has tended to be rather technical/functional, with limited attention paid to the ethnographic reconstruction of the social aspects of such work.

THE REFLECTION OF GENERAL "EAST/WEST" DIFFERENCES IN ARCHAEOZOOLOGY

As a relatively early symptom of the aforementioned "divide", the interpretation of skeletal element distributions may be worth mentioning here. Classifications of various bones at a Palaeolithic site in Hungary (Kretzoi 1968) and in a methodological article on economic archaeology (Uerpmann 1973: 316) display fundamental similarities (Table 1).

Table 1. The classification of skeletal elements.

Kretzoi 1968		**Uerpmann 1973**	
A	Head region: skull and mandibles, teeth, tongue bones and the first two neck vertebrae	A	High value meat: the vertebral column (excl. tail), upper leg bones, and bones of the shoulder and pelvic girdle
B	Trunk region: vertebral column, ribs, sternum, pelvis	B	Medium value meat: the lower leg bones and skull (with brain and jaw musculature) and mandible (jaw musculature and tongue), ribs and sternum
C	Shoulder and thigh region: scapula, humerus, proximal radius and ulna; femur, patella, proximal tibia and fibula	C	Lowest value meat: face bones, tail, feet (including ankle joints)
D	Dry limb bones: distal radius and ulna, carpals and metacarpals; distal tibia and fibula, tarsals and metatarsals		
E	Terminal bones: phalanges, caudal vertebrae, baculum		

It is noteworthy that while the two forms of classification do not fundamentally differ, the first follows the dry didacticism of anatomy, while the second reflects economic judgment. Although the two are evidently correlated in the case of major

mammals, Uerpmann's list implies hypotheses that are to be tested (using external evidence), to decide, what should be considered "high" and "low" value cuts in various cultures (Bartosiewicz 1997).

The late 20th century divergence of zoological studies in archaeology can be appraised in two authoritative books, representing our discipline on either side of the Atlantic. Benecke (1994: 15) summarized data from mainstream archaeozoology on the basis of largely Old World literature. A similarly comprehensive work by Reitz and Wing (1999: 321-6) listed primary data in zooarchaeology from what could be described as a "North American perspective" (Table 2).

Table 2. Alternative attitudes to faunal data in archaeology.

Forms of data in archaeozoology (Benecke 1994)	**Primary data in zooarchaeology** (Reitz and Wing 1999)
1. species identification 2. measures of species frequency 3. frequency of skeletal elements within species 4. fragmentation and butchering 5. identification of age and sex 6. osteometric data (bone measurements) 7. anatomical-pathological modifications	1. first and second order changes 2. nutrition and diet 3. spatial and temporal studies of animal use 4. technology: capture techniques, food processing, raw materials, tools, and ornaments 5. exchange systems 6. animals as social markers 7. domestication 8. palaeoenvironments

This concise table, is an object lesson in differences between the inductive vs. deductive approaches of "archaeozoology" and "zooarchaeology". The first major similarity, the comparable number of the items listed, is at best a coincidence.

Although both paradigms are intellectually sound and valid, when applied imprudently, disadvantages become evident. Scarce and non-experimental (non-reproducible) archaeological data seldom lend themselves to the appropriately rigorous statistical testing of viable hypotheses. This fact has led to a degree of understandable impatience with "processual" methods, which when pursued correctly often yield nothing but commonplace results. Archaeozoologists, on the other hand, in command of inductively accumulated major bodies of osteological information, may feel tempted to draw just about any culture historical conclusion they desire from their ever increasing inventory of animal remains. Some non-archaeologist natural scientists often come up with simplistic explanations that disregard the fact that archaeological finds had been exposed to ancient human influence and a host of taphonomic factors.

INTERFACES

The basis of both types of study remains biological identification using terminology borrowed from natural sciences (taxonomy, anatomy, *etc.*) Increasingly, however, archaeozoologists have begun to recognize the effect of human activity on the composition of the bone material as a culturally idiosyncratic factor within the site formation process. The interpretation of these aspects again varies between "East" and "West", along a fault line which largely corresponds to the aforementioned inductive vs. deductive lines of reasoning within archaeology itself. This divergence had already been apparent in processual approaches to faunal analysis. The emergence of post-processual thought in archaeology has added a new dimension to the need for a coherent presentation and interpretation of animal remains. Owing to its evidently "processual" roots, however, the study of animal remains remained of largely negligible interest to postprocessualists, unless they were considering a culturally charged (*e.g.,* ritual) reading. Altogether, the avant-garde of post processualism has come and gone too far to have ever had a major impact in the areas where archaeozoology was practiced in a mostly inductive and processual manner and has thus left our discipline largely unaffected, especially in Eastern and Central Europe (Beech 1993).

In my opinion, the most productive compromise between these two major strands in the analysis of zoological finds is represented by taphonomic studies. Archaeological problems are often viewed in a dualistic manner that leads to simplistic interpretations. One typical paradigm is the dichotomic "nature versus nurture" dilemma that usually requires a more multi-faceted answer. In contrast to this intellectual requirement in interpretation, the possibly clearest distinction between universal and culturally idiosyncratic components in site formation processes is the cornerstone of field research and empirical post-excavation work. Since "the tension between notions of variability and notions of 'universals' and their intrinsic relationship to 'meaning' is a central problem in archaeology" (Alexandrini 1997: 61), no efforts should be spared in making this distinction. Sophisticated methods (including the in-depth taphonomic study of animal remains) are required to best identify the impact of natural factors, the universal/functional effects of human action and characteristics of the material that are indeed diagnostic of ancient lifeways which we wish to understand on the basis of the find material. This requirement is not unknown in historical research, where the critical evaluation of sources is fundamental.

Alongside the most traditional historical approach to archaeozoology in particular, a different history became of major interest: the sequence of *post mortem* changes that define the character and composition of zoological assemblages. Owing to its roots in ecology and paleontology (Wasmund 1926; Efremov 1940), taphonomic research had an appeal to archaeozoologists (methodologically still related to paleontology). Meanwhile, taphonomic studies have lent themselves relatively easily to

both experimental and ethnographic testing to the satisfaction of zooarchaeologists who have pioneered actualistic studies in this field. With over half a century delay, the English translation of an 1927 book by Weigelt (1989) discussing the decay of animal corpses has become a bestseller among faunal experts in archaeology.

What is the explanation for this relatively sudden and universal interest? Using classical terminology, the transformation of a live community (*biocoenosis*) to a death community (*thanatocoenosis*), and subsequent events of assemblage formation may be briefly summarized in Table 3.

Table 3. Simplified sequence of the taphonomic process.

Source of data	Selective process	Interpretation
Biocoenosis		="fauna"
↓	biostratonomy	= primary human action and pre-depositional natural effects
	fossil diagenesis	= post-depositional natural effects
Thanatocoenosis		
↓	survey and excavation	= secondary human action
Archaeological assemblage		
↓	documentation, analysis	
Publication		

While even in non-archaeological (*e.g.,* palaeontological) assemblages biostratonomy is a very complex but never-the-less single event (pre-depositional natural effects), the biostratonomy of archaeological animal remains is constantly influenced by past human action. Should one attempt an ideal scientific analysis of animal remains, this anthropogenic bias will remain a constant "noise" in the system. Adopting the only progressive slogan in this case, "if you can't beat them, join them!" has inspired a great many valuable zoological studies in archaeology. After all, primary human effect as part of the biostratonomy of assemblages, is potentially culturally idiosyncratic: in other words, properly accounting for taphonomic loss, may yield valuable archaeological information in and of itself. Studying secondary human effects should please postprocessualists in as much as it offers new insights into how our perception influences the interpretation of animal remains. This complexity within the taphonomic approach as well as the emergence of sophisticated techniques offered by hard science (isotope studies, DNA analysis, *etc.*) have created a common denominator for archaeozoological and zooarchaeological studies which are probably facing an unexpected but joint renewal in the years to come.

CONCLUSIONS

I would argue that the divide between the culture-historical, processual and post-processual approaches to archaeology tends to be sometimes even stronger than the perceived differences between East and West. Although research attitudes have never been independent of the prevailing political situation, the degree of ideological isolation varied across Eastern Europe. Scholars in many of these countries, have therefore been influenced by both their continental research traditions (usually rooted in German speaking countries and to some extent in France) as well as some of the ideas that have been more characteristic of the (largely Anglophone) Atlantic region.

East-West differences seem to be manifested at another level. Repressive [political] isolation in our [eastern] region sometimes seems to continue in the form of self-imposed isolationism, rooted in insecurity in the face of the aggressive globalization of culture. This aspect of East-West differences also tends to be eminently generational: young scholars tend to feel, understandably, less threatened by establishing new academic identities than those who feel that their life's work and reputation may be at stake.

In addition to the geopolitical and generational differences, a vocational divide should also be tackled. What seems to be lacking in many cases, is the consistent and creative dialogue between archaeologists and natural scientists. Archaeozoologists and zooarchaeologists working in distant continents seem to have far more in common with each other than some archaeologists and physicists within the same country, whose mutual interest lay in the procurement of reliable absolute dates, vital to even the most traditional, culture historical interpretation of excavation materials. It should be understood that investigations in humanities and natural science are not mutually exclusive, but are indispensable in drafting the possibly most detailed picture of the piecemeal fragments of our past.

The complexity of differences is shown in the way by which vocational differences feed back into the "East-West divide": scientific methods requiring sophisticated scientific hardware were sometimes limited by political reasons, embodied by measures such as the famous COCOM list in the early 1980s. More recently, the same type of sophisticated equipment has again become increasingly inaccessible in many countries at a time of general deceleration in research activity as the state gradually begins to withdraw from subsidizing the public sector (including heritage management) in countries of the former "Eastern Block" (Schild 1993: 146).

It should be appropriate to sum up this paper with two quotes. The more recent one states: "In many ways the question of whether biological or anthropological issues should be emphasized [in faunal studies] reflects the variety of roles played by animals in human lives and the diversity of information provided by animal remains from archaeological sites, not all of which are pursued by every researcher" (Reitz and Wing 1999: 5-6). To put it more briefly: "(...) all true believers shall break their eggs at the convenient end (...)"

(Swift 1726). Complementing processual archaeozoological information consistently with a critical cultural evaluation of relationships between people and animals opens up new vistas in our understanding of human behavior and concomitant historical events alike. The richness of academic diversity offered by the multidisciplinary approach will hopefully produce a synergetic effect with methodological advancements in the field.

ACKNOWLEDGEMENTS

This article is a revised version of the paper presented at the conference entitled "Archaeologies East – Archaeologies West" organized at the University of Poznań in 2000. Grateful thanks are due to Dr. Arkadiusz Marciniak for his comments aimed at improving the manuscript. The English text was revised by Dr. Alice M. Choyke. The presentation of this paper was supported by the joint Research Project No. 01204 of the Hungarian Academy of Sciences and the Loránd Eötvös University.

REFERENCES

Alexandrini, A. 1997. The origins of meaning. In *Interpreting archaeology: finding meaning in the past*, I. Hodder *et al.* (eds), 57-67. London – New York.

Ascher, R. 1961. Analogy in archaeology. *Southwestern Journal of Anthropology* 17(4): 317-25.

Bartosiewicz, L. 1997. This little piggy went to market... An archaeozoological study of modern meat values. *Journal of European Archaeology* 5(1): 170-82.

– 1999. Recent developments in archaeozoological research in Slovenia. *Arheološki vestnik* 50: 285-95.

Beech, M. 1993. Post-processual archaeology: "The good, the bad and the ugly". Some comments by an archaeozoologist working in the Czech Republic. *Archeologické Rozhledy* 45: 375-80.

Belcher, W.R. 1994. Butchery practices and the ethnoarchaeology of South Asian fisherfolk. In *Fish exploitation in the past*, W. Van Neer (ed.), 169-76. Tervuren.

Benecke, N. 1994. *Der Mensch und seine Haustiere. Die geschichte einer jahrtausendealten Beziehung*. Stuttgart.

Binford, R.L. 1967. Smudge pits and hide smoking: the use of analogy in archaeological reasoning. *American Antiquity* 32: 1-12.

– 1978. *Nunamiut ethnoarchaeology*. New York.

Bobrowsky, P.T. 1982. Olsen and Olsen's identity crisis in faunal studies. *American Antiquity* 47(1): 180-83.

Boessneck, J., P. Jéquier and H. R. Stampfli, 1963. *Seeberg Burgäschisee Süd*. Teil 3: Die Tierreste. Bern.

Boessneck, J., A. von den Driesch, U. Meyer-Lemppenau and E. Wechsler von Ohlen 1971. *Die Tierknochenfunde aus dem Oppidum von Manching*. Wiesbaden.

Boessneck, J. and A. von den Driesch 1979. *Eketorp. Befestigung und Siedlung auf Öland/Schweden. Die Fauna*. Stockholm.

Breasted, J.H. 1916. *Ancient times*. Boston.

Childe, V.G. 1928. *The most ancient East: The oriental prelude to European Prehistory*. London.

Csongor, É., I. Bognár-Kutzián, I. Szabó and E. Hertelendi 1981. Radiocarbon dating of Holocene bone samples in Hungary. In *First International Symposium on 14C and Archaeology, Groningen 1981. Program and Abstracts*. 37. Budapest.

Efremov, I.A. 1940. Taphonomy: a new branch of paleontology. *Pan-American Geologist* 74: 81-93.
Forchhammer, G., J. Steenstrup and J. Worsaae 1851-1856. *Undersøgelser i geologisk-antikvarisk retning.* København.
Heer, O. 1866. Die Pflanzen der Pfahlbauten. *Neujahrsblatt der Naturforschenden Gesellschaft in Zürich für das Jahr 1866* 68: 1-54.
Higham, C.F.W. 1967. Stock rearing as a cultural factor in prehistoric Europe. *Proceedings of Prehistoric Society* 33: 84-107.
Jarman, M. 1971. Culture and economy in the north Italian Neolithic. *World Archaeology* 2: 256-265.
Jerem E. and I. Poroszlai (eds) 1999. *Archaeology of the Bronze Age and Iron Age: Experimental archaeology, environmental archaeology, archaeological parks.* Budapest.
Kleindienst M. R. and P. J. Watson 1956. "Action archaeology": the archaeological inventory of a living community. *Anthropology Tomorrow* 5: 75-8.
Kramer, C. 1979. Introduction. In *Ethnoarchaeology*, C. Kramer (ed.), 4-7. New York.
Kretzoi, M. 1968. Étude paléontologique. In *La station du paléolithique moyen d'Érd, Hongrie,* M. Gábori and V. Csánk (eds), 59-104. Budapest.
László, G. 1940. Avarkori pásztorkészségek (Zu den Beigaben der Gräber von awarischen Hirten). *Archeológiai Értesítö* 3(1): 91-8.
– 1941. Adatok az avarság néprajzához (Contributi all' etnografia degli Avari). *Archeológiai Értesítö* 3(2): 175-204.
Mengoni Goñalons, G.L. 1988. Análisis de materiales faunísticos de sitios arqueológicos. *Mendoza, Xama* 1: 71-120.
Móra, F. 1932. *Néprajzi vonatkozások Szegedvidéki népvándorláskori és korai magyar leletekben (Ethnographic aspects of Migration Period and Early Hungarian finds in the Szeged region).* Budapest.
Morales, A. 1996. Towards a holistic archaeozoology? *Archaeofauna* 5: 183-4.
S. L. Olsen, S.L. and J.W. Olsen 1981. A comment on the nomenclature of faunal studies. *American Antiquity* 46(1): 192-4.
Peake, H. and H. J. Fleure 1927. *Peasants and Potters.* London.
Quitta, H. and G. Kohl 1969. Neue Radiokarbondaten zum Neolithikum und zur frühen Bronzezeit Südosteuropas und der Sowjetunion. *Zeitschrift für Archäologie* 3: 223-55.
Reitz, E.J. and E.S. Wing 1999. *Zooarchaeology.* Cambridge.
Rütimeyer, L. 1861. Die Fauna der Pfahlbauten der Schweiz. Untersuchungen über die Geschichte der wilden und der Haus-Säugetiere von Mittel-Europa. *Neue Denkschrift der Allgemeine Schweizerische Gesellschaft der ges. Naturwissenschaft* 19.
Schild, R. 1993. Polish archaeology in transition. *Antiquity* 67: 146-50.
Swift, J. 1726. *Travels into several remote nations of the World. In four parts. By Lemuel Gulliver, first Surgeon, and then Captain of several Ships. Vol. I.* London.
Uerpmann, H.-P. 1973. Animal bone finds and economic archaeology: A critical study of "osteo-archaeological" method. *World Archaeology* 4(3): 307-22.
Wasmund, E. 1926. Biocoenose und Thanatocoenose. Biosoziologische Studie über Lebensgemeinschaften und Totengesellschaften. *Archiv für Hydrobiologie* 17: 1-116.
Watson, P.J. 1979. The idea of ethnoarchaeology. In *Ethnoarchaeology*, C. Kramer (ed.), 46-52. New York.
Weigelt, J. 1989. *Recent vertebrate carcasses and their paleobiological implications.* Chicago.
Wylie, A. 1985. The reaction against analogy. In *Advances in archaeological method and theory*, vol. 8, M. B. Schiffer (ed.), 63-111. New York.
Wyman, J. 1868. An account of some kjoekkenmoeddings, or shell-heaps, in Maine and Massachusetts. *American Naturalist* 1(11): 561-84.