The Archaeology of Animals

Simon J. M. DAVIS

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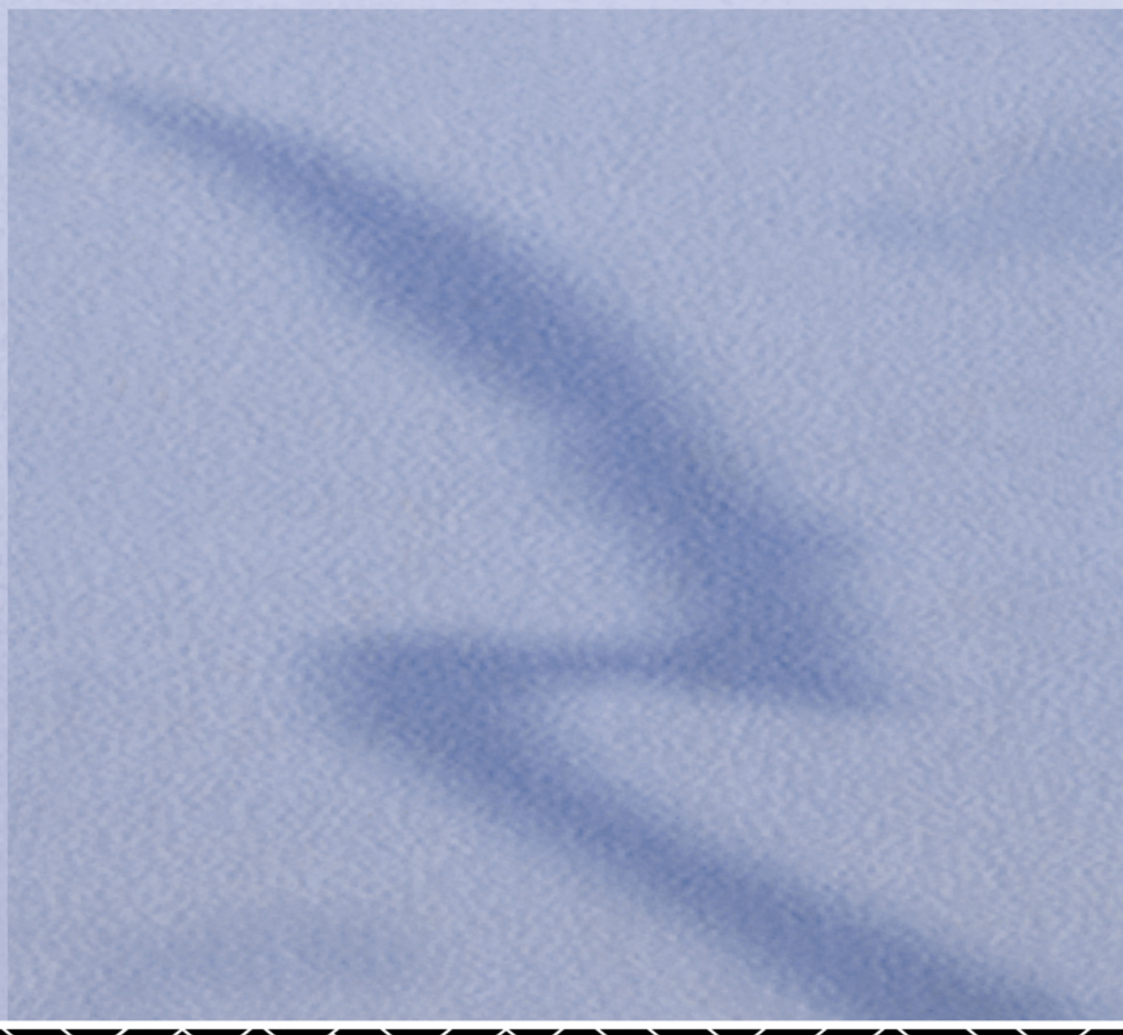

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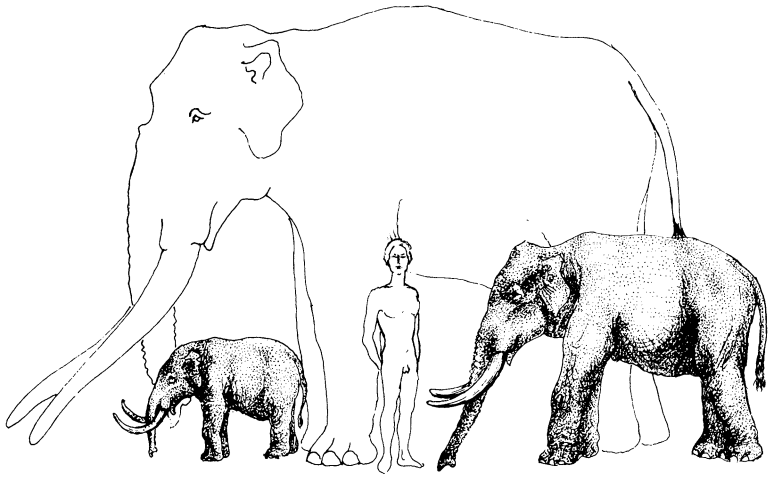

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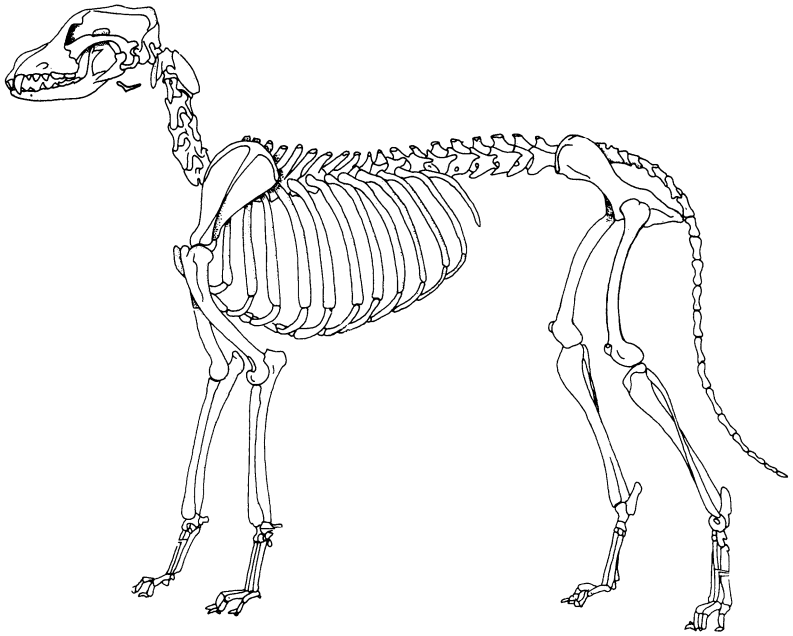

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A Note to the Reader

Many of the archaeological sites discussed in this book date to the last fifty or so millennia. Since the 1950s the analysis of radiocarbon (^{14}C) content has been used to date organic remains extending as far back in time as 45,000 years. However, it is now known that radiocarbon dates do not necessarily equal real or calendar dates. The convention, followed herein, is to use bc for radiocarbon dates, and BC for their calibrated equivalent in calendar years.

See also Clark, R.M. (1975) A calibration curve for radiocarbon dates. *Antiquity* 49, 251–66.

'. . . on this neutral territory between Palaeontology and Archaeology a wide field is opened for investigation, which must eventually lead to a great extension of our knowledge of the history of primeval Man.'

Joseph Prestwich,
read before the Royal Society, London,
26 May 1859 (Prestwich, 1861)

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Glossary

Allele any of the different forms of a gene that occupy the same place on the chromosome

Alveolus the tooth socket in a mammal's jaw

Ameloblasts ectodermal epithelial cells that secrete enamel in the formation of a tooth

Apatite a mineral which consists mainly of calcium phosphate, with either fluorine or chlorine, or both. It crystallizes in a hexagonal form

Articular that which is situated at a joint

Assemblage a group of fossils/artefacts occurring together in the same stratigraphic level

Aurochs *or* **Urus** this was the 'wild ox' ancestor of our domestic cattle

Bezoar a stone found in the stomach or intestine of some animals, mostly ruminants. Bezoar stones consist of layers of organic matter deposited round some foreign substance, used in traditional medicine. The wild goat ('Bezoar goat') of the Near East is the best-known source of these stones

Carnassial those teeth adapted for cutting by a scissor-like action. In carnivores (dogs and cats, for example), the carnassial teeth are the fourth premolar in the upper jaw and the first molar in the lower jaw

Cementum a bone-like material deposited around a tooth, often the root only

Cestode a class of parasitic Platyhelminthes commonly called tapeworms

Chondroclasts large cells whose function is the destruction of cartilage. Such destruction is termed 'chondroclasis'

Cline a character gradient; continuous variation in the expression of a character through a series of contiguous populations, often associated with a change in the environment

Collagen a protein, usually in fibrous form, that is the major constituent of cartilage and bone

Commensal an organism living with another and sharing its food. Both species usually benefit from this association

Cursorial those animals which are adapted for running, such as cats and antelopes

Cyst the enclosing membrane (protective covering) round the resting stage of an organism, e.g. the encysted larvae of parasitic worms

Cytoplasm the substance of a cell exclusive of the nucleus

Dasyuridae a family of carnivorous marsupial mammals

Dentine the bone-like layer beneath the enamel and surrounding the pulp cavity in a tooth. Ivory consists of dentine

Dermal ossification bone formation which occurs within the embryonic 'dermal' or surface layer of an embryo

Diagnostic character a character that unambiguously differentiates one taxon from others, e.g. the shape of the metacarpal condyles differentiates between sheep and goat

Diaphysis the shaft of a long bone

Dimorphism a condition in which a population or species has two genetically determined morphological types, e.g. sexual size dimorphism, in which the sexes are of different sizes

Diphyodont having two sets of teeth. This condition exists in the mammals which replace their teeth once only: the deciduous or 'milk' teeth are replaced by the permanent teeth

Distal that which lies further away from the body, e.g. the hand is distal to the shoulder

Ectoderm the outer of the three embryonic, or germ, layers of an animal

Electrophoresis a technique for separating mixtures of organic molecules, based on their different rates of travel in an electric field. Electrophoresis is commonly used by geneticists to separate the proteins produced by the various alleles of a particular gene in an individual

Endochondral beginning or forming within the cartilage

Enzymes proteins, produced by living organisms, which act upon specific biochemical reactions in living organisms. 'Enzymes' are approximately analogous to 'catalysts' in chemistry

Epiphysis any part or process of a bone (usually at its end) which is formed from a separate centre of ossification and later fuses with the bone

Epitaxy oriented intergrowth between two solid phases. The surface of one crystal provides, through its lattice structure, preferred positions for the deposition of the second crystal

Epithelium the tissue that covers, or lines, an organ or organism

Exoskeleton a hard supporting structure formed around the outside of the body, as in insects

Exostosis an outgrowth of bone tissue (from a bone), usually the result of trauma or disease

Guanaco a South American camelid ruminant artiodactyl

Histogram a chart which depicts quantites in the form of bars whose lengths are proportional to the quantities they represent

Histology the study of the detailed structure of animal (or plant) tissues, and their microscopic morphology

Hypsodont teeth with high crowns—usually adapted for chewing abrasive food such as grass (e.g. the cheek teeth of sheep, goats and antelopes)

Infundibulum in reference to mammal teeth, this is a 'funnel' or 'pouch' of enamel which penetrates down part of the central portion of the tooth from its occlusal surface

Karyotype the chromosome complement of a cell, individual, or group of animals (or plants)

Keratin the organic substance (a scleroprotein) which forms horn, claws, nails, and hooves of mammals. Hair and feathers also contain much keratin

Lamella in bone—a small plate of bone, for example surrounding a Haversian canal

Macropods a family of marsupial mammals that includes the kangaroos and wallabies

Madder a herb, *Rubia peregrina*, from which the dyestuff madder (alizarin) is derived

Malacology the study of molluscs, i.e. snails, clams, squid, etc. (Conchology is the study of the hard parts, shells, only of molluscs)

Mastodon large extinct mammal resembling the elephant, characterized by having pairs of nipple-shaped tubercles on the crowns of the teeth

Mesenchyme a diffuse tissue formed chiefly from the middle germ layer (mesoderm). In vertebrates, the connective tissues, bone and cartilage, are formed from mesenchyme

Mesoderm the middle of the three embryonic or germ layers found in developing 'higher' animals

Metaphysis the growing end of the diaphysis of a developing long bone, situated next to the epiphysis

Moa a large extinct New Zealand bird related to the kiwi

Nematodes a group of worm-like animals which are distinguished by their cylindrical body covered with a cuticle

Odontoblasts mesodermal cells that secrete dentine in the formation of a tooth

Osteoblast a bone-forming cell

Osteoclast a cell which destroys bony tissue

Osteocyte a bone cell developed from an osteoblast

Osteon a unit of bone which consists of a Haversian canal and its surrounding lamellae of bone

Otolith *or* **'Ear stone'** calcareous particles in the inner ear of many vertebrate animals, concerned with balance and movement

Pademelon a popular name given to small wal-

labies of the genera *Setonyx* and *Thylogale*. They are the least kangaroo-like macropods

Papilla a small conical protuberance or nipple

Pedicle a short stem or process

Periostial membrane, periosteum the tough fibrous membrane which covers the surface of the bones except on their joint surfaces. The periostial membrane is tightly adherent to the bone surface, and it is from this membrane that new bone is laid down on the surface of young developing bone

Prodomesticates those wild animal species which were subsequently domesticated

Rancholabrean a 'faunal period' at the end of the Pleistocene named after the tar-pit deposits at Rancho la Brea in Los Angeles

Sacrum that region of the vertebral column (backbone) to which the pelvic girdle is attached. In mammals the sacrum usually consists of several vertebrae which fuse

Saithe coalfish = *Pollachius virens*

Secodont teeth which are adapted for cutting

Silica a hard mineral substance (silicon dioxide) which is contained in the cell walls of certain plants, e.g. grasses. Sand, flint and glass are largely silicon dioxide

Synovial membrane the inner layer of the articular capsule in a joint which secretes the lubricating fluid

Taphonomy the study of the environmental phenomena and processes that affect organic remains after death, including the process of fossilization, e.g. what happens to the various bones of a skeleton after an animal's death, how they are scattered, and which are preserved as fossils

Tasmanian devil a predatory marsupial, *Sarcophilus ursinus*

Teleosts the true bony fishes

Ungulate hoofed animals. This term is now used in a popular sense to include two orders of mammals: (1) Perissodactyls, or odd-toed ungulates (e.g. horses, tapirs, rhinoceroses), and (2) Artiodactyls, or even-toed ungulates (e.g. antelopes, goats, cattle)

Vicugna a South American camelid ruminant artiodactyl

INTRODUCTION

Bones and antiquaries, a nineteenth-century prelude

This book is about zoo-archaeology (also known as archaeozoology): the study of fossilised faunal (i.e. animal) remains from archaeological sites. These remains are derived mainly, though by no means exclusively, from the hard parts such as bone, tooth and shell of animals eaten in antiquity. Zoo-archaeology is thus basically the study of the garbage of ancient peoples' meals. Remains of animals which were used for other purposes like transport and decoration, or which happened to co-exist with early humans, are also sometimes found. And on rare occasions even hair and wool are preserved.

Our human and earlier hominid ancestors have been traced back in time several million years—a span which encompasses the geological Quaternary period, or Pleistocene and Holocene epochs. For much of this period our ancestors' remains are associated with those of animals, so zoo-archaeology may be regarded as Quaternary palaeontology.

Zoo-archaeology, along with other specialist sciences such as physical anthropology, archaeobotany, geology and chemistry, all serve to build up for the archaeologist a more complete picture of our ancestors' way of life and the environment they inhabited. But zoo-archaeology is the study of animal remains (here termed 'archaeofaunal remains'), which not only reflect human behaviour patterns, but which can also reveal much about the animals themselves. Given the detailed chronology now available to archaeology, these archaeofaunal remains provide a unique opportunity to study the evolution of animal species through a short but finely divided period—the envy of any palaeontologist studying fossils from earlier periods and interested in micro-evolution (small-scale changes occurring over short spans of time). So, zoo-archaeology bridges two disciplines—palaeozoology and anthropology/archaeology.

THE PURPOSE OF THIS BOOK

This book is intended primarily for students of archaeology and anyone with an interest in both natural history and the history of our own species. My aim in writing it has been to describe how zoo-archaeologists go about studying faunal remains from archaeological sites, and to explore the nature of these remains, and some of the information they may provide. This occupies the first part of the book. The second part outlines the long relationship between people and animals. This starts with our early ancestors in Africa and ends in post-medieval Britain. This part concentrates on a few specific problems from a restricted number of geographical localities—usually those where there has been considerable archaeological excavation. I have not attempted to write an exhaustive survey of zoo-archaeology. The inquiring reader is encouraged to delve into the fast-growing body of literature on the subject, some of which is included in the list of references at the end.

But first let me briefly describe how the subject developed in its early days, that is in the nineteenth and early twentieth centuries.

FAUNAL REMAINS ASSOCIATED WITH ANCIENT MAN

Zoo-archaeology represents another dimension of the study of our ancestors' way of life. Two important contributions which archaeofaunal remains have made are, first, in establishing the antiquity of man, and, second, in unravelling the food-producing revolution—the change from hunting to herding livestock, formerly termed the 'Neolithic revolution'.

As late as 1859 Joseph Prestwich complained (Prestwich, 1861) that 'The conclusion, in fact, that man did not exist until after the latest of our geological changes and until after the dying out of the great extinct mammals, had become almost a point of established belief.'

Until the mid-nineteenth century it was customary to take the biblical narrative of the creation literally. According to James Usher, Archbishop of Armagh (1581–1656), the world was created in 4004 BC (9.00 am on 23 October according to a later scholar). So when in 1797 John Frere, High Sheriff of Suffolk, Member of Parliament for Norwich, and country squire, found at Hoxne in Suffolk flint artefacts '... weapons of war, fabricated and used by a people who had not the use of metals' associated with 'some extraordinary bones, particularly a jaw-bone of enormous size, of some unknown animal, with the teeth remaining in it', tempting him 'to refer them to a very remote period indeed; even beyond that of the present world' (Frere, 1800), he was duly ignored. Similar associations of human remains with extinct animal bones were reported in Germany (Daniel, 1975:25).

These finds in Germany and England were treated with scepticism, and were explained away by one means or another. An 'elephant' (presumably mammoth) found with a 'British weapon' in Gray's Inn Lane, London, at the end of the seventeenth century was considered to have been imported by the Roman emperor, Claudius (Daniel, 1975:26). The remains of Neanderthal man, found in 1857 near Dusseldorf in Germany, were thought of as having belonged variously to some poor idiotic hermit, or to an ailing Cossack deserter (Reader, 1981)!

Despite its lack of recognition at the time, Frere's communication in the journal *Archaeologia* in 1800 must be one of the earliest published contributions to zoo-archaeology.

In the 1830s a customs official from Abbeville in northern France, Jacques Boucher de Perthes (Daniel, 1975), studied the 'diluvial' remains of man and extinct animals found in nearby quarries. In Sicily the palaeontologist Hugh Falconer found hippopotamus and elephant bones with small flint implements resembling obsidian knives from Mexico. Like Frere's report, these two were given a cold reception. By 1859, however, the geologists Sir Joseph Prestwich and Sir John Evans, after visiting Perthes in Abbeville, became convinced of the authenticity of Perthes' as well as Frere's and other reported finds. They communicated their opinions to the Royal Society in that year (this was the same year that Charles Darwin's, *Origin of species* was published). Prestwich (1861:309) wrote: 'It might be supposed that in assigning to Man an appearance at such a period, it would of necessity imply his existence during long ages beyond all exact calculations; for we have been apt to place even the latest of our geological changes at a remote, and, to us, unknown distance.'

During the second half of the nineteenth century, thanks to geologists and other scientists such as Charles Lyell, Lord Kelvin, Thomas Huxley and Charles Darwin, the great age of the earth and the antiquity of our ancestors came to be appreciated. In England further evidence came in the mid-nineteenth century with William Pengelly's re-excavation of caves in south Devon which yielded remains of man contemporary with bones of such extinct animals as lion, hyaena, bear, mammoth, rhinoceros and reindeer (Daniel, 1975:58).

The first major contribution therefore of zoo-archaeological remains was in providing proof of the antiquity of man. Once this was established the next task was to rationalize prehistoric remains into some kind of chronology. Much pioneering work in establishing a sequence of archaeological periods was done in Denmark by antiquaries like Christian Jurgensen Thomsen and J. J. A. Worsaae. The magistrate and palaeontologist, Edouard Lartet (1801–71) explored cave sites in France. He recognized changes in the species composition of different cave strata, and distinguished four periods according to their associated animals: (1) cave bear period, (2) woolly mammoth and rhinoceros period, (3) reindeer period and (4) aurochs or bison period. His was an early attempt to classify archaeological remains on the basis of non-archaeological data (Daniel, 1975:101).

By 1870 a chronological framework in archae-

ology was accepted. Excavations now began to be conducted rigorously by men like the antiquarian Worsaae and the soldier turned archaeologist General Augustus Pitt-Rivers. Both stressed the importance of careful excavation and preservation of even ordinary or 'trifling' objects. Faunal remains were now studied for their contributions to our understanding of early human behaviour and economy.

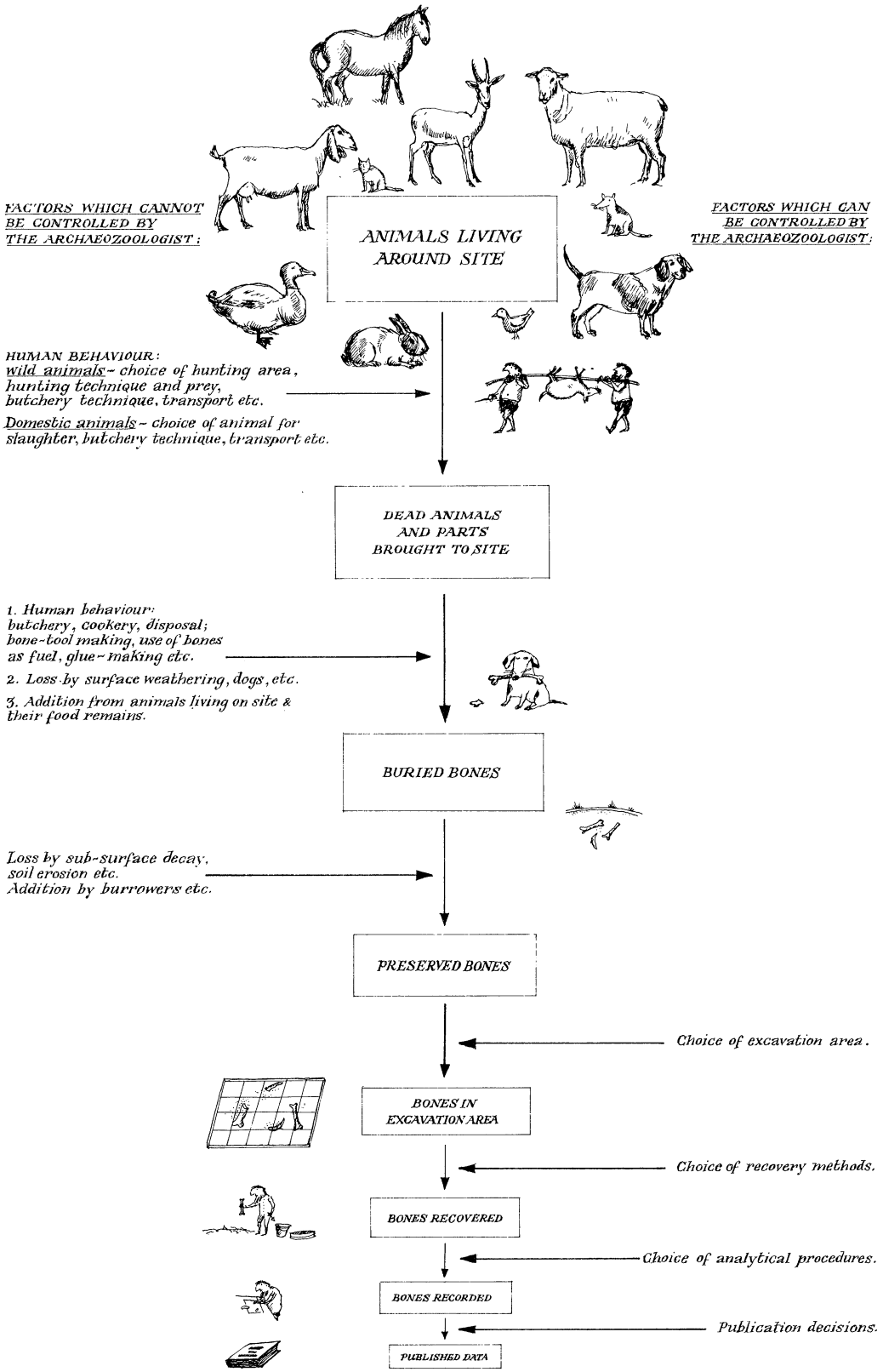
Early zoo-archaeology proper, in the sense of specialist studies of archaeofaunal remains, is often associated with two Swiss workers: L. Rütimeyer and J. Ulrich Duerst. In 1862 Rütimeyer described the mammal bones from Neolithic lakeside dwellings in Switzerland. He was perhaps the first to distinguish between bones of domestic animals such as sheep, pigs and cattle, and bones of their wild ancestors. His observation of cut-marks on fox bones led him to infer that this animal was consumed by humans. Further work on the origin of domestication was done by Duerst, who spent nearly three years from 1904–07 studying half a ton of animal bones from excavations carried out by Pumpelly and Schmidt at Anau in Russian Turkestan. He claimed (Duerst, 1908) to be able to show, via a reduction of size and a change in texture of the bone itself, the transition of wild cattle, and sheep to their domestic descendents. The osteological investigation of the origin of domestic animals was now under way.

After chronology and domestication, the next contribution which archaeofaunal remains made was in reconstructing the environment of the past. An early example is Dorothea Bate's now famous *Dama-Gazella* graph. In the 1930s, on advice from her mentor, Frederik Zeuner (whose later book on domesticated animals, published in 1963, is still a standard text), Bate plotted the frequencies in different strata of the Mount Carmel caves (excavated by Dorothy Garrod) of two animals each characteristic of a different habitat. She was able to deduce climatic changes during the Upper Pleistocene of the Levant. Her study was an early example of the use of quantitative data in zoo-archaeology (her results are discussed in Chapter 3).

As archaeology grew, so did the interest in the geographic origin of food production. Eduard Hahn at the end of the nineteenth century suggested that many animals were first domesticated in the Near East. Gordon Childe termed this first attempt to control our source of food the 'Neolithic Revolution'. The plant geneticist Nikolai Ivanovich Vavilov, who later tragically perished in the Stalinist purges, sought to determine what he termed centres or hearths of domestication. Interest in the early origin of food production took Robert Braidwood, of the Oriental Institute in Chicago, to the Near East in the late 1940s and 1950s. He was accompanied by a zoologist—Charles Reed. It was Reed in the late 1950s who questioned (Reed, 1961) some of the assumptions being made at that time concerning the domestic status of many of the animals found on excavations. Reed set the stage for a more rigorous approach by subsequent investigators to the origin of domestication (see Chapter 6).

The origin and subsequent evolution of livestock breeds have for a long time been a major subject of study in Germany. Since the 1950s, one renowned pioneer of the use of zoo-archaeology to this end has been Joachim Boessneck, together with his students (the 'Munich school'). Besides studying in great detail faunal remains from European and Near Eastern archaeological sites, he has made important contributions to our understanding of the osteology of domestic livestock and to basic methods now used by zoo-archaeologists.

The 1970s saw a huge increase in the number of people investigating archaeofaunal remains. An international conference of zoo-archaeologists was held in 1971 in Budapest. Out of this grew the International Council for Archaeozoology (ICAZ)—founded in 1976 in Nice. Subsequent meetings were held in Groningen in 1974 and Stettin in 1978. And at the fourth conference held in London in 1982 over 200 people participated from over 30 different countries. Anneke Clason of the Biological-Archaeological Institute of the University of Groningen (Poststraat 6, 9712 ER Groningen, The Netherlands) is currently the secretary of ICAZ. She publishes an annual newsletter containing information on conferences, new publications, an address-list and a list of current research projects and other items that might be of general interest to zoo-archaeologists. An annual bibliography is published by Hanns–Hermann Muller of: Im Wiesengrund 6, 15732 Waltersdorf Siedlung in Germany. Much of what these zoo-archaeologists have been studying forms the basis of this book.


FACTORS WHICH CANNOT BE CONTROLLED BY THE ARCHAEOZOOLOGIST:
ANIMALS LIVING AROUND SITE
FACTORS WHICH CAN BE CONTROLLED BY THE ARCHAEOZOOLOGIST:
HUMAN BEHAVIOUR:
wild animals - choice of hunting area, hunting technique and prey, butchery technique, transport etc.
Domestic animals - choice of animal for slaughter, butchery technique, transport etc.
DEAD ANIMALS AND PARTS BROUGHT TO SITE
1. Human behaviour: butchery, cookery, disposal; bone-tool making, use of bones as fuel, glue-making etc.
2. Loss by surface weathering, dogs, etc.
3. Addition from animals living on site & their food remains.
BURIED BONES
Loss by sub-surface decay, soil erosion etc.
Addition by burrowers etc.
PRESERVED BONES
Choice of excavation area.
BONES IN EXCAVATION AREA
Choice of recovery methods.
BONES RECOVERED
Choice of analytical procedures.
BONES RECORDED
Publication decisions.
PUBLISHED DATA