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AN ANNOTATED BIBLIOGRAPHY  
ON THE  
ORIGIN AND DESCENT  
OF DOMESTIC MAMMALS  
1900-1955

SHIMON ANGROSS

AND

CHARLES A. REED

FIELDIANA: ANTHROPOLOGY  
VOLUME 54, NUMBER 1

*Published by*  
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*Peabody Museum of Natural History  
Yale University*

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*Edited by* LILLIAN A. ROSS

*Library of Congress Catalog Card Number: 62-21868*

PRINTED IN THE UNITED STATES OF AMERICA  
BY CHICAGO NATURAL HISTORY MUSEUM PRESS

## Shimon Angress

March 14, 1924–March 30, 1958

Shimon Angress was a rare individual who had many abilities and developed them equally over the years. Gifted in art, poetry, philosophy, the humanities, and the natural sciences, he was patiently nurturing them all to intellectual maturity when his tragic death in a highway accident ended a most promising scientific career.

Shimon's first 15 years were in the happy tradition of a typical intellectual German-Jewish family, but with the Nazi shadow darkening over them. An ardent Zionist who rightly feared the worst from his homeland, Shimon slipped across the Danish border on the first day of World War II; his parents lingered—to disappear into Auschwitz. Abandoning school of necessity, Shimon and other Jewish youths learned farm work during the first months of the war, and again Shimon got away—this time to Palestine—before Denmark was overrun by the Nazis.

In the youth group at Ramat David, Shimon worked with the livestock, and his interest in domestic animals and their origins became one more among many. Working hours were long and the labor hard, but some time for reading was always to be found. In 1942 he moved to the kibbutz of Ma'ayan Ts'wi, where he was in charge of the dairy cattle, but he patiently continued his self-education, reading particularly at this time in philosophy and the humanities. Four years thus, milking and learning, and then he was chosen by his group to attend the Kibbutz Teachers Seminary, where for two brief years he resumed his formal schooling. Here he was intrigued by the natural sciences, particularly zoology, and here he caught up educationally with the lost years.

Returning in 1948 to Ma'ayan Ts'wi, Shimon founded the first school there. The worth of a teacher is evaluated only over the long years by the achievement of his students, and one hears glowing tales of Shimon's breadth of knowledge, his infectious enthusiasm, his clarity of presentation, and the answering responses of the children. During this time he built a museum collection of zoological, geolog-

ical, and archaeological specimens; patiently accumulated much of the information contained in the bibliography published here; tamed wild animals; joined in the activities of the kibbutz; and wrote poetry, drew incessantly, taught and inspired the children, and always learned more and more.

So outstanding a record was not to be unrewarded; in 1954 the kibbutz again supported Shimon's necessity for further education. After several months in South America, he spent slightly more than a year at the University of Chicago. In spite of having had only two years of formal education since he was 14, Shimon received his master's degree (in zoology) by June of 1955, and two departments—Zoology and Anthropology—wanted him to continue as a graduate student. The sense of duty called him home, however—that and a desire to put his new knowledge to use—and Shimon returned to his teaching and his natural history at Ma'ayan Ts'wi, while, amongst a multitude of other activities, he continued his graduate studies at the Hebrew University in Jerusalem. His interests in zoology, archaeology, and paleontology here combined to produce a thorough student of the animal remains dug from archaeological sites, and his few technical publications are in this field.

During this time, too, Shimon married. It was a most happy marriage, unfortunately brief; barely was there time for a daughter to be born.

The simultaneous role of teacher at Ma'ayan Ts'wi and graduate student in Jerusalem necessitated much highway travel. Shimon had no control over his instantaneous death, no chance for decision, as he was not driving.

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I met Shimon Angress only once, in Chicago, in the summer of 1954. I have met many people only once, but no other such meeting has led me nearly half around the world to visit the small community where the person had his life. It was in June of 1960 that I visited the small jewel of a museum that the people of Ma'ayan Ts'wi have built to honor Shimon Angress and to keep his collections intact. I went through his files, where everything is meticulously in order, and looked over the small library of the working-man-scholar. Museum and library are open for any to use, but with Shimon's knowledge and leadership gone, few there are who do so.

If the museum was built in honor, the rock garden on a jutting promontory of cliff was built in love, for it was built by the children whom Shimon had taught. They took a bit of the natural land that

Shimon loved, and left it natural, adding but a path and stairway and a bench by a small pool. I walked down the path in the summer evening with Shimon's widow and Shimon's child and looked across the narrow strip of green coastal plain to the sun sinking into the Mediterranean. Below me the cliff dropped abruptly; behind me rose the limestone mass of Mt. Carmel, where Shimon had spent so many happy days studying and collecting. Wasps came to the edge of the pool, gaining mud for their nests, and a variety of small birds flitted above. Here was Shimon's world, a world that he had helped to create, a world incomplete now because of his absence.

CHARLES A. REED



## FOREWORD

In the growth of cultures, as Kroeber has pointed out, there are some basic factors that have profoundly influenced many societies. One of these fundamental elements has to do with farming and stock-raising.

The taming of animals for man's use and pleasure constituted a revolutionizing innovation that enormously raised his subsistence level. Furthermore, by the process of domestication, man brought under control some of the natural forces about him. In effect, he created an artificial animal environment and by thus controlling his environment he assured himself of a more stable food supply and a great source of protein.

Since the subject of this paper has always been of great importance to anthropologists and since the literature is difficult for us to find, we welcome the opportunity to place this monograph in the Anthropology Series.

We are greatly indebted to Dr. D. A. Hooijer of Leiden, who has abstracted some of the articles from the Dutch; his abstracts are signed "D. H." Abstracts contributed by Dr. Reed are signed "C. A. R." Dr. Reed also read all proofs and made the indexes to this volume.

PAUL S. MARTIN

*Chief Curator, Department of Anthropology*

*February, 1962*





## CONTENTS

	PAGE
INTRODUCTION . . . . .	13
ACKNOWLEDGMENTS . . . . .	15
BIBLIOGRAPHY AND ABSTRACTS . . . . .	17
SYSTEMATIC INDEX . . . . .	111
GENERAL INDEX . . . . .	118



# Origin and Descent of Domestic Mammals

## INTRODUCTION

However a domestic animal may be defined, two factors at least, the animal itself and the human-controlled environment, must be included. Consequently, domestic animals, with respect to their origin and history, have been studied from two points of view. Origins of domestication, inseparably associated with the evolution of human civilization, have been investigated chiefly by students of cultural history. The descent of domestic species, their phylogenetic relationships, and the aspects of speciation under the domestic environment, have been considered mainly a subject for biological research. Additional studies on the ancestry of recent breeds have been made by students of animal husbandry.

Although these types of studies, each with its own methods, have been devoted to particular ends, it has been evident since the days of Rutimeyer, who laid the cornerstone for modern research in the history of domestication a century ago, that a co-operation of several sciences is imperative, and that the combined data of archaeological, historical and zoological research are essential to a comprehensive understanding of the fascinating problem.

At the dawn of this century, Keller (1902) included in his critical review the more important works that had been published prior to 1900 on the origin of domestic animals. Since then numerous manuals on the subject have been issued. A wealth of information, the result of extensive exploration and research, has been published; it is scattered through archaeological, ethnological, biological and agricultural literature, incorporated in historical and zoological treatments of general nature, and attached to reports of excavations. Most of the data have never been considered within the scope of any abstracting journal.

The body of this report consists of abstracts and indexes of the ethno-zoological records published in the last five and a half decades that have been available to us. The work was undertaken in the hope that this compilation would be of some help to students of

domestication by providing a collection of references, of subjects dealt with, and of conclusions reached in the study of the descent and ancestry of domestic mammals.

The nature of the study, which must include various fields of science, and the scope of this compilation set certain limits in the choice of the material to be abstracted. As indicated by the title, this bibliography is concerned with the study of the origin of domestic mammals rather than with the origin of domestication. Works based on zoological evidence form the primary listing, and few investigations of pure epigraphical or linguistic nature are included. Even among zoological treatments only those that bear directly on the topic under consideration are cited. An extensive literature on the genetics, breeding experiments, and hybridization of domestic species exists but does not bear directly on the subject. A collection of those records would demand another bibliography equal in scope to the present work. The same applies to the studies on the effects of domestication, from which we have tried to select those presentations, mainly concerned with osteological effects, that may help the zoologist to determine the domestic status of those animals whose subfossil remains have been discovered. The latter, arrayed with the stratigraphical and distributional data of the archaeologist, are regarded as the most valuable basis for the study of the rise of domestic species, and thus this bibliography depends principally upon the zoological treatments of material provided from archaeological, mainly prehistoric, sources and upon comparative studies of primitive living breeds and related wild forms in relation to those ethno-zoological facts.

Even within this defined scope, this collection is probably far from complete. The most obvious omissions are the numerous original papers in the Russian language, in particular the reports of excavations from the cultures of Tripolje and Minussinsk. These, like a number of other references, have not been available.

This work is merely descriptive. The view of the author is given without comment or evaluation. Chronologies and generic and specific nomenclature used in the original paper are retained in the abstracts, although in many cases these have been shown to be incorrect or inadequate by more recent evidence. Moreover, the recent evidence on chronology concerning the periods and regions to which most of the abstracted articles refer has been summarized by Charlesworth (1957, the Quaternary Era, vol. II), by Barendsen, Deerey, and Gralenski (Science, 1957, vol. 126, p. 917), by

Braidwood (1958, *Science*, vol. 127, pp. 1419-1430; 1958, *Österreich Akad. Wissensch., phil.-hist. Kl., Anz.*, no. 19, pp. 249-259), by Reed (1959, *Science*, vol. 130, pp. 1629-1639), by Braidwood, Howe, *et al.* (1960, *Studies in Ancient Oriental Civilization*, vol. 31), and by Clark (1961, *World Prehistory in Outline*).

The determination of the correct names of the animals, with all the involved synonyms, is beyond the scope of the present work, and in no way has been attempted. For recent breeds the spelling recommended by Mason (1951, *A World Dictionary of Breeds . . .*) is used throughout the text. Where possible, foreign descriptive names have been translated, but sometimes translation was impossible (e.g., Heidschnucke, *Préalpes du Sud*, etc.).

Wherever possible, the references are abbreviated in the form used in the *World List of Scientific Periodicals, 1900-1950* (third ed., 1952). Other references have been written out more fully. The date of the year under the author's name designates in every case the year of publication of the work.

### ACKNOWLEDGMENTS

When I presented myself at the University of Chicago in 1954 as a graduate student interested in the origins of domestic animals, and thus in their comparative anatomy, I was assigned to the direction of Dr. Karl P. Schmidt, then Chief Curator of the Department of Zoology at Chicago Natural History Museum, and Lecturer in Zoology at the University. Dr. Schmidt suggested the present bibliography and its form as an annotated list in lieu of studies on the remains of domestic animals from archaeological sites, pointing out that it would in any case be an essential preliminary to further studies on the origins of domestication. I am greatly indebted to Dr. Schmidt for aid and advice, and also to Dr. Everett C. Olson, Professor of Vertebrate Paleontology at the University, who took an active interest in the project.

The study of the origins of domestication, and of domestic mammals in particular, combines essentially archaeological studies with zoological investigations, and these in turn must frequently refer to paleontological data. The study itself represents the co-operation between the University of Chicago and Chicago Natural History Museum. At the Museum, all of the resources of the Museum library were made available to me, and when these failed I had the ever ready aid of the library staff under the direction of Mrs. Meta P. Howell,

who searched for sources from which the required books and journals could be borrowed. Thus this paper is based on the riches of the library of Chicago Natural History Museum, quite as other studies are based on wealth of materials in the scientific departments. I wish to express my gratitude to the authorities of the Museum for placing these facilities at my disposal.

SHIMON ANGRESS

I have to thank, first of all, Shimon Angress himself, whose vision and industry started this annotated bibliography, which I have seen through into final published form, working from his first manuscript. Miss Lillian Ross, Editor of Publications at Chicago Natural History Museum, has borne a greater editorial load with this publication than she would ordinarily have to do, since the senior author was deceased and the junior one not always available for consultation; she has carried this load with cheer and fortitude. Lastly, I owe a great debt to Miss Roberta French, Secretary at the Peabody Museum of Yale University, who successfully assembled the Index in alphabetical order from my numerous pages of handwritten notes.

CHARLES REED

## BIBLIOGRAPHY AND ABSTRACTS

### Adametz, Leopold

1915. Untersuchungen über *Capra prisca*, einer ausgestorbenen Stammform unserer Hausziegen. Mitt. landw. Lehrk. Wien, Bd. III, Heft 1, pp. 1-21, 4 pls.

Detailed description of the skull, especially the horns, of a goat, found together with other Neolithic skeletal parts near Zloczow (Poland). The specimen, characterized by the homonymously twisted horns in the male, is made the holotype of a new form, which is named *Capra prisca*.

A comparison of the crania of *C. prisca* and *C. aegagrus* shows that the majority of the European domestic goats agree in skull and horn features with the extinct *C. prisca*, which therefore is considered the probable ancestor of most of the European domestic breeds.

1920. Herkunft und Wanderungen der Hamiten erschlossen aus ihren Haustier-rassen. Osten und Orient, Ser. I, Bd. II; Wien, Verl. des Forschungsinstituts für Osten und Orient. 107 pp., 24 pls., 44 figs.

Based on the origin and the distribution of ancient Egypt's domestic animals, conclusions are drawn as to the origin of the Egyptian people and the Hamite immigration into Africa.

The most ancient domestic breeds kept among Egyptians and also among Sumerians were sheep (*Ovis vignei cycloceros*) and goat (*Capra falconeri jerdoni*). These point to Afghanistan, Baluchistan and northwestern India, where they first became tamed, as the region where the cradle of the Sumerian-Hamitic civilization should be sought. The tamed horse, not known to the Hamites when they invaded Africa, was introduced from Mesopotamia during the Eighteenth Dynasty. The earliest domestic cattle, however, were tamed by the ancient Egyptians from the indigenous *Bos primigenius*, whose later distribution—North and South Africa—indicates the dispersal of the Hamite race. The same is true in the case of the greyhound, which was tamed by Hamites in Africa.

1925. Über den Schädelbau des Rindes der Auvergne und dessen Stellung im Rüttimeyer-Wilkensschen Einteilungssystem der Rinderrassen. Z. Tierz. ZüchtBiol., Bd. II, pp. 163-177, 2 figs.

A study of eleven skulls from cattle of Auvergne (Salers, in Cantal, France) refutes their supposed relation to the brachycephalid type, which was suggested formerly for this breed. The skull characters are clearly of the *primigenius* type, and the breed seems to have originated from *Bos primigenius hahni*, which latter gave rise also to the Iberian cattle of southern Spain. The race of Auvergne is considered a connecting link, indicating the route of dispersal the breed took in prehistoric times from Spain via France to England.

1926. Lehrbuch der allgemeinen Tierzucht. Julius Springer (Wien).

The first chapter (pp. 5-49) is devoted to the origin of domestic animals and gives a short summary of information about the ancestors and history of the most important farm animals.

Table 2 summarizes the origin, distribution and time of first domestication of mammals; Table 3 does the same for the important kinds of domestic fowl.

1927. Über die Herkunft der Karakulschafe Bocharas. Z. Tierz. ZüchtBiol., Bd. VIII, pp. 2-64.

A study of the origin of the fat-rumped sheep of the Bukhara, the Karakul or "Arabi." The radiation center for the breed is sought in the vicinity of Baghdad (Arabian tribes brought the sheep to Bukhara and Chiwa from Mesopotamia in the eighth century A.D.), its wild ancestor being of an urial type, probably *Ovis vignei arkal*.

1928. Über neolithische Ziegen des östlichen Mitteleuropas. Z. Tierz. ZüchtBiol., Bd. XII, pp. 65-83, 1 table, 5 text figs.

The skull-fragment of a goat, discovered in a Neolithic cemetery (end of third millennium B.C.) at Złota near Sandomierz (Poland), is identified as belonging to the *Capra prisca* type. Other Neolithic finds of *C. prisca* from Nauenburg, Schaffis (Switzerland), and Klausenburg (Transylvania) are described.

The occurrence of descendants from *Capra aegagrus* among the European races of the domestic goat is doubted by the author, who, however, takes *C. aegagrus* to be the ancestor of certain central Asian breeds.

1932. Über die Stellung der Ziege von Girgentini im zootechnischen Systeme und ihre angebliche Herkunft von *Capra falconeri*. Z. Tierz. ZüchtBiol., Bd. XXV, pp. 231-236, 5 figs.

Investigation of shape and twisting of horns of the goats from Agrigento (Girgentini, Sicily), considered by Magliano in 1930 as a type of *Capra falconeri*. Since the anterior keel is twisted in clockwise direction (homonymous) and not counter-clockwise as in the *falconeri* type, the Girgentinian goat is regarded by the author as a special but characteristic form of *C. prisca*.

1933. Die Bedeutung der Abzeichen des Banteng (*Bibos banteng* Raffl.) und des Urus für das Abstammungsproblem des Hausrindes. Biol. gen., Bd. IX, pt. 2, no. 3, pp. 33-47, 3 figs.

The author refutes the suggestion of a banteng ancestry for the European brachyceros cattle on the basis of similar color characters.

1936. Untersuchungen über den Schädelbau der Rinder Bocharas mit Rücksicht auf deren Herkunft und Abstammung. Z. Tierz. ZüchtBiol., Bd. XXXV, pp. 239-266.

On the basis of a craniological study of Bukhara cattle the author contradicts the traditional view of a brachyceros ancestry for this breed. The main characters of the Bukhara cattle correspond closely to those of the Pleistocene *Bos namadicus* Lydekker.



1937. Über die Rassenzugehörigkeit des "ziegenhörigen Torfschafes" der neolithischen schweizer Pfahlbauten und seiner Abkömmlinge. Z. Tierz. Zücht-Biol., Bd. XXXVIII, pp. 113-129, 4 figs.

The "goat-horned" type of the turbary sheep—previously regarded as a distinct race—is considered as the female form of *Ovis aries palustris* or its derivative. Closely related to the turbary sheep is the southern European Zackel sheep, and since the latter is derived from the Asian *Ovis vignei* the former is also taken to be descended from a wild form of the urial. The primitive northern European breeds (Soay sheep, Heidschnucke) bear no relation to the turbary sheep but show close affinity to the European mouflon (*Ovis musimon*).

1941. Ursprung und heutiges Vorkommen der Rasse der Girgentiziege und ihre Beziehungen zur Angoraziege. Z. Tierz. Zücht-Biol., Bd. XLVIII, pp. 1-6, 7 figs.

The goat of Agrigento (cf. Adametz, 1932) is traced back to a screw-horned form represented at Ur, and the close relationship of both to the extinct *Capra prisca* is emphasized. The Angora goat of Asia Minor (cf. Vetulani, 1934) is seen as another surviving breed of this ancient stock, kept by Sumerians as early as the fourth millennium B.C.

#### Adlerberg, G. P.

1933. [On the origin of the domestic pig.] (Russ., Eng. summ.) Transcript of the conference on the origin of domesticated animals, held at the Laboratory of Genetics, Acad. Sci. USSR, Leningrad, 1932, pp. 185-209.

On the basis of extensive, mainly craniological, material of wild boars it is assumed that the Asiatic pig (*Sus orientalis*) has to be considered as a mere subspecies of *S. scrofa*, which latter is subdivided into a western and an eastern complex. Also *S. mediterraneus* cannot be seen as a separate species. All European and most of the Asiatic races of the domestic pig (including the Chinese pig) originated from *S. scrofa*.

*S. cristatus*, the East Asian wild boar, is taken as the probable progenitor of the Indian domestic pig.

*S. vittatus* may have had a local influence on domestic breeds of the Indonesian islands, which, however, also show many characteristics of European breeds.

#### Albright, William F.

1940. From the stone age to Christianity. xi+363 pp. The Johns Hopkins Press (Baltimore).

After discussing archaeological records of the occurrence of the camel in western Asia (pp. 120, 121), the author concludes that its effective domestication cannot antedate the outgoing Bronze Age (end of second millennium B.C.), though partial and sporadic domestication may go back several centuries earlier.

1950. On the taming of the camel. Z. Alttestamentliche Wiss., Bd. LXII (XXI), p. 315.

It is shown that the dromedary was well known in Egypt down to the beginning of the dynastic age, after which it disappeared. It is suggested that the animal

became domesticated during the late centuries of the second millennium B.C. in Arabia.

#### Allen, Glover M.

1920. Dogs of the American aborigines. Bull. Mus. Comp. Zool., Harvard University, vol. LXIII, no. 9, pp. 431-517, 12 pls.

A brief general outline of views on the origin of the domestic dog, in which a wolf ancestry is concluded, is followed by a detailed study of North American dogs and their origin.

In an extensive description of the breeds of American aboriginal dogs three main types are distinguished: (a) the large broad-muzzled Eskimo dog, (b) a large, and (c) a smaller Indian dog. The two latter types, both of which gave rise to several distinct local breeds, are compared to the large *Canis intermedius* and the small *C. palustris*, respectively, found in Eurasia from the Neolithic on, and it is suggested that these two general types of dogs were cultivated in Asia, reaching Europe as well as America at a very early period with the human immigrants. In a similar way the Eskimo dog, of a type common to Asia and Europe, has been introduced into America by the Eskimos.

Although hybridization of the larger dogs with wolf or coyote may have occurred occasionally, such crossing had no significant influence on the original stock.

#### Amon, Rudolf

1938. Abstammung, Arten und Rassen der Wildschweine Eurasiens. Z. Tierz. ZüchtBiol., Bd. XI, pp. 49-88, 5 figs., 4 maps, 6 tables.

While investigating Eurasian races of the wild boar, the author also attempts to create a background for solving questions as to the origin of the domestic pig. Three forms ("Artengruppen") of Eurasian wild pigs are distinguished: a northern group (*Sus scrofa*), a southern type (*S. vittatus*), and a third group (*S. verrucosus*). Only the first two are regarded as "hereditarily fixed."

The origin of new populations is explained by "mutual penetration" of the two groups resulting from climatic changes during the glacial periods, which ultimately also caused the restriction of the *vittatus* group to its recent range.

#### Amschler, J. Wolfgang

1929a. Zur Revision der Abstammungsfrage der Hausziege. Züchtungskunde, Bd. IV, pp. 466-469, 1 fig.

Two primitive types of the domestic goat—a saber-horned and a twisted-horned form—are described from the Caucasus. Both appear to be geographical variations derived from the same wild ancestor, the bezoar goat (*Capra aegagrus*).

1929b. Gengeographische Studie am Hissarschaf. Züchtungskunde, Bd. IV, pp. 336-341, 2 figs.

The Hissar sheep, kept in Tadzhikistan, USSR, is seen as an example of the most generalized type of sheep in terms of evolution, combining almost all the main characters of primitive domestic races; all transitions from hairy to fleecy fur are found and the weight ranges from 99 up to 440(!) pounds.

Like the Tadzhikians themselves, the Hissar sheep were isolated for millenniums and retained the characters of a type that gave rise to many breeds of domestic sheep in the Near and Far East.

1931. Beitrag zur Rassen- und Abstammungsfrage der Hausziege sowie zur Erforschung der Urzentren der Haustierwerdung. Biol. gen., Bd. VII, pp. 445-468, 16 figs.

Summary of the results of an expedition of the Siberian academy at Omsk under the direction of the author in the summer of 1930.

In the Siberian Altai (including the mountains of the Mongolian boundary) a domestic type of *Capra prisca* is kept. Domestic forms of *C. falconeri* and *C. aegagrus* are also present, and the wild ancestor of the latter is still found in the eastern Dzungarian mountains today. *Capra prisca* was presumably imported from the north, while the dispersal of *C. aegagrus* and *C. falconeri* as domestic goats is supposed to have coincided with the spread of conquering armies from central Asia.

The Siberian Altai is seen as the primeval center and radiation area for all the forms of domestic goats.

1932. Zur Biologie und Kranilogie des Haus-Yak im Sibirischen Altai. Biol. gen., Bd. VIII, pp. 1-44, 15 figs.

A morphological and craniological description of the Siberian yak follows a discussion of the distribution of wild and tame yaks in general and the origin of the latter. The center of origin is found in the Koko-Nor region (northeastern Tibet), whence the domesticated yak spread in two main directions: westward into the Hindu Kush and via the Pamir plateau to eastern Turkestan, and northward to Mongolia, to a secondary radiation center. In a map of the area under discussion the distribution of wild and domestic yak is depicted.

1933. 2000-Jährige Pferde in den Skythengräbern des Sibirischen Altai. Kosmos, Jhg. 1933, Heft 11, pp. 382-387, 5 figs.

Short description of the horses from the Scythian tombs in the Altai and the Sajon, found frozen and almost completely preserved and dated to the fifth century B.C. The author holds that all the horses belong clearly to the tarpan type, which fact leads him to the conclusion that the tarpan did pass the Volga-line eastward and has to be considered ancestral also to the horses of the Kalmucks and the Kirghizes.

1934. Die ältesten Nachrichten und Zeugnisse über das Hauspferd in Europa und Asien. Forsch. Fortschr. dtsch. Wiss., 10 Jhg., pp. 248-299, 2 figs.

After a short survey of the archaeological evidences for horse breeding in ancient European (mainly Scandinavian) and Asian civilizations (especially from sites in Mesopotamia and Iran, and those of the Minussinsk culture of Siberia), it is concluded that the inner Asian-Iranian area has to be considered as the area of origin of the domestic horse.

1935. The oldest pedigree chart. A genealogical table of the horse and pictures of horsemen dating back 5000 years. J. Hered., vol. XXVI, no. 6, pp. 233-238, figs. 5, 6.

An engraved seal from 3000 B.C., discovered by De Mecquenem near Ur, Mesopotamia, is taken as a pedigree record of horses representing the oldest known genealogical table. On the basis of this and other archaeological material the author concludes that horses—descendants of the Przewalski as well as the tarpan type—were known and used in the earliest Sumerian and Elamitic civilizations. The supposition is expressed that the first crossbreeding between horse and ass took place at Ur.

1936. Die ältesten Funde des Hauspferdes. Wiener Beiträge zur Kulturgeschichte und Linguistik, Jhg. 4, pp. 497–516, 5 figs.

This preliminary description of the equid material from Kish in Mesopotamia distinguishes two forms of true horses (*Equus caballus*) and also a type of ass. The presence of the horse in the Anau fauna (cf. Dürst, 1908) is confirmed. Finds of horse remains from various excavations—Ur, Susa, Minussinsk (Sajan in western Siberia), and Tripolje (Kiew, Ukraine)—are summarized briefly.

1937. Goats from Ur and Kish. Antiquity, vol. 11, pp. 226–228, pls. V, VI.

A horn, found among animal bones from the early dynastic levels (ca. 3000–2530 B.C.) at Kish, is compared with a goat's horn portrayed in a sculpture discovered at Ur, and both are identified as belonging to *Capra girgentana* (cf. Adametz, 1932).

- 1939a. Die Knochenfunde aus dem Königshügel Shah Tepe in Nord-Iran. Forsch. Fortschr. dtsh. Wiss., 15 Jhg., Nr. 9, pp. 115–116.

Preliminary report on the bone material from Shah Tepe (cf. Amschler, 1939b). The author emphasizes the frequency of sheep remains, the presence of bones of the horse and two-humped camel and especially the discovery of the wild ancestral type for the brachyceros cattle, named *Bos brachyceros arnei*.

- 1939b. Tierreste der Ausgrabungen von dem "grossen Königshügel" Shah Tepe. The Sino-Swedish Expedition, vol. VII, part 4, pp. 35–129, pls. XIV–XXVI. Bokförl. Aktieblaget Thule (Stockholm).

A detailed discussion of the animal remains discovered in the mound of Shah Tepe on the Turkoman steppe, southeast of the Caspian Sea, during archaeological excavations in 1932–33. The material, mainly prehistoric, from the fourth and third millenniums B.C., consisted of bones of wild and domestic animals. Among the latter, bones of sheep (30.1 per cent) were most frequent. Fewer remains were found of pig, horse, ass, and Bactrian camel.

The author takes the domestic pig of Shah Tepe to be derived from the wild *Sus scrofa attila*, finding both types as well as transition forms in the material of the site. The domestic dog seems to be closely related to the pariah dogs of today.

A special part (pp. 100–120) is devoted to the wild cattle of Shah Tepe (*Bos brachyceros arnei*) in which the author finds the progenitor of the short-horned domestic type (*B. taurus brachyceros*) present in the same strata.

- 1939c. Uranfänge der Tierzucht in Vorarlberg. Forsch. Fortschr. dtsh. Wiss., 15 Jhg., Nr. 17, pp. 222–223.

A short report on animal remains collected at Bludenz in Vorarlberg (western Austria), mainly from the Bronze Age and the following urn-field culture (1500-1000 B.C.). By far the most numerous bones were those of cattle, most of brachyceros type, but a larger form was also present about 1000 B.C.

Sheep possessed mouflon-like horns; among the few horse remains, a pony type and a larger "cold-blooded horse" could be distinguished; the dog bones belonged to the group of the large *Canis familiaris inostranzewi*. Pig remains were absent at the end of the Bronze Age.

1949. Ur- und Frühgeschichtliche Haustierfunde aus Österreich. Archeol. Austriaca, Heft 3, 102 pp., 12 pls., 58 tables.

A study of the domestic fauna of prehistoric and early historic Austria, based upon an examination of over 10,000 skeletal remains from twelve sites, dating from the Neolithic (Attersee, Föllik) up to the Turkish period.

Domestic species kept during the Neolithic comprised cattle, sheep, goat, pig, horse, and dog. The Neolithic ox belonged to the brachyceros type, the sheep was derived from the European mouflon and is referred to as *Ovis aries* var. *musimon*, the prehistoric goat is considered a descendant of *Capra prisca* Adam., and the Neolithic pig was an indigenous breed of the wild European boar, *Sus scrofa ferus*. The domestic horse of the Neolithic shows similarity to the Oriental race, *Equus caballus orientalis*, and the dog is of the *Canis familiaris palustris* type.

From the Bronze Age on, there occurred two additional races of the domestic dog, *Canis familiaris matris optimae* and *C. familiaris inostranzewi*, and after the Hallstatt period appeared cattle of the primigenius type and sheep belonging to the *Ovis vignei* group.

#### Anderson, J. G.

1943. Prehistory of the Chinese. Bull. Mus. far east Antiq., Stockholm, no. 15, 304 pp., 200 pls.

Animal remains, collected from prehistoric sites in Honan and Kansu in the Hwang-Ho (Yellow River) valley, are identified by E. Dahr (p. 43).

At Chih Kou Chai, one of the Ho Yin sites (Honan), the most common remains were those of pigs. Also well represented were domestic cattle; neither sheep nor goats were found.

Bones of the domestic pig were most abundant also at the site of Ma Chia Yao (Kansu). The only other domesticated animal there was the dog, while bones of large cattle from this site belonged to the wild *Bos namadicus*. However, at Ch'i Chia P'ing (oldest of the Kansu cultures), bones of domestic dog, pig, cattle, goat and sheep were present.

#### Andreeva, E.

1933. [The structure of the metapoda of some wild and domestic animals.] (Russ., Eng. summ.) Transcript of the conference on the origin of domesticated animals, held at the Laboratory of Genetics, Acad. Sci. USSR, Leningrad, 1932, pp. 263-311.

Investigation of anatomical and histological structure of metacarpals of wild and domestic animals. A marked difference in tissue and shape (stouter and with thinner walls in domestic races) is found in bones of wild and domestic sheep, resulting in a more efficient blood supply in the metapodials of wild forms. Primitive breeds exhibit intermediate character. In the horse (*przewalskii* and domestic) the osteological changes due to domestication are much less obvious than in sheep.

### Antonius, Otto

1918. Die Abstammung des Hauspferdes und des Hausesels. Naturwissenschaften, 6 Jhg., Heft 2, pp. 13-18.

A short account of the paleontologic and historic evidence of the origin of the domestic horse. The Mongolian breed is derived from the Mongolian wild horse (*przewalskii*), and its cradle of domestication is sought either in the Mongolian steppe or in southern Asia among Aryan tribes, in which latter case the tarpan, *Equus gmelini* Ant., would be the ancestral type. An independent domestication of "Occidental" breeds in prehistoric central or western Europe is suggested.

1919. Die Abstammung der Hausrinder. Naturwissenschaften, 7 Jhg., Heft 43, pp. 781-789.

A study of the origin of domestic cattle. The first part tries to give a systematic outline of wild bovids, recent and extinct; the second part deals with domestic buffalo, banteng, gayal and yak; the third section covers the wild forms of the genus *Bos* sensu stricto.

The fourth and main part is devoted to the earliest domestic oxen and their origin. Domestic cattle are divided into three main stocks: (a) the brachyceros cattle, derived from a small, wild European bovid, *Bos brachyceros europaeus* (= *B. longifrons* Owen); (b) the primigene cattle of Europe and Africa, derived from *B. primigenius*, the large urus of Europe, North Africa, and southwestern Asia; (c) the zebu cattle of southern and central Asia, the ancestor being of an unknown race related to the urus. It is suggested that the domestication of c took place much later than the taming of a and b.

1922. Grundzüge einer Stammesgeschichte der Haustiere. xvi + 336 pp., 144 figs. Gustav Fischer (Jena).

The origin and history of the important domestic mammals are covered in a semi-popular manual, which is based to a great extent upon original investigations of the author.

The first section (pp. 1-50) evaluates the various sources that supply materials for the study of domestication, and the different methods by which the problem is attacked; the second section (pp. 51-71) gives an account of the morphological and physiological changes that followed domestication. Another part deals comprehensively with cattle (divided into a primigenius and a zebu type), sheep, goat, camel and llama; more briefly with swine (three hearths of domestication—two in Europe, one in Asia—are suggested); and at great length with the horse and the domestic dog. To the Oriental (*Equus orientalis*) and the Occidental (*E. robustus*) horses a third species (*E. ferus*) is added, considered

to be a descendant of the Mongolian wild horse. The wolf is taken to be the true ancestor of the domestic dog.

The book is supplemented with a wealth of photographs.

- 1935a. Zur Abstammung des Hauspferdes. Z. Tierz. ZüchtBiol., Bd. XXXIII, pp. 359-398, 13 figs.

A discussion of recent views on the origin of the domestic horse. The author takes the tarpan ancestry as certain for the "Indo-European" breeds and as possible in the case of the Oriental horse, but as doubtful for the origin of the "cold-blooded" stock.

Special treatment is given to the taming of the half-ass in the ancient Near East, and earlier archaeological and zoological identifications of "horses" from this area are discussed.

- 1935b. Über das Kladruber Pferd. Beobachtungen an Einhufern in Schönbunn, XII. Der Zool. Gart., Heft 7, pp. 249-262.

A study of the Kladrub breed ("a horse that belongs to the past") and its history. In the last section, dealing with the origin of the ancient Spanish (later Habsburgian) breed, the close correspondence of the Kladrub skull and dentition with those of the stout cold-blooded horses of Quaternary times (*Equus mosbachensis* = *E. abeli*) is worked out.

1937. On the geographic distribution, in former times and today, of the recent Equidae. Proc. Zool. Soc. London, vol. 107B, pp. 557-564.

The author considers the geographical ranges of all known species and sub-species of equids (true horses, asses, onagers, and zebras) from the beginning of human history to the present. The story is one of continually decreasing ranges and diminishing populations (sometimes extermination). Of particular interest to students of animal domestication are the original ranges of the tarpan (*Equus silvestris* or *E. gmelini*), Przewalski's horse (*E. przewalskii*), the Syrian onager (*E. hemionus hemippus*), the Atlantic ass (*Asinus* "atlanticus"), and the Nubian ass (*Equus asinus africanus*), for these are the only wild equids which have been considered as ancestors of the domesticated ones.—C.A.R.

1944. Über die Herkunft der Haustiere, insbesondere des Pferdes. Verh. zool.-bot. Ges. Wien, Jhg. 1940/41, Bd. 90/91, pp. 294-303.

A brief review of data on the ancestry of domesticated mammals. The domestic dog is considered to be derived exclusively from the wolf. For cattle three independent ancestors are supposed: *Bos brachyceros*, first tamed in Africa; *B. primigenius*, its probable domestication center on the Iberian Peninsula; and the Asiatic *B. namadicus*, which gave rise to the zebu stock.

The Iranian plateau is seen as the cradle for the domestic goat and sheep, derived from *Capra aegagrus* and *Ovis vignei* respectively. Screw-horned breeds of goats, derived from the extinct *Capra prisca* Adametz, and the race of the "copper-sheep," a domestic form of *Ovis musimon*, were developed independently in late Neolithic or early Bronze Age Europe.

The riding of horses, preceded by the use of equids with chariots, was introduced into Europe from the East about 1000 B.C.

**Ash, Edward C.**

1927. Dogs: their history and development. Vol. I, pp. i-xviii, 1-384; frontispiece, pls. 1-108, 6 figs. Vol. II, pp. i-xvi, 385-778; frontispiece, pls. 109-160; 7 figs. Houghton Mifflin Company (Boston).

The author attempts to include almost everything known about dogs, exclusive of detailed anatomy and physiology. The result is encyclopaedic but uncritical. Major emphasis is placed on the different breeds and their history, but there is much random information on the history of dogs in general, and on dogs in medicine, folklore, law, poetry, and art. The literature concerning the hybridization of dogs with wild canids is summarized.—C.A.R.

**Ashton, E. H., and Thompson, A. P. D.**

1955. Some characters of the skulls and skins of the European polecat, the Asiatic polecat and the domestic ferret. Proc. Zool. Soc. London, vol. 125, no. 2, pp. 317-333.

Skulls and skins of the domestic ferret, *Mustela putorius furo*, are compared with skulls and skins of the European polecat, *M. p. putorius*, and the Asiatic polecat, *M. p. eversmanni*. The domestic ferret resembles the European polecat in more characters than it does the Asiatic polecat, but the available data do not allow a final conclusion as to the ancestry of the domestic ferret. The skulls of the domestic ferrets are more variable than are those of the wild subspecies studied, primarily because of differences in human selection, since different breeders disagree on the proper form of a good hunting ferret.—C.A.R.

**Auld, Robert**

1927. Polled and horned cattle. J. Hered., vol. XVIII, no. 7, pp. 309-321, figs. 10-19.

A summary of evidence about the appearance of polled cattle in ancient and recent times, and a discussion of the genetic factors involved. It is suggested that cattle were hornless when domestication started.

**Baas, Josef**

1938. Der älteste Haushund der Welt im "Senckenberg." Natur u. Volk, Bd. LXVI, Heft 10, pp. 469-475, frontispiece, 3 figs., 1 table.

A dog skeleton, found near Frankfort and dated by pollen analysis to about 9000 B.C., is regarded as the most ancient domestic dog. The animal shows a close relationship to *Canis poutiatini* and to the present Australian dingo.

The author holds that a small type of wolf became tamed in the earliest Mesolithic (or even Paleolithic) times, and that this type—transition forms not yet found—gave rise to the European dogs of the *poutiatini* group as well as to the dingo, which was taken to Australia by man.

**Bate, Dorothea M.**

1932. A note on the fauna of the Athlit caves. J. R. anthrop. Inst., Gt. Brit. and Ireland, vol. 62, pp. 277-279.

This is a first report on animals associated with the Natufian culture (Palestine, Mesolithic). The author rejects the possibility that the horse and ox found were



domesticated. No domestic dog was found (but see Bate, 1937). Study of the Natufian culture would seem to indicate that agriculture was developed prior to domestication of animals.—C.A.R.

1937. The fossil fauna of the Wady El-Mughara caves. *In* The Stone Age of Mount Carmel, by D. Garrod and D. M. Bate, vol. 1, part 2, pp. 136–240. Clarendon Press (Oxford).

On pp. 175–177 (fig. 4a, b) the skull of a supposedly domestic dog from the Mesolithic of Palestine is described. The Palestine form seems to show closest resemblance to the type *Canis matris optima* and to the dog from Anau (cf. Dürst, 1908).

1938. Animal remains from Megiddo. *Orient. Inst. Publ. (Univ. Chicago)*, vol. 33, pp. 209–213, figs. 204–206.

Description of animal bones from tombs at Megiddo (Palestine), including deposits from late Neolithic to Late Bronze II. Domesticated specimens identified are *Bos* cf. *longifrons*, *Hircus mambricus*, *Ovis* sp. and *Sus* sp.; designated “probably domesticated” are *Canis* sp. and a small equid (*Equus hemionus*?).

1942. The fossil mammals of Shukbah. *Proc. Prehist. Soc.*, vol. VIII, pp. 15–20.

Identification of a lower jaw of a domestic dog found among the skeletal material from the Mesolithic cave of Shukbah in the Judean hills (Palestine). Excavated by D. A. E. Garrod.

Remains of oxen, probably *Bos primigenius*, goat, pig and an equid (*Equus* cf. *hemionus*?) are not considered as belonging to domestic species.

1949. The fauna of Esh Shaheinab. *Arch. News Letter*, vol. II, no. 7, pp. 128–129.

The author, who investigated the mammalian faunas of Early Khartoum and the nearby Esh Shaheinab, stresses the emergence of domestic animals in the latter site in contrast to the former, where domestic species were not found. From the presence of three forms (a dwarf goat with small horns, another goat with twisted horns, and a small sheep), all of which bear no relationship to local species and had to be imported, she concludes that stock-farming at Esh Shaheinab was a well-established custom. A northwest African origin of those three animals, which were accompanied probably by a domestic dog, is suggested (see Bate, 1953, for the full account of the fauna of Esh Shaheinab).

1953. The vertebrate fauna. Pp. 11–19, figs. 2–5, *in* Shaheinab: An account of a Neolithic occupation site carried out for the Sudan Antiquities Service in 1949–50, by A. J. Arkell. Published for the Sudan Government by Geoffrey Cumberlege, Oxford University Press (London).

The site is on the west bank of the Nile, and is dated at approximately 3300 and 3900 B.C.; the climate was somewhat more humid than at present. Numerous bones of a dwarf goat and rare remains of what may be a larger goat or sheep constitute the earliest known record of domestic animals from the Sudan. Many of the goats, as indicated by the dentition, were immature at time of death. The dwarf goats were of almost the same size as present dwarf Nilotic goats but are

thought to be morphologically more like the remains of dwarf goats from Algerian cave-sites. Horn-cores of the dwarf goats from the predynastic site of Toukh in southern Egypt (cf. Gaillard, 1934) are quite different from those found at Esh Shaheinab.

No remains of the domestic dog were found.—C.A.R.

### Batu, Selahattin

1939. Neue Feststellungen über die Geschichte, Herkunft und Abstammung der Hausziege. *Z. Tierz. ZüchtBiol.*, Bd. XLIV, pp. 219-229, 2 figs.

A survey of ancient records shows that the Angora goat was unknown in its present distribution center (Anatolia) during the Hittite period and in classical times as well. The view of a *Capra prisca* origin (cf. Adametz, 1928, 1941, and Vetulani, 1934) is accepted, and the Angora goat is seen as a very ancient breed which originated in Asia and was already kept by Sumerians in the fourth and third millenniums B.C. It is suggested that the Angora goat reached Anatolia only in the thirteenth century A.D. with the invasion of the Turks.

### Bäumler, Hans

1921. Die morphologischen Veränderungen des Schweineschädels unter dem Einfluss der Domestikation. *Arch. Naturgesch.*, Bd. 87, Abt. A, Heft 12, pp. 140-178, 11 tables.

A craniological study of domestic and wild pigs, part of the latter brought up under captivity. The skull of the *Sus vittatus* type is seen as a retardation of an early ontogenetic stage of a primitive form, the further development of which produced *S. scrofa ferus*. The skull of the European as well as of the Indian domestic pig resembles in its neotenic character the wild *vittatus* rather than the wild *scrofa* type.

### Belic, Jovan

1939. Die Abstammung des Balkanwildschweines. *Z. Tierz. ZüchtBiol.*, Bd. XLII, pp. 151-214, 30 tables, 54 figs., 12 graphical charts.

Following an investigation of 130 skulls of wild boars from Eurasian countries (central Europe through southeastern Asia), the author concludes that a diphyletic origin of the domestic pig from *Sus scrofa* and *S. vittatus* is indicated. Both the latter are seen as distinct species; *S. mediterraneus*, however, is considered a subspecies of *S. scrofa*, and the Sardinian *S. meridionalis* probably a stunted form of the European wild boar.

### Bishop, Carl Whiting

1933. The Neolithic age in North China. *Antiquity*, vol. 7, pp. 389-404, 8 pls., 2 figs.

The Neolithic of Europe had domestic cattle, goat, sheep, pig, and dog, but the Neolithic of north China had only the pig and dog. The chief activity of the people was probably agriculture, with no evidence of a pastoral type of life. The major source of protein seems to have been the pig.—C.A.R.

1939. The beginnings of civilization in eastern Asia. *J. Amer. Orient. Soc.*, vol. 59, suppl. to no. 4, pp. 45-61.

In a brief review of Far Eastern prehistoric cultures, the earliest types of farming in the northern Chinese plains are outlined (pp. 48-49). On all save the latest Neolithic sites the only remains of domestic animals are those of dog and pig. At later sites, bones of sheep and ox also occur. Few if any of the domestic animals appearing prior to and around the beginning of the Bronze Age were of native origin. Most of the domesticated breeds—ox, sheep (derived from the western *Ovis vignei*), horse (not derived from *Equus przewalskii*), water-buffalo, and jungle fowl—were acquired as culture loans from abroad.

1940. Beginnings of civilization in eastern Asia. *Antiquity*, vol. 14, pp. 301-316 (cf. Bishop, 1939).

#### Bisschop, J. H. R.

1937. Parent stock and derived types of African cattle (with particular reference to the importance of conformational characteristics in the study of their origin). *S. Afr. J. Sci.*, vol. 33, pp. 852-870, 1 fig., 2 tables.

Summary of information on the derivation of African domestic cattle. The Hamitic longhorn is regarded as a descendant of the African urus, *Bos opisthonomus* Pomel, which was domesticated in Egypt before and during the Neolithic. At the end of the Neolithic, brachyceros cattle, derived from *Bos namadicus*, were brought to Lower Egypt and forced the longhorn breeds westward. Longhorned zebus arrived in Ethiopia and Upper Egypt during the third millennium B.C. and by interbreeding with the Hamitic stock formed the Sanga type of cattle. Short-horned zebus arrived later, by the same route.

#### Boessneck, Joachim

1953. Die Haustiere Altägyptens. Veröff. zool. Staatssamml. Münch., Bd. III, 50 pp., 22 tables with 45 figs.

An account of domestic and semi-domestic animals kept in predynastic and ancient dynastic Egypt, based mainly upon an evaluation of animal representations from prehistoric and early historic sites all over North Africa. An extensive bibliography and numerous illustrations are appended.

#### Bogaevsky, B.

1937. [The artifacts and the domestic animals of Tripolje.] (Russ., Fr. summ.) Akademiia Nauk SSSR. Gruzinskii Filial. Institut iazyka, istorii i material'noi kul'tury im N. IA. Marra, Leningrad. 309 pp., 18 tables, 4 pls.

The second part of the book (pp. 144 ff.) attempts to reveal the origin and first stages in the development of stock-farming among the Tripolje cultures in the Dnieper basin. The study is based upon subfossil finds, animal representations on vases, and animal figurines.

Domestication began at the beginning of Tripolje B; pig and sheep (both of the *palustris* type), goat and a *primigenius* race of cattle were kept everywhere. The horse had been a rare animal among the early Tripolje settlements, in contrast with dogs, numerous remains of which were found in most of the sites.

#### Boicoianu, C.

1932. Studien über das belgische Pferd. *Z. Tierz. ZüchtBiol.*, Bd. XXIII, pp. 25-54, 5 figs.

A craniological, and especially odontological, study of the origin of the Belgian horse. Besides characters of the "Occidental" breeds, features of tarpan-like ("Oriental") races are evident, and a hybrid origin from both groups is assumed for the Belgian strain.

**Boule, Marcellin**

1910. Les chevaux fossiles des grottes de Grimaldi et observations generales sur les chevaux quaternaires. Ann. Paléont., Paris, Tom. V, pp. 113-135, 7 figs.

Description of the equid remains from cave deposits of the French Aurignacian and discussion of European Quaternary horses in general. The Quaternary *Equus caballus typicus* considered ancestral to recent horses—is derived from the Pliocene *E. stenonensis*. Remains of ass and half-ass (*E. hemionus*) from the caverns of Grimaldi are described and compared to those of the true horse.

**Bourdelle, E.**

1932. Notes ostéologiques et ostéométriques sur le cheval de Przewalski. Bull. Mus. Hist. nat., Paris; 2nd Ser., Tom. IV, pp. 810-821, 3 tables.

Osteometric characters of *Equus caballus przewalskii* are worked out and compared to those of the domestic horse and the domestic ass. Special emphasis is given to the limb bones, their measurements and indices. A table (no. 3) summarizes the osteometric features of the horse group as contrasted to the ass group.

1938. Essai d'une étude morphologique des équides préhistorique de France d'après les gravures rupestres. Mammalia, Tom. II, pp. 1-11, 8 figs., 2 pls.

A study of the numerous rupestrian engravings and sculptures of prehistoric equids discovered in France. The author finds few representations of ass- or onager-like forms, but distinguishes three types of horses according to the shape of the cranial profile. Pointing to the same variations of profile in Przewalski horses kept in captivity, he finds in *Equus przewalskii* the common ancestor for all those varieties, and regards the recent Camargue horse as one of its descendants.

**Bourdelle, E., and Trombe, F.**

1946. Les dessins d'équides préhistoriques de Ganties-Montespan, Haute-Garonne. Mammalia, vol. 10, pp. 13-25, 20 figs.

Equid images, depicted on gallery walls of the underground river Ganties-Montespan (in the Plantaurel range of the Pyrenees) and in caves frequented by Upper Paleolithic people, are described and analyzed.

The authors distinguish four types of equids among the representations. Most frequently portrayed and most primitive in type is the Przewalski horse, taken as the ancestor of the Arabian as well as of the Camargue breed. Other types recognized are the Celtic horse (the ancestor of the Shetland pony), the Nordic horse, and an ass-half-ass type.

**Braidwood, Robert**

1952. The Near East and the foundations for civilization. Condon Lectures. Oregon State System of Higher Education (Eugene).

Animal remains from the site at Jarmo (see Braidwood and Braidwood, 1950) are described briefly (pp. 26 and 30). Ninety-five per cent of the animal bones fall in the sheep, goat, pig and ox categories, and many of the first two are those of yearlings.

**1954.** The Iraq-Jarmo project of the Oriental Institute of the University of Chicago, season 1954-1955. *Sumer*, vol. 10, pp. 120-136.

On pp. 134-136, C. A. Reed outlines the necessary training and skills for a zoo-archaeologist who is studying, among other matters, the origin of domestic animals. Preliminary results are given of study of three sites in northeastern Iraq: M'lefaat (early village-farming), El Khan (archaic Hassuna), and Banahilk (Halafian). Equid remains were found at none, dog was very rare; all three had sheep and/or goat (stated to be mostly domestic goat), and all three had medium-sized cattle. Remains of pigs were common at Banahilk, rare at M'lefaat, not found at El Khan. (The supposedly domestic status of any animals from M'lefaat was later disclaimed: *Science*, vol. 130 [1959], p. 1639).—C.A.R.

**Braidwood, Robert, and Braidwood, Linda**

**1950.** Jarmo; a village of early farmers in Iraq. *Antiquity*, vol. 24, no. 96, pp. 189-195.

A brief report on the first excavation (1948) of Jarmo near Kirkuk (Iraq), a site dated to 5270-4630 B.C., and therefore preceding the earliest village assemblages of the Near-Middle East. A preliminary study of the animal bones by Bryan Patterson revealed remains of sheep and/or goat, cattle, pig, and dog, and several equid teeth.

**Breuil, M. H., and Kemal el Dine**

**1928.** Les gravures rupestres du Djebel Ouenat. *Rev. Sci.*, Paris, Ann. 66, No. 4, pp. 105-117, frontispiece and figs. 45-62.

Description of animal pictures found at Ouenat, a mountain mass in the heart of the Libyan desert. Among numerous other animals the pictures show cattle, horses, camels and dogs (or jackals). Besides engravings of a Paleolithic hunter-culture and modern additions (probably the depicted camels and dogs), the pictures range from the fifth to the first millennium B.C. and are divided by the author into two main cultures: V-a (proto-dynastic and Old Empire) and V-b (starting at about the Middle Empire). The big-horned *Bos africanus* is the only domestic type of cattle depicted in V-a; in V-b *B. brachyceros* appears beside *B. africanus*, which latter becomes gradually displaced.

**Brinkmann, August**

**1920.** Equidenstudien I, II. *Bergens Mus. Aarbok* 1919-20, *Naturvidenskabelig række*, Nr. 5, pp. 1-38, 1 fig., 3 tables.

Osteological study of the extinct Norwegian Lofoten breed of horse, which is described in the first part and compared to other prehistoric types. The author accepts the four basic types of horses, established by Ewart (cf. Ewart, 1904, 1907a, 1909), and considers the Lofoten horse a straight derivation from the small, broad-headed *Equus caballus robustus*, endemic in Europe since glacial times. The second part is a craniological investigation of asses, in which the racial significance of the cranial index is emphasized.

1921. Canidenstudien I, II, III. Vidensk. Medd. dansk naturh. Foren. Kbh., Bd. 72, pp. 1-44, 3 pls. with 16 figs., 3 tables.

A study of several prehistoric dogs from Scandinavian sites, especially of a skeleton found near Errindlev (Denmark) with close affinities to a greyhound type. The origin of the large greyhounds is discussed. They are derived from the Indian wolf, *Canis pallipes*, the Errindlev dog representing a link between *C. pallipes* and recent greyhounds and borzois. *C. pallipes* is regarded as a separate species clearly distinct from *C. lupus* and its races.

- 1923-24. Canidenstudien V, VI. Bergens Mus. Aarbok 1923-24, Naturvidenskabelig række, Nr. 7, pp. 1-57, 4 pls., 4 tables, 3 figs.

An extensive investigation of the dog remains from Scandinavian Stone Age sites, collected by the Museum of København and the Bergen Museum. A large type of dog, belonging to the *Canis inostranzewi* group and considered the most ancient domesticated dog, occurred in all Danish sites from the Azilien (pre-Campignien) on. Beginning with the next culture period (Campignien, the Danish "kitchen-midden" time), this form is accompanied by *C. palustris ladogensis*, which by that time already showed signs of advanced influence of a domestic environment. *Inostranzewi* and *palustris* types are seen as the earliest forms of domesticated dogs, living throughout millenniums in northern Europe. The latter type in a dwarfed form constituted the turbarry or peat-dog, *Canis palustris* proper, which either reached Switzerland by late Neolithic or developed there. The author holds that *Canis palustris ladogensis* is derived directly from a small type of wolf and is the result of thousands of years of domestication, while the *inostranzewi* type is identified with a wolf-dog hybrid.

A *palustris* type and wolf hybrid occur simultaneously in all the Neolithic sites throughout the Nordic countries until recent times, where they are represented by the gray deerhound (wolf hybrid) and the Finnish dog (*palustris* type) respectively, both the latter breeds described in detail in part VI.

#### Brøgger, A. W.

1940. From the Stone Age to the Motor Age. A sketch of Norwegian cultural history. Antiquity, vol. 14, pp. 163-181.

In the chapter "Hunting, Catching and Farming," the economic foundation of the Stone and Bronze Age in Norway is outlined. During the first few thousand years of the settlement of the country, when people lived in a hunting and catching stage, no domestic species besides the dog was known. Only from the third millennium B.C., with new civilizations invading from the south, additional domestic animals (cow, sheep and pig) became known and were kept.

#### Bronholm, H. C., and Rasmussen, J. P.

1931. Ein steinzeitlicher Hausgrund bei Strandegaard, Ostseeland. Acta Archaeol., vol. II, pp. 265-278, 8 illus.

Remains of domestic cattle (*Bos taurus domesticus*) were found in a dwelling place dating to the end of the early Stone Age, and were identified by M. Degerbøl (p. 278).

**Brunton, Guy, and Caton-Thompson, G.**

1928. The Badarian civilization. British School of Archaeology in Egypt. x + 128 pp., 85 pls.

Report of excavation of the predynastic cemeteries and settlements at Badari (near Qau, Upper Egypt). Among the mammal remains found in the graves, skulls of an "ox-buffalo" and a sheep were identified by D. M. S. Watson (p. 38). The faunal remains discovered at the settlements (North Spur Hamamieh, between Badari and Qau-el-Kebir) yielded bones of sheep (or goat), pig and ox (p. 77). Pottery from this site shows figures of a bovine (pl. XXXVIII). On pp. 92-94 an account of animal burials is given. They consisted of thirteen carefully arranged piles, composed of the remains of young oxen (connected with one of the heaps was the skull of an ass), and masses of dog bones beneath blocks of limestone. All the ontogenetic stages were represented. Intermingled with the dog remains were jaw parts of (domestic?) cats.

**Bryner, Jones**

1932. The origin and development of British cattle. Proceedings of the First International Congress of Prehistoric and Protohistoric Sciences, London, pp. 151-154. Oxford University Press (London).

An account of the origin of cattle, not only of Britain but in general. The Pleistocene *Leptobos* with horned males and hornless females—although descendants of a remote ancestor which was hornless in both sexes—is seen as the first representative of the species from which all domesticated cattle were ultimately derived. From this early wild race sprang several forms, one of which, *Bos primigenius*, was domesticated at an early period in western Asia. This species has contributed the main share to the make-up of modern cattle in western Europe, including Britain, in which latter the wild *Bos primigenius* was found up to the Neolithic, although it was probably never domesticated there. From the late Neolithic onward there is found in abundance a smaller, more slightly built race, *Bos longifrons* Owen, which also originated in Asia (found at Anau; cf. Dürst, 1908). It does not constitute a separate species but is a mere domestic breed of prehistoric times derived from the same *primigenius* ancestor. Interbreeding between the different forms had probably occurred already in prehistoric periods.

**Burkhill, I. H.**

1935. Origins of the cultivated plants of the Old World. Proc. Linn. Soc., London, vol. 164, part 1, pp. 12-42.

In the introductory pages to a comprehensive study on the origin and dispersal of cultivated plants, the author devotes some discussion to the earliest breeding of sheep, which probably gave rise to the first tillage, when abundant spring pasture inspired the herdsmen to try to increase the supply of vegetation.

**Burns, Robert, and Moody, E. C.**

1935. The trek of the Golden Fleece. J. Hered., vol. XXVI, nos. 11-12, pp. 433-443, 505-518.

An account of the origin and history of the Merino stock throughout two millenniums is preceded by a short section on the origin and ancestors of domestic sheep.

**Bylin-Althin, Margit**

1946. The sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu. Bull. Mus. far east. Antiq., Stockholm, no. 18, pp. 383-498, 6 pls., 18 figs.

Report of excavations in the prehistoric sites in the Hwang-Ho valley: Ch'i Chia P'ing (pre-Yang-Shao period) and Lo Han T'ang (Yang-Shao period). The bones, examined by E. Dahr (pp. 457-498), were mainly those of domestic mammals (the stratigraphic conditions are uncertain). The majority of the bones belonged to a small form of dog (one skull similar to *Canis familiaris palustris*), pigs (which displayed clear affinities to *Sus vittatus*), and a large type of cattle. There were fewer remains of sheep and goat.

**Cabrera, Angel**

1922. The domestic animals. 94 pp. Libro de la Naturaleza, Calpe (Madrid).

This popular guide to the origin and history of the common domestic mammals and birds and their influence upon human society is provided with numerous photos and drawings.

1932. Los perros domesticos de los indigenos. Actas Cient. Congr. Intern. Amer., La Plata, 25 (1931). Tom. I, pp. 81-93, 5 figs.

Brief description and discussion of bones of subfossil dog and of dog mummies from South America, especially Argentina. A common wild ancestor is suggested for South American, North American, and Old World dogs; the appearance of similar types of breeds in the Old and the New World is, however, explained by convergent evolution, due to similar adaptations and mutations.

**Cardas, A.**

1926. Essai sur l'origine des animaux domestiques de Roumaine. Ann. Sci. Univ. Jassy, Tom. XIII, pp. 409-423.

A brief survey of the important domestic species and their wild ancestors with special emphasis on the Romanian races. Treated are equids, oxen, buffalos, sheep, goats, pigs and dogs. The primitive Romanian horses (Hutsul, Moldavian breeds) are derived from the tarpan with some admixture of Przewalski's horse; the indigenous cattle are considered as derived from *Bos primigenius* (the descent of the Montagne cattle from a brachyceros ancestor is refuted). The ancestor of the Tsigai sheep is regarded as *Ovis argali* and that of the Tzourcana breeds as *O. musimon*. The Romanian domestic goat is derived from *Capra prisca* (cf. Adametz, 1915), and breeds of the primitive Mangalitsa pig are traced back to *Sus ferus europaeus*.

**Cardoso, Anibal**

1912. Antigüedad del caballo en el Plata. An. Mus. nac. B. Aires, Tom. XXII (Ser. III, Tom. XV), pp. 371-439, 16 figs. (Fr. summ.).

A review of historical sources on the introduction of Spanish horses into South America is followed by an osteological study of the Criollo horse and of fossil equid remains from South America. The author concludes that *Hippidium* is the ancestor of the Pleistocene Argentinian *Equus reitidens*, which gave rise to the domestic Criollo horse, which consequently is taken as an indigenous breed.



**Carruthers, Douglas**

1949. Beyond the Caspian. A Naturalist in Central Asia. xx + 290 pp., 22 pls. Oliver and Boyd (Edinburgh and London).

In the tale of his wanderings beyond the Caspian the author deals at some length (pp. 41-50) with the Bukharian breeds of sheep and especially with the distribution and habits of the wild species (*Ovis vignei* and *O. orientalis*) considered ancestral to the domestic stock. A useful synopsis of the various classifications of the genus *Ovis* is appended (pp. 226-244).

**Caton-Thompson, G.**

1934. The camel in dynastic Egypt. *Man*, vol. XXXIV, no. 24, p. 21.

The presence of the camel in ancient Egypt is proved by a twist of cord made of camel hair, found among other objects from the third dynasty during excavations in the northern Fayum.

**Caton-Thompson, G., and Gardner, E. W.**

1934. The desert Fayum. 2 vols. Royal Anthropological Institute of Great Britain and Ireland (London).

Report of excavations at predynastic and early dynastic sites in the desert oasis of Fayum (northern Egypt). Remains of animals from Kom W (predynastic) included those of pig and sheep (or goat), cattle, and five canid teeth or parts of jaws which may be dog or jackal; contrary to the assumptions of many later authors, there is no mention in the original report that these animals were presumed to be domestic.

Among the faunal remains from the Old Kingdom site of Umm-es-Sawan were horn cores of typical domestic longhorned cattle from the early dynasties. These contrast with the shorthorned cattle from Old Kingdom levels at Hemamiah (cf. Brunton and Caton-Thompson, 1928). Thus rock engravings of shorthorned cattle may be from the Old Kingdom period, contemporaneous with those of longhorned cattle.

A cord of camel-hair was found among the quarrymen's debris of the Old Kingdom period (cf. Caton-Thompson, 1934), suggesting fairly common use of camel-hair by the poorer laborers.—C.A.R.

**Chard, Thornton**

1937. An early horse skeleton. *J. Hered.*, vol. XXVIII, no. 9, pp. 317-319.

The earliest horse skeleton from Egypt, found in a tomb of the time of the Queen Hatshepsut (early in the fifteenth century B.C.), is described. On the basis of the skull-likeness and estimated height the author relates the specimen to the modern Arabian type.

**Childe, V. Gordon**

1940. Prehistoric communities of the British Isles. xiv + 274 pp., 16 pls., 96 figs. W. & R. Chambers, Ltd. (London and Edinburgh).

Chapter III ("The Neolithic Revolution") contains a description of the oldest Neolithic culture in the archaeological record of Britain, named after the site at Windmill Hill. Besides sheep (or goat) and pig, the occupants kept cattle, which

were smaller than the then native wild urus but were larger and provided with longer horns than the later Celtic shorthorn (*Bos longifrons*). The origin of this early breed of cattle from a cross of imported shorthorn with wild indigenous oxen is seen as conceivable (cf. also Bryner, 1932).

1941. Horses, chariots and battle-axes. *Antiquity*, vol. 15, no. 58, pp. 196-199.

On the basis of equid identifications from Tepe Sialk (cf. Vaufrey, 1939) the use of horses in southwestern Iran in the fourth millennium B.C. is taken as certain. The author also finds evidence for equids in Elam and Mesopotamia during the fourth and early third millenniums B.C.

**Chlebaroff, G. S.**

1929-30. Das brachycere Rodoporind in Bulgarien. Univ. i Sofia, Agronomicheski fakul'tet, Tom. VIII; special copy-print, 99 pp.

A craniological study of the brachyceros cattle of the Balkan breeds (Illyrian, Albanese, Macedonian, Montenegrin) and particularly of the Bulgarian Rhodope cattle. It is concluded that this race could not have been derived from the European *Bos brachyceros* but is probably of Asiatic origin. The Asiatic urus (*B. namadicus*) or one of its varieties is considered as a possible ancestor.

**Chubb, S. H.**

1913. The horse under domestication; its origin and the structure and growth of the teeth. *Amer. Mus. nat. Hist., Guide Leaflet Ser.*, no. 36, ed. 3, part II, pp. 37-60, figs. 25-38.

An account of horse ancestry, in which the view of a diphyletic origin for the domestic horse is accepted. The "Norseman's" horse, from which both European draft horses and Shetland ponies were derived, is a descendant of the native horse of Europe and northwestern Asia, which in turn was perhaps a near relative of the Przewalski horse of Mongolia. In contrast, the "Oriental" stock (the Arabian type) originated from *Equus lybicus* in North Africa.

**Clark, Grahame**

1941. Horses and battle-axes. *Antiquity*, vol. 15, no. 57, pp. 50-70, 9 figs.

The introduction of horses into Asia Minor by 2500-2000 B.C., the earliest occurrence of horses in the Near East, is examined from the archaeological point of view. The area between the Baltic and the Black Sea is regarded as the home of horses and battle-axe people, who originally probably used their animals only as pack-horses. (See also Childe, 1941.)

1947. Sheep and swine in the husbandry of prehistoric Europe. *Antiquity*, vol. 21, no. 83, pp. 122-136.

A consideration of the position of pigs and sheep in prehistoric European husbandry, based upon a comparison of animal remains from successive levels at various archaeological excavations. Characteristic for most of the sites under consideration (mainly in the British Isles, Scandinavia, and Switzerland) is a relative abundance of the pig in the Neolithic, and a substantial decline in its frequency, together with a steady increase in sheep population, in the transition

time between the Neolithic and the Early Iron Age. It is suggested that the foliaceous forest, which formed the background for rearing pigs and also cattle, became reduced at about that period, forming thereby favorable conditions for sheep breeding.

1948. Fowling in prehistoric Europe. *Antiquity*, vol. 22, pp. 116-130, 7 figs.

Ancient man hunted nesting geese for food and feathers; it would seem probable that the young, after the parents had been killed, were taken to camp and kept alive for food and the down. In this way the domestication of the goose probably occurred.—C.A.R.

Clark, J. G. D.

1952. Prehistoric Europe, the economic basis. xix + 349 pp., 180 figs., 16 pls. Methuen & Co., Ltd. (London).

A survey of animal remains from prehistoric sites in northern, northwestern and central Europe (pp. 108-128). It becomes apparent that cattle and swine were the predominant domestic forms in Neolithic times, but from the Late Bronze Age sheep and goats came to play a part of increasing importance, a phenomenon explained by changes in the flora, due to settled farming. The European domestic pig (*Sus scrofa palustris*) is regarded as a stunted version of the European wild pig (*S. scrofa ferus*); the earliest European dog is considered a small race of *Canis familiaris palustris*; and the chief breeds of cattle kept by prehistoric farmers are divided into two main groups—the *primigenius* form with large horns and the *longifrons* group with short ones, both groups derived from the aurochs.

Coon, Carleton

1951. Cave explorations in Iran—1949. Univ. Monog. Univ. Mus., Univ. of Pennsylvania (Philadelphia).

A brief description (pp. 43-52, tables III-VI) of the animal bones found in northern Iranian Mesolithic and Neolithic caves (especially in the "Belt Cave"). During late Mesolithic times remains of gazelle and (wild?) ox outnumbered by far those of sheep and goat, but the latter became more abundant and were apparently domesticated in the early Neolithic period. The increase in immature bones of goats in the later Neolithic phase was caused by a selective slaughtering of the young males, while the females were kept for milking. At this time, or somewhat later, oxen and pigs probably became domesticated also. The upper Mesolithic levels of the Belt Cave (layers 24-15) also yielded fragments of canids, and some of these bones were identified as belonging to the domestic dog.

1952. Excavations in Hotu Cave, Iran, 1951. A preliminary report. *Proc. Amer. Phil. Soc.*, vol. 96, pp. 230-249, 23 figs., 2 tables.

A short account (pp. 243-246) of the faunal findings from the Hotu Cave (northern Iran). In the Neolithic levels (fifth millennium B.C.) domestic oxen, pigs, sheep and goats were represented. Both of the latter were present as domestic animals throughout the occupancy of the cave but pigs and cattle became tamed (or introduced) later. Remains of the wild urus, however, which apparently had been hunted from the very beginning, were detected in the lowest levels.

1954. The story of man. xiii-425 pp., 32 pls., figs. in text. Alfred A. Knopf (New York).

A popular account of the rise of garden tilling and animal husbandry is given (pp. 114-150). Archaeological data for the earliest farming, and zoological evidences for the ancestry of domestic farm animals, are summarized briefly.

**Crawford, O. G. S.**

1938. The Kish goat, Bulgaria. *Antiquity*, vol. 12, no. 45 (Notes and News). pp. 81, 82, pl. I.

The occurrence of goats of the *Capra girgentana* type (cf. Adametz, 1932) from Bulgaria is reported. The horns correspond also to the "Kish goat" (cf. Amschler, 1937), and a *Capra prisca* ancestry is suggested.

**Curwen, E. Cecil**

1938. Early agriculture in Denmark. *Antiquity*, vol. 12, pp. 135-153, 4 pls.

Bones from the Mesolithic of the Mullerup cultures (approximately 6000 B.C.) indicate that the dog was the only domestic animal; the domestic ox, pig, sheep, and goat first appear at the beginning of the Neolithic, simultaneously with wheat and barley, and must have been introduced from the south. The sheep is believed descended from a species domesticated in Turkestan about 6000 B.C., and the goat is regarded as derived from *Capra aegagrus*. The similarity between domestic and wild pigs was greatest in the Neolithic, with subsequent morphological divergence. The domestic cattle were either longhorned (thought to be derived from *Bos primigenius*) or shorthorned (*B. brachyceros*). The origin of the latter is unknown. The horse seems not to have reached Denmark until the Megalithic period; poultry and cats did not appear until the Roman Iron Age.—C.A.R.

1946. Plough and pasture. *Past and Present*, vol. IV, 122 pp., 14 pls., 21 figs. Thomas Knight & Co. (Hoddesdon, England).

Cf. Curwen, E. C., and Hatt, G., 1953.

**Curwen, E. Cecil, and Hatt, Gudmund**

1953. Plough and pasture—the early history of farming. xii+529 pp., 14 pls., 24 figs. Henry Schuman (New York).

A semipopular outline of the story of food production from its earliest beginnings. In the first part of the book Curwen deals with the origin of stock-breeding in Europe and the Near East (chap. 3, pp. 36-48) and gives a brief review of the ancestry of the earliest domestic animals—sheep, goat, ox and pig. Their hearth of domestication is sought at some point within the area bounded by the Nile on the west, the Indus on the east, and the forty-fifth parallel on the north. Nomadic tribes—not identical with the settled farmers, who started the cultivation of cereals in about the same area—are considered as the first animal-breeders. Tarpan-ancestry is accepted for the domestic horse, and its first domestication center is found in southern Russia as early as the fourth millennium B.C.

The second part, by Hatt, is a study of the economic cultures of non-European peoples in modern and historic times. In America (p. 199) two independent centers of animal domestication are distinguished—Peru and Central America, llama and alpaca being characteristic of the former and never reaching the latter, where-

as domestic turkeys and tame bees were characteristic of Central America but never were found in Peru. Old World pastoralism (chaps. 15 and 18) arose in Asia. The first domestication (of bovids, reindeer, horse, camel) was done by hunters, who developed the use of animals for transport and for dairy purposes.

#### Dahr, Elias

1937. Studien über Hunde aus primitiven Steinzeitkulturen in Nordeuropa. Acta Univ. Lundensis, N. S., Avdelingen 2, Bd. 32, Nr. 4, pp. 1-63, 3 pls., 12 tables, 5 figs. (Eng. summ., pp. 58-61).

An osteological treatment of dog remains from pre-Neolithic ("Miolithic") cultures of northern Europe (from among Baltic comb ceramics and Danish kitchen-middens), especially from the dwelling site at Sjöholmen in southern Sweden. In all these Stone Age cultures the only achievement in domestication is the dog, of which, however, there are several breeds, all closely related. On the basis of differences in the dentition and in other craniological features (e.g., the position of the orbital plane), wolves, jackals and coyotes are excluded from the pedigree of the Miolithic dogs, which are supposed to have been derived from an extinct species closely resembling or even identical with the dingo, assuming that the latter was represented in Asia during prehistoric times.

1942. Über die Variationen der Hirnschale bei wilden und zahmen Caniden. Ein Beitrag zur Genealogie der Haushunde. Arkiv Zool., Bd. 33 A, Nr. 16, pp. 1-56, 3 figs., 7 tables.

The co-variation of length and breadth of the brain-case in wild and domestic dogs is investigated, and conclusions concerning the genealogy of the latter are drawn from the results. Neither true wolves nor typical jackals are considered ancestral to recent domestic dogs, which are supposed to have been derived from a dingo-like form, spread during early Quaternary time on the Eurasian continent.

#### Dalimier, Paul

1954. La morphologie de la chèvre sous l'influence de la domestication. Bull. Inst. Sci. Nat. Belg., vol. 30, no. 13, pp. 1-12, 5 figs.

Following a discussion of the opinions of Keller and of Lydekker, the author concludes that the domestic goats of Kashmir and Tibet, with heteronymous horns, are derived from the markhor, *Capra falconeri*; most other domestic goats (and particularly those of Europe) are descended from the bezoar or pisang, *Capra hircus aegagrus*. There are *aegagrus*-derived dwarf goats in Lapland and West Africa. Human selection has had little influence on the behavior or morphology of the goat, aside from the retention of the lop ear and the development of different kinds of pelage. This lack of change under domestication, as contrasted with profound changes in most domestic mammals, is ascribed to the fact that the goat has always been kept in small groups by the poor, never in large flocks by rich stockmen who might have practiced selective breeding.—C.A.R.

#### Davis, Malcolm

1954. The history of the domestication of animals. All-Pets Magazine, February, 1954, pp. 21, 32-37.

A popular review of domestic mammals and birds and how they originated.

**Dawkins, W. Boyd, and Jackson, J. W.**

1917. The domestic animals of the Lake Village. In A. Bulleid and H. G. Gray, The Glastonbury Lake Village, vol. II, chap. 26, pp. 648-661, pl. XCVII. The Glastonbury Antiquarian Society (Glastonbury).

Study of the faunal remains from excavations at a lake village near Glastonbury (Great Britain), dated to the prehistoric Iron Age prior to the Roman occupation. Sheep bones constitute by far the most abundant remains and represent at least two distinct breeds. Sheep are followed in frequency by cattle (*Bos longifrons*), while few remains belonged to the horse (a small breed, probably *Equus agilis*), dog and goat(?). The description of the lake village fauna follows a brief discussion on animals in prehistoric Britain in general; all of the domestic breeds—horse, cattle, sheep, goat, pig and dog—are considered as introduced species, brought by Neolithic herdsmen from the Continent.

**Debono, Fernand**

1948. El-Omari (près d'Hélouan). Exposé sommaire sur les campagnes des fouilles 1943-1944 et 1948. Ann. Serv. Antiq. Égypte, vol. 48, pp. 561-569, 6 pls.

The pre-dynastic site of El-Omari in Egypt yielded a fauna which included pig, goat, a bovid (presumably cattle), and a canid. It is suggested that the goat and the bovid were probably domesticated. The time of occupation of El-Omari probably lies between the times of occupation of Merimde and Maadi.—C.A.R.

**Degerbøl, Magnus**

1927. Über prähistorische dänische Hunde. Vidensk. Medd. dansk naturh. Foren. Kbh., Bd. 84, pp. 17-60, 6 tables, 4 pls.

Discussion of dogs from the Danish Stone Age and description of dog skulls from the Svärdborg Moor (Ancylus period). Those skulls, remains of the most ancient domestic animal in Denmark, are regarded as a "palustris-svärdborgensis" form distinct from the larger and stouter *Canis palustris ladogensis*. A dog skeleton from the following (pre-Roman) period is described and identified with *Canis familiaris inostranzewi*, the occurrence of which in the Danish Campignien is discussed briefly.

- 1933a. Danmarks Pattedyr i Fortiden i Sammenligning med recente Former. (Danish mammals of old times in comparison with recent forms.) Festskr. i Anledning Hundreårsdagen dansk naturhist. Foren., pp. 357-641, pls. xii-xxiv, 21 figs. (cf. Degerbøl, M., 1933b).

- 1933b. Danmarks Pattedyr i Fortiden. (Danish mammals of old times.) 284 pp., 21 figs., 24 pls., 50 tables in text, 13 tables appended. C. A. Reizels Forlag (København).

A detailed survey of the Danish mammal fauna from the last interglacial period up to the Neolithic, based primarily upon the subfossil material collected by the Zoological Museum of the University of Copenhagen.

The book deals almost exclusively with wild forms, but a special part (pp. 231-237) is devoted to the domestic dog, the most ancient and up to early Neolithic

the only domesticated animal. Specimens found in Zealand settlements (Lundby Bog) are closely related to *Canis familiaris inostranzewi*. But beside this larger form the sites at Svärdborg (cf. Degerbøl, 1927) and Mullerup (also early Neolithic) yielded a smaller dog related to the *palustris* type, which had been kept in Denmark thousands of years before *C. familiaris palustris* appeared at Lake Ladoga. The new type is named *C. familiaris palustris svarborgensis*. The wolf is seen as ancestor for the large breeds of dogs, the jackal as probable progenitor for the small breeds.

1939. Dyreknoqler. (Animal bones.) In T. Mathiassen, Bundsø. En yngre Stenalder's Boplads paa Als; Aarbøger, 1939 (København), pp. 85-198, 3 pls., 36 figs., 25 tables.

A detailed description and discussion of the faunal remains from a prehistoric dwelling place, Bundsø on Jylland (Denmark).

Bones of the wild urus and domestic cattle were found. Among the latter, *primigenius* and *brachyceros* (= *longifrons*) types are distinguished and their osteological relationship is worked out in detail; *trochoceros* and *frontosus* forms are regarded as variations of the *primigenius* type. Pig and sheep belonged to the turbarry type (*Sus scrofa palustris* and *Ovis aries palustris*), and the few goat remains are identified as *Capra hircus*. The dogs at Bundsø showed closest resemblance to *Canis familiaris palustris ladogensis*.

#### Dobzhansky, Theodosius

1955. Evolution, Genetics, and Man. xi+398 pp. John Wiley & Sons, Inc. (New York).

In chap. 9 (pp. 191-221) a domestic form is tentatively defined as one that regularly reproduces in captivity and whose populations are controlled by man. The horse is discussed as an example. The European forest horse, the tarpan of the steppes, and the eastern Przewalski horse are regarded as no more than sub-specifically distinct, and all three populations have contributed to the gene-pool of the domestic horse.

A table (p. 193) of domestic mammals is presented, with the place and time of their domestication, as known. The reindeer is not included.—C.A.R.

#### Dottrens, E.

1946. La faune néolithique de la couche profonde de Saint-Aubin. I. Étude préliminaire: les phalanges osseuses de *Bos taurus domesticus*. Rev. suisse Zool., Tom. 53, no. 4, pp. 739-774.

Preliminary report of the cattle remains from Saint-Aubin (cf. Revilliod and Dottrens, 1947) and a detailed study of the phalanges from ten individuals.

#### Dürst, J. Ulrich

1900. Die Rinder von Babylon, Assyrien und Ägypten—und ihr Zusammenhang mit den Rindern der Alten Welt. 94 pp., 8 pls. Georg Reimer (Berlin).

Animal representations in ancient Egypt and Mesopotamia and osteological material from recent African and Asiatic cattle are studied and compared in order to trace the history and nature of the domestic cattle kept by Assyrians, Babylonians and Egyptians. The author suggests that the domesticated longhorned

racas as well as the *brachyceros* breeds from the Near East, from North and East Africa, and from the Swiss lake dwellings originated in India, probably from *Bos namadicus* Falconer.

1904. Über ein neues prähistorisches Hausschaf und dessen Herkunft. Vjschr. naturf. Ges. Zürich, Jhg. 49, pp. 17-31, 2 pls. with 6 figs.

Description of the remains of a new type of domestic sheep from a Swiss lake dwelling, but found in other European Neolithic sites as well. The stouter bones and heavier horns clearly distinguish this type from the turbary sheep (*Ovis aries palustris*) and it is named by the author *Ovis aries studeri*; since it seems to appear at the threshold of the Copper Age it is referred to as "copper sheep."

The copper sheep is seen as an offspring from a cross of the turbary sheep with the wild mouflon.

1908. Animal remains from the excavations at Anau, and the horse of Anau in its relation to the races of domestic horses. Carnegie Inst. Washington, publ. 73, vol. II, part 6, pp. 339-442, pls. 71-91.

Extensive and detailed treatment of the osteological material from the prehistoric site at Anau in southwestern Turkestan. Domestic species identified and described were dog, pig, cattle, sheep, goat, camel and horse. The dog of Anau is of the type *Canis familiaris matris optima*, which resembles the dingo as well as the fossil *Canis poutiatini* (cf. Studer, 1906) and is derived from one of them. Remains of pig, very common in later strata, are close to *Sus vittatus* and regarded as the oldest trace of the turbary pig. The bovid of the lower layers from Anau is identified with wild *Bos namadicus*, but during later periods a domesticated long-horned type of cattle originated from this wild form. Among the sheep bones (about 20 per cent in all levels), the author distinguishes the wild *Ovis vignei* arkal and a domestic form, *O. aries palustris*, which is considered a direct descendant of the former. Domestic goat (*Capra hircus*) and camel yielded few fragments and only in the uppermost layers; it is suggested that both were imported from the Iranian plateau.

The numerous equid remains from Anau are designated as a desert type of horse—the oldest domestic breed of the Oriental group and named *Equus caballus pumpellii*. The horse of Anau, its genealogy and its connection with the other domestic horses are discussed in a special chapter (pp. 401-442). Three basic types for the domestic horse stock are suggested, all derived from *E. c. fossilis* (a recent form of which is found in the Przewalski horse): (a) a steppe type (*E. c. robustus*), which gave rise to the Occidental horses; (b) a forest type (*E. c. neh-ringi*), the ancestor of the Celtic pony; and (c) a desert type, the horse of Anau (cf. above).

1945. Zur Frage der Herkunft des Haushundes. Anthropos, Tom. 37-40 (1942-45), Analecta et Additamenta, pp. 318-319.

Serological tests showed that the jackal and the wolf have the same affinity to the domestic dog; both are considered ancestors. The Australian *Canis dingo* is seen as a wild, never domesticated animal, though a related form gave rise to the pariah type, found at a domestic stage in the Anau culture.



**Dürst, J. U., and Gaillard, C.**

1902. Studien über die Geschichte des ägyptischen Hausschafes. Rec. Trav. Rel. Phil. et Arch. Egypt. et Assy., Paris, Tom. 24, pp. 44-76, 10 figs.

A zoological-archaeological study of the "goat-horned sheep," which occurred in prehistoric Egypt. It was the original prototype for the famous "Ram of Mendes," but was replaced later, after its extinction, by a goat (probably *Hircus mambricus*). The study shows the similarity of the African wild *Ovis longipes* and the Egyptian "goat-horned sheep" named *O. l. palaeoaegypticus*, which is taken to be the oldest domestic form of the long-legged and horizontally screw-horned breeds (as represented by the recent Walachian sheep).

**Dyson, Robert H.**

1953. Archaeology and the domestication of animals. Amer. Anthrop., vol. 55, no. 5, part 1, pp. 661-671.

A brief summary of early archaeological evidence concerning the domestication of cattle, pig, goat and sheep, and a compilation of references to studies on their origin. It is concluded that a Neolithic economy, based in part on those four domestic animals, was first developed in the Near East, some time during or prior to the fifth millennium B.C.

A comprehensive bibliography is appended.

**Epstein, H.**

1953. Descent and origin of the Afrikaner cattle. J. Hered., vol. XXIV, no. 12, pp. 449-462, frontispiece, 5 figs.

The South African red Afrikaner cattle evolved from indigenous breeds by severe and careful selection. The nucleus was formed by the Hottentot cattle, which did not originate from a cross of Hamitic longhorn (*primigenius* type) with zebu, like most of the other African breeds (Zulu, Bechuana, Watusi and Damara cattle), but represents—according to craniological and other skeleton features—a pure zebu breed (derived from *Bos namadicus*), which is believed to have reached Africa via Bab-el-Mandeb and Ethiopia during the second millennium B.C. The author holds that the original characteristics of the zebu race are preserved in a purer form in the Afrikaner cattle than in the zebu of Asia, which have been exposed to the influence of shorthorned (*brachyceros*) breeds.

**Erkes, Eduard**

1940. Das Pferd im alten China. T'oung-Pao Archives, vol. 36, liv. 1, pp. 26-63. E. J. Brill (Leiden).

Archaeological evidences are brought together to prove that the wild horse was known to man in China in early Paleolithic times and was tamed in China by the Neolithic. Also, on the basis of ethnological material, it is assumed that horse-breeding evolved in China from the taming of the indigenous wild horse. The ass, on the other hand, was introduced into China, together with mule and camel, by the Huns at the end of the third century B.C.

**Etheridge, R.**

1916. The warrigal, or "dingo" introduced or indigenous? Mem. geol. Surv. N. S. W., Ethn., no. 2, pp. 43-54, pls. x-xii.

Records dealing with discoveries of post-Pliocene dog remains from the Wellington and other bone caves in New South Wales are presented, and contradictory views concerning the status of the dingo—whether indigenous in Australia previous to the advent of man or introduced by the latter—are quoted. The “Wellington Caves Teeth” are compared with teeth of a modern domestic dog, and with those of the Tasmanian wolf and the Tasmanian devil. The author concludes that a dog did exist in New South Wales in Post-Tertiary times, and that some of the teeth are those of a dog.

**Ewart, J. Cossar**

**1904.** The multiple origin of horses and ponies. Trans. Highl. agric. Soc. Scotland, vol. XVI, pp. 230–268, 24 figs.

An outline of the probable polyphyletic origin of domestic horses from several distinct species which persisted from pre-glacial times almost unaltered to recent days. Three distinct types of living horses are distinguished and described: the wild *Equus przewalskii*, the Celtic pony, and the Norse horse, the two latter called *E. caballus celticus* and *E. c. typicus*, respectively. In addition to these, several African and Oriental varieties are suggested as possible ancestors of modern breeds.

**1907a.** On skulls of horses from the Roman Fort at Newstead near Melrose, with observations on the origin of the domestic horse. Trans. roy. Soc. Edinb., vol. 45, part 3, pp. 555–587, 1 table, 17 figs., 3 pls.

Among the horse remains from the Roman Fort at Newstead, Scotland, dated to the first and second centuries A.D., three distinct kinds of skulls are distinguished. A comparative study of the skulls of living varieties with the skulls of Newstead proved that (a) long, bent skulls from Newstead are almost identical with the skull of *Equus przewalskii*; (b) very narrow skulls agree with those of typical Celtic ponies (and also some Arabian horses); (c) broad-faced skulls resemble closely the skulls of horses of the “forest type,” frequently met with in northern Europe and in northern and western Africa.

The new evidence confirms the previous view of the author on the origin of the tamed horse (cf. Ewart, 1904), and three groups of domestic horses are recognized: (a) The “steppe variety,” which has either sprung from or is closely allied to Przewalski’s horse; this group comprises the Oriental horses, including the tarpan, which is taken to be a feral horse. (b) The “plateau variety,” which includes two races, the “Celtic,” adapted for a subarctic habitat and widely distributed in prehistoric Europe, and the “Libyan” (identical with *Equus caballus libycus*; cf. Ridgeway, 1905), adapted for a subtropical region. (c) The “forest variety” (identical with the Norse horse; cf. Ewart, 1904), derived from the wild *Equus robustus*, found in alluvial deposits in France.

The Arabian horses are considered partly of the steppe and partly of the forest type. Most of the recent breeds, which are reviewed briefly, carry blood of several ancestors.

**1907b.** The derivation of the modern horse. Quart. Rev., vol. 206, no. 411.

After a short review of the theories on the origins of the domestic horse, evidence is produced to show that the three types of recent horses, forest, plateau,

and steppe types (cf. Ewart, 1907a), were already present in prehistoric times and go back to three distinct Paleolithic ancestors.

1909. The possible ancestors of the horses living under domestication. Science, vol. 30, no. 763, pp. 219-223.

In a brief discussion of the probable ancestors of the domestic races of horses the author claims a polyphyletic origin from several (at least five) Pleistocene forms. To the three forms previously established (cf. Ewart, 1907a, b), a "Siwalik" type is added, to include horses allied to *Equus sivalensis* of the Pliocene deposits found in the Siwalik Hills of India. Slender-limbed forms are derived either from *E. gracilis libycus* (syn., *E. caballus libycus*; cf. Ridgeway, 1905) or from a cross of the latter with *E. robustus*.

1912. The principles of breeding and the origin of domesticated breeds of animals. 27th Ann. Rep., Bur. Anim. Industry, 1910, Washington, pp. 125-186, 7 figs.

In the second part of this article the author gives a detailed description of the characteristics of ancient domestic breeds and deals at length with the origin of sheep, cattle and domestic horses. It is suggested that some of the long-tailed European breeds of sheep descended from the urial or from mouflons, but the spiral-horned varieties were perhaps derived from the argali type (cf. Ewart, 1913, 1914). The Celtic shorthorn (*Bos longifrons*) is considered to be more intimately related to longhorned zebus than to *Bos primigenius*; other British races, however (Galloway, Cadrow cattle), are regarded as of the *primigenius* type; Aberdeen-Angus cattle are derived from an ancient Oriental race. Gaur and banteng are considered as descendants of *Bos acutifrons* of the Punjab.

A full description is given of the four types of domesticated horses distinguished by the author: the forest, plateau, steppe and Siwalik types (cf. Ewart, 1907a, b, 1909). The latter is related to the Pliocene *Equus sivalensis*, or to its more specialized relative, *E. stenonis* of Europe.

1913. Domestic sheep and their wild ancestors. I. Sheep of the mouflon and the urial types. Trans. Highl. agric. Soc. Scotland, ser. V, vol. XXV, pp. 160-191, figs. 30-67.

After referring to characteristics and distribution of the present types of wild sheep, an attempt is made to indicate the part that the varieties of the mouflon (*Ovis orientalis* and *O. musimon*) and the urial (*O. vignei*) have played in forming modern breeds. Special attention is directed to the Shetland sheep of the peat or turbary type (*O. aries palustris*), which retains the main characteristics of the urial ancestor, and to the semi-wild sheep of the islands of Soay, some of which resemble the urial while others appear to be closely related to the mouflon or to its early domesticated ancestor, the so-called "copper sheep" (cf. Dürst, 1904). It is suggested that a tame mouflon and the urial, the latter in the form of the domestic turbary sheep, met and blended early in the Bronze Age.

1914. Domestic sheep and their wild ancestors. II. Wild sheep of the argali type. Trans. Highl. agric. Soc. Scotland, ser. V, vol. XXVI, pp. 74-101, 8 pls. with 26 figs.

By examining sheep remains from alluvial deposits of the Thames Valley and by studying skeletons of wild and domestic forms, primitive and improved, evidences are obtained that besides the urial and the mouflon (cf. Ewart, 1913), the wild argali (*Ovis ammon*) has also contributed to domestic breeds of sheep. Argali characters are found in subfossil sheep material from the Thames alluvium and in the fat-rumped breeds of Bukhara and Turkestan.

**Fairservis, Walter A., Jr.**

1955. Wool through the ages: A research survey on the history of wool. 23 pp.  
The Wool Bureau, Inc. (New York).

A popular summary of the history of wool and the wool-industry, from the prehistoric period into the first millennium A.D. Included is a short account of the archeologic evidence, as known, for the origin of domestic sheep and for their early history (cf. Hilzheimer, 1936; Braidwood, 1952; Dyson, 1953).—C.A.R.

**Feige, Ernst**

1927. Das Haustierproblem. Naturwissenschaften, Jhg. XV, Heft 42, pp. 841-847.

A brief summary of information on the early dispersal of domestic mammals is followed by a discussion of zoogeographic aspects. Particular emphasis is given to the significance of pigmentation in relation to the original environment of domesticated animals.

1928. Die Haustierzonen der alten Welt. Petermanns Mitt., Nr. 198, 121 pp., 1 map.

The wild ancestors of domestic ungulates and their geographic distribution are investigated in order to localize the areas of domestication. "Natural areas" of domestication are marked for the various groups in Africa, Asia and Europe and contrasted to "economic areas" of domestication in these continents. The dependence of pigments upon geographic and ecological factors is stressed (pp. 107-117). The author holds that the morphological influence of human culture on domestic forms has usually been insignificant in comparison with the influence of the natural environment. A geographical map schematizes the "natural areas" of domestication.

**Flor, Fritz**

1930. Haustiere und Hirtenkulturen. Wiener Beitr. Kulturges. und Linguistik. Inst. Völkerkunde, Univ. Wien, pp. 1-238.

This historical survey covers the origins of the domestic dog, reindeer and horse. The philological aspects are emphasized, but zoological information is considered. The author finds the cradle of the domestic dog (chap. 3) in the Protoeskimoid culture in arctic Siberia and associates with the rearing of the dog the earliest breeding of reindeer (chap. 4) among the Protosamojeds. The keeping of reindeer is considered to be the most ancient pastoral culture and it eventually gave rise to the domestication of the horse (chap. 6), practiced first in Asia by the Proto-Altaian tribes.

**Forbes, R. J.**

1955. The coming of the camel. In *Studies in Ancient Technology*, vol. II, pp. 187–208. E. J. Brill (Leiden).

The camel and the dromedary are separate species, independently domesticated from different wild species. The camel was probably domesticated in central Asia in late Neolithic times, the dromedary in Arabia, perhaps somewhat earlier. Neither animal was adopted by peoples of historical cultures for several millenniums, although both species were known to the Akkadians; the Egyptians, from pre-dynastic times onward, had rare contacts with dromedary-owning Bedouins.

The Assyrians were the first historical people to use these animals, the camel from about 1100 B.C. onward, the dromedary from approximately 800 B.C. Trans-desert traffic by means of dromedary caravans came only with the Persian Empire. Although the dromedary existed wild in northern Africa in prehistoric times, there is no evidence that it was domesticated there, and its use west of the Nile spread slowly, even after its introduction into Egypt about 300 B.C.—C.A.R.

**Fraser, F. C., and King, J. E.**

1954. Faunal remains. In *Excavations at Star Carr: An Early Mesolithic Site at Seamer near Scarborough, Yorkshire*, by J. G. D. Clark, pp. 70–95. Cambridge, at the University Press.

The Star Carr horizon of the Maglemosian (Mesolithic) culture belongs to an earlier period (a late phase of the pre-Boreal, or Zone IV) of post-glacial time than did the classic Maglemosian sites of Denmark and the shores of the Baltic. A wide variety of animal remains was found, but none were domestic species, although an earlier report (*Proc. prehist. Soc.*, 1950, vol. 15, pp. 109–129) had suggested the presence of the domestic dog. However, all canid materials proved to belong to the wolf. The absence of a dog is particularly interesting in view of the  $C^{14}$  determination ( $9488 \pm 350$  years), which is so close to the suggested date of 9000 years ascribed to the dog found at Frankfort (cf. Baas, 1938).—C.A.R.

**Free, Joseph**

1944. Abraham's camels. *J. Near East. Stud.*, vol. III, pp. 187–197.

A collection of evidences (chiefly art representations) that point to the presence of camels in ancient Egypt in predynastic periods. Many items seem to offer evidence that the animals were domesticated.

**Friederichs, Heinz**

1933. Zur Kenntnis der frühgeschichtlichen Tierwelt Südwestasiens. *Alte Orient*, Bd. 32, Hefte 3, 4, pp. 1–44, 26 figs.

Animal representations from four sites in southwestern Asia—Mohenjo-Daro near the Indus, Tell Halaf in northern and Ur in southern Mesopotamia, and Maikop in northern Caucasia—are described, and problems of domestication in the fourth and third millenniums B.C. in this area are worked out. Earliest domestic animals of southwestern Asia, according to their representations, are *Bos primigenius*, spread over all the area and, in Mohenjo-Daro, accompanied by *B. namadicus*; sheep (*Ovis aries* in India, *O. vignei* in Mesopotamia and *O. orientalis* in Maikop); and goat. Those species are followed somewhat later by camels (at Tell Halaf), horses and asses, both the latter indicated by the occurrence of mules.

**Funkenstein, Daniel H.**

1955. The physiology of fear and anger. *Sci. Amer.*, vol. 192, no. 5, pp. 74-78, 80, 7 figs.

Domestic mammals, mammals depending upon flight for survival, and very social animals such as baboons produce a high proportion of adrenalin to nor-adrenalin, whereas aggressive animals such as the lion have a higher proportion of nor-adrenalin. The domestic cat produces about equal amounts of each. Adrenalin and nor-adrenalin are both hormones secreted by the medulla of the adrenal gland; nor-adrenalin is associated with emotional and physiological reactions accompanying rage, whereas adrenalin is associated with those of fear.—C.A.R.

**Fürer-Haimendorf, C. von**

1932. Zur Frage der Herkunft der Büffelhaltung auf den Philippinen. *Biol. gen.*, Bd. VIII, pp. 66-72.

The carabao, kept as an animal of the household and for cult purposes by the mountain tribes of the Philippines, cannot be derived from the only indigenous bovid (*Bos mindorensis*). Looking for the cradle of the domestic carabao and discussing the date of its introduction to the islands, the author concludes that Austro-Asiatic invaders brought the tamed animal from the Asian continent.

1955. Culture history and cultural development. *Yearb. Anthr.*, vol. 1, pp. 149-168.

Based on recent archaeological evidence (cf. Dyson, 1953), there has been a complete reversal of ethnological theory concerning origins of domestication. Former ideas of the antiquity and independence of horse and reindeer breeding by nomads of central and northern Eurasia must be abandoned in favor of the concept of primary domestication of goats, sheep, cattle, and pigs by the early farmers (or their immediate ancestors) of southwestern Asia.—C.A.R.

**Gaillard, Claude**

1912. Les tâtonnements des Égyptiens à la recherche des animaux à domestiquer. *Rev. Ethnogr. Sociol.*, Paris, Tom. III, pp. 329-348, 19 figs.

A survey of the domestic and semi-domestic fauna of Egypt at the time of the Old Kingdom as reflected by animal figurines, sculptures and paintings from the ancient monuments. Besides the domestication of sheep, mamber-goat and longhorned cattle, which are dealt with briefly, the author finds evidence in the animal representations for a taming of the Nubian wild goat (*Ibex nubiana*), the dorcas gazelle, the Beatrix antelope (*Oryx*), and the addax (*Addax nasomaculata*) during several dynasties.

1934. Contribution à l'étude de la faune préhistorique de l'Égypte. *Arch. Mus. Hist. nat. Lyon*, Tom. XIV, Mem. III, 126 pp., 12 pls., 55 figs.

A detailed study of the fossils from the Paleolithic site at Kom Ombo (north of Aswan) and the faunal remains from a Neolithic kitchen-midden deposit at Toukh (Upper Egypt). Besides remains of wild horse, ass, and buffalo among the faunal assemblage from Kom Ombo, those of *Bos primigenius* and *B. brachyceros* were identified; both species were considered to belong to wild and indigenous

racés. Most of the species represented in Toukh are regarded as probably domesticated; they included cattle, pig, dog, buffalo, goat and sheep. Cattle remains were most frequent and belonged to the *brachyceros* type, the pig was of the turbary race (*Sus scrofa* aff. *palustris*), sheep were identified as *Ovis longipes palaeoaegypticus* (cf. Dürst and Gaillard, 1902), and among the goat remains two species were distinguished—the mamber goat (*Hircus mambricus*) and *H. reversus*.

#### Galbreath, Edwin C.

1947. Additions to the flora of the late Pleistocene deposits at Ashmore, Illinois. Trans. Kans. Acad. Sci., vol. 50, no. 1, pp. 60–61.

The Indian dog is listed as being present with the following extinct mammals: giant beaver, ground sloth, American mastodon, and an undetermined ovibovoid. The coyote was separately identified.—C.A.R.

#### Gandert, Otto F.

1930. Forschungen zur Geschichte des Haushundes. Mannus Bib., Nr. 46, 93 pp., 34 figs. C. Kabitzsch (Leipzig).

An archaeological-chronological analysis of the Neolithic comb-ceramic culture of northeastern Europe (third millennium B.C.) is followed by an investigation of its domestic stock. The finds from the Russian site at Bologoe (Gouv. Novgorod) are described and treated in detail. The only domestic animal of this culture was the dog, used for hunting. It also provided food and fur. The dog remains belong to two forms: *Canis familiaris palustris* and the larger *C. f. inostranzewi*. The author opposes the view that the larger gave rise to the smaller turbary form and suggests that the reverse may have been true.

#### Gehl, Otto

1930. Postglaziale Haushunde aus Schleswig-Holstein—nebst einem Beitrag zur caniden Osteometrie. Z. Tierz. ZüchtBiol., Bd. VIII, pp. 225–288, 5 figs., 12 tables, 4 pls.

Remains of Neolithic canids from northern Germany, especially from sites in Schleswig-Holstein, are described and discussed. In the early Neolithic sites (Kiel, Klausdorf) two forms appeared: *Canis palustris ladogensis* and *C. intermedius*. In the high Neolithic (Ellebeck, Husum) *C. palustris* appeared as the result of a more intensive domestication. A dog (the body preserved in peat) from the early Iron Age showed affinities to *C. pallipes* and a marked influence of the north European wolf.

The first part of the paper contains a discussion of the customary craniometric methods for canids, with a guide to new ones.

#### Gejvali, Nils G.

- 1937–38. The fauna of the different settlements of Troy. Kungl. Humanist. Vetenskaps. Lund, Arsberättelse 1937–38, pp. 50–57.

Preliminary report on the animal bones collected at Troy during the excavations from 1932 onward. From Troy I (early third millennium B.C.) the genera *Bos*, *Sus*, *Ovis*, *Capra* and *Canis* are recorded. In Troy II an increase in cattle breeding becomes evident. Equid remains, first recorded from Troy IV, belong probably to the domestic ass, while the horse appears only in Troy VI.

- 1938-39. The fauna of the successive settlements of Troy. Kungl. Humanist. Vetenskaps. Lund, Arsberättelse 1938-39, pp. 1-7.

The second preliminary report on the faunal remains from Troy (cf. Gejvali, 1937-38) confirms the occurrence of the horse in early Troy VI. The domestic horse seemed to become abundant soon after its first appearance. From Troy IX a skull of a domestic(?) cat is recorded.

1938. Über ein Pferd aus der schwedischen Wikingerzeit. Ark. Zool., Bd. 30A, Nr. 17, pp. 1-16, 2 figs.

A detailed investigation of a skeleton belonging to a domestic horse of the Viking period, found in Uppland (Sweden). The measurements and indices point to a close affinity with the Arabian horse or the tarpan.

### George, Naguib

1950. The camel in ancient Egypt. Brit. vet. J., vol. 106, no. 2, pp. 76-81, 5 figs.

Cervical vertebrae and ribs of camel were found in excavations at Helwan near Cairo, Egypt. They are regarded as evidence that the camel was present in Egypt during predynastic periods.

### Gerbes, Eduard

1951. Über die Rinderreste aus den keltisch-römischen Niederlassungen der Engelhalbinsel bei Bern. Rev. suisse Zool., Tom. 58, no. 1, pp. 1-23.

On the basis of a study of the cattle remains from a Celtic site (400-58 B.C.) on the Engel Peninsula near Bern the conclusion is reached that the stout bovid of this site also belongs to the *brachycephalus* race, as cattle of *primigenius* type are lacking.

### Gromova, V. J.

1927. [Material on the knowledge of the fauna of the Tripolje culture.] Yezhegodik Zoologicheskogo Muzeia, Akad. Nauk SSSR., pp. 83-121 (in Russian).

Detailed description and summary of the animal remains collected from five sites in the central sphere of the Tripolje culture (near Kiev, Ukraine). The great majority of the bones (86 per cent) belonged to domestic species, among which cattle were represented most frequently (37 per cent), followed by pig (23 per cent) and sheep or goat (15 per cent). Other animals recognized were domestic horse (6 per cent) and dog. The preponderance of cattle over pig, sheep and goat and the insignificance of horse-keeping are seen as main characteristics for the domestic fauna of this Tripolje (B) culture.

Among the wild fauna, *Bos primigenius*, apparently hunted in Tripolje A, was identified, and most of the domestic oxen from Tripolje are taken to be the direct result of domestication of the wild urus, though some cattle of *brachyceros* type were recorded as well.

### Haag, Wm. G.

1948. An osteometric analysis of some aboriginal dogs. Univ. Ky. Rep. Anthr., vol. 7, no. 3, pp. 105-264, 16 figs.



The study is based on large collections of skeletons of domestic dogs from North American archaeological sites. These dogs resemble Old World domestic dogs, not native wild North American canids. North American aboriginal dogs are classified into 8 morphologic breeds, distinguishable primarily on a size basis (the husky is the largest). For any area, small size of dog is correlated with older archaeological horizon and also with poverty of human cultural remains. The necessity is stressed of making statistical analyses of large series before attempting conclusions. The study lends support to the idea that the dog was derived from a small wolf-like form not approximated by any of the living boreal wolves, and that domestication occurred not long before 6000 B.C. It is thought that the ancestors of the dog, as scavengers, adopted man long before man adopted and domesticated the dog. Probably the domestic dog was introduced to North America about 500 B.C. by a people with a late Mesolithic culture.—C.A.R.

### Hahn, Eduard

1909. *Die Entstehung der Pflugkultur*. viii + 192 pp. Carl Winter (Heidelberg).

In his ethnological study the author sees in religious rites and cult associations the origin of domestication of oxen, and, following it, the origin of plough-culture in general. Herd animals (and eventually pastoralism) as well as horse-breeding and camel-breeding came out of this early seed-and-plough agriculture, practiced first in Mesopotamia.

### Haltenorth, Theodor

1953. *Die Wildkatzen der Alten Welt, eine Übersicht über die Untergattung Felis*. 166 pp., 10 tables, 117 figs. Akademische Verlagsgesellschaft. Geest & Portig (Leipzig).

A systematic treatment, based on morphology, of the Old World wild cats. In the last chapter the origin of the domestic cat is dealt with. The only truly domesticated cat is *Felis silvestris libyca* Forster of Egypt, which appears in a stage of domestication from the beginning of the Middle Empire (2000 B.C.). When it was introduced into Europe, it may have mated with European wild cats occasionally.

### Hancar, Franz

1951. *Probleme und Ergebnisse der neuen russischen Urgeschichtsforschung*. 33. Ber. Römisch-Germanischen Komm. 1943-50, Deutsches Archaeol. Inst., Berlin, pp. 25-60, 3 pls., 10 figs.

A comprehensive survey of the Russian literature concerned with the latest archaeological excavations of the Tripolje settlements, the Neolithic complex of the Ukrainian steppe. Special attention is directed toward the change in the composition of the domestic stock from the "classical" stage (Tripolje B), in which tillage appeared to have been the principal economic base, to the final stage (Tripolje C, ca. 2100-1700 B.C.; demonstrated by the sites at Horodsk and Usatovo), which is characterized by a marked increase in the number of domestic animals (identified at Usatovo): sheep (48 per cent), cattle (28 per cent), horse (13 per cent), and goat, pig and dog (only a few fragments). The great increase in the frequency of sheep and horse (associated with a decrease of pig) becomes evident by a comparison with the faunal composition from Tripolje B (cf. Gromova, 1927).

The author traces in detail the transition from a culture of settled farmers and cattle-breeders to a nomadic pastoralism, based upon the rearing of huge herds and change of pastures.

1952. Stand und historische Bedeutung der Pferdezucht Mittelasiens im ersten Jahrtausend v. Chr. Wiener Beitr. Kulturges. und Linguistik, Jhg. IX, pp. 465-483.

A compilation of ethnological, historical and zoological data forms the background from which a picture of horse-breeding in Bactria and adjacent inner Asia is drawn. Such breeding reached a high level in the early first millennium B.C. Inner Asia is seen as the radiation center for all the mounted invaders that haunted Europe.

### Hatt, Gudmund

1919. Notes on reindeer nomadism. Mem. Amer. anthrop. Ass., vol. VI, pp. 75-133.

A collection of references on the biology of the reindeer and on the history of reindeer nomadism, based largely on Scandinavian literature. The nature of reindeer nomadism is seen as responsible for the slight degree of domestication in the tamed reindeer (when compared to other domestic animals), and therefore does not indicate the recent origin of their domestication; however, it is not considered to be a very ancient achievement.

### Havesson, D.

1933. On the domestic pigs of Tschuwasia (Russ.). Transcript of the conference on the origin of domesticated animals, held at the Laboratory of Genetics, Acad. Sci. USSR, Leningrad, 1932, pp. 313-373.

A primitive, small breed of pig from Tschuwasia (Chuvash, former Gouv. Kazan) is investigated (46 skulls) and compared with wild and domestic pigs (fossil and recent) of other races. The Tschuwasian pig exhibits a close affinity to the Neolithic turbary pig (*Sus scrofa palustris*). It is distinct from the surrounding domestic breeds but resembles wild forms. Presumably the breed was brought in by the ancestors of the Tschuwasians (of Turkish origin) and probably it was originally domesticated in the area of Kuen-Lun or Tien-Shan.

### Hediger, H.

1938. Tierpsychologie und Haustierrforschung. Z. Tierpsychol., Bd. II, pp. 29-46, 302-313, 2 figs.

A treatment of the psychical background of the origin of domestication. The author shows the transition from the wild via the tamed to the domestic stage and suggests the presence of a "psychical preadaptation" for the status of domestication present in certain species and usually associated with a biological inferiority of those forms in their natural biocoenosis.

### Hehn, Victor

1902. Kulturpflanzen und Haustiere in ihrem Übergang aus Asien nach Griechenland und Italien sowie in das übrige Europa. 7th ed., viii+651 pp., published and annotated by O. Schrader. Gebrüder Bornträger (Berlin).

The work (first edition, 1870) is an attempt to investigate the history and dispersal of civilization in general and of cultivated plants and domestic animals in particular on the basis of a study of comparative linguistics. The author comes to the conclusion that the domestication of numerous animals was started in the Orient, and that from there the idea of domestication together with the animals themselves spread to Greece, Italy, and later to the remaining European countries. Among the domestic mammals the story of the horse is examined at greatest length (pp. 19-54). Its cradle is found among Iranian tribes, whence it was received by Indo-Europeans only after they became established in their historical places of residence. Rabbit, cat and cattle are dealt with more briefly.

#### Heinrich, E.

1936. Kleinfunde aus den archaischen Tempelschichten in Uruk. Ausgrabungen der Deutschen Forschungsgemeinschaft in Uruk-Warka, Bd. I. Leipzig.

The animal images from Uruk-Warka (Mesopotamia) are described in detail (pp. 17-28) and discussed from a zoological point of view by M. Hilzheimer (pp. 48-54). Major emphasis is given to the domestic sheep in comparison to the wild form. Goat and cattle are mentioned briefly.

#### Hermanns, Matthias

1949. Die Nomaden von Tibet. xvi+325 pp., 4 maps, 56 figs. Herold (Wien).

This book, based to a great extent upon original exploration, deals extensively with the sources and developments of the herdsmen-cultures in Amdo (=Tsing Hai, northwestern Tibet) and with the origin of cattle-breeding in general. The cradle of stock-farming is sought in western Asia (probably western Turkestan). The earliest breeds are sheep and goat, followed soon afterward by domestic oxen (in the ancient herdsmen-culture of Amdo only sheep and yak were known as breeds). Somewhat later, ass and onager became domesticated; much later, camel, horse and reindeer.

Appended are tables on the origin of the most important domestic breeds, chronological lists, maps and a comprehensive bibliography.

1952. Were animals first domesticated and bred in India? J. Bombay Br., R. Asiat. Soc., vol. XXVII, pp. 134-173.

A survey of various domestic animals of India and their related wild forms: gayal, banteng, water buffalo, yak, zebu, sheep, goat, camel, pig and kiang (*Equus onager indicus*). The gayal (*Bibos frontalis*) is considered an offspring of the wild gaur male and the domestic cow. For the Indian humped cattle (zebu) a specific wild, probably indigenous ancestor (not *Bos namadicus*) is suggested. Cattle and sheep constituted the oldest domestic stock of prehistoric Asia, followed later by horse and reindeer.

The northwest Indian highlands together with the Iranian and Tibetan plateau are seen as the center where cattle-breeding originated, perhaps as early as the Mesolithic (9000 B.C.).

#### Hermes, Gertrud

1935-36. Das gezähmte Pferd im neolithischen und frühbronzezeitlichen Europa. Anthropos, Tom. 31, pp. 115-129.

A compilation of data on horse remains, horse representations and finds of artifacts associated with horse-breeding, from prehistoric Europe. Although of a doubtful character, the Neolithic "evidences" and those of the Bronze Age lead to the assumption that the practice of horse-breeding was introduced into Europe by that time.

1936. Das gezähmte Pferd im alten Orient. *Anthropos*, Tom. 31, pp. 364-394, 2 figs.

Archaeological records of equids from the ancient Near East back to the fourth millennium B.C. are collected, and their historical background is traced. The development of the harness, especially the bridle, from the primitive halter to the bridoon-bit, is outlined in detail.

### Herre, Wolf

1939. Beiträge zur Kenntnis der Wildpferde. *Z. Tierz. ZüchtBiol.*, Bd. XLIV, pp. 342-363, 11 figs.

A consideration of methods for solving problems of the origin of domestic animals in general, and a study of some aspects of the distribution of wild horses and their relation to domestic species in particular. The author discusses the status of the Russian tarpan and considers it as a form of the *przewalskii* horse (now restricted to Mongolia).

1949. Zur Abstammung und Entwicklung der Haustiere. I. Über das bisher älteste primigene Hausrind Europas. *Verhandl. Deutschen Zool. in Kiel*, August, 1948, pp. 312-324.

A description of the most ancient cattle of *primigenius* type from northern Europe, found in Schleswig-Holstein (Moor of Satrupholm) and dated to the early Neolithic (3000-1800 B.C.). The find seems to indicate domestication in northern Europe, and though the primigene character is dominant the skull shows also a slight resemblance to the *brachyceros* type. The author assumes that at the same time and in different localities *primigenius* and *brachyceros* groups were developed from the domesticated urus. Animals with mixed characters from the Neolithic are seen as the primitive material and not as results of later crosses.

1951. Kritische Bemerkungen zum Gigantenproblem der Summoprimaten auf Grund vergleichender Domestikationsstudien. *Anat. Anz.*, Bd. 98, pp. 49-65, 12 figs.

A comparative study of lower jaws and teeth in wild and domestic animals. The author points to the great variability in size and form of teeth and in size and powerfulness of lower jaw bones, which characters cannot be associated *per se* with general size and skull-form of domesticated races or their wild ancestors. Effects of domestication are considered to be due to selection rather than to physiological factors.

1952. Studien über die wilden und domestizierten Typlopoden Südamerikas. *Zool. Gart.*, Bd. 19, Hefte 2-4, pp. 20-98, 16 figs.

More than a hundred skulls of the wild and domesticated typlo pods of South America—guanaco and vicugna on the one hand, llama and alpaca on the other—

are examined, in order to find the phylogenetic relationship of both of the ancient domestic breeds. On the base of the craniological differences, the wild vicugna is excluded as possible ancestor, and both the llama and the alpaca are traced back to the wild guanaco, *Llama guanicoë*.

1955. Domestikation und Stammesgeschichte. In Die Evolution der Organismen: Ergebnisse und Probleme der Abstammungslehre. Herausgegeben von Gerhard Heberer. 2. Erweiterte Auflage. 4. Lieferung. pp. 801-856; 24 figs. Gustav Fischer (Stuttgart).

This is an important summary of the literature on domestication, as evidenced by the bibliography of 11 pages in small print. The 44 pages of text are in themselves an abstract of this literature. The subjects covered range far beyond the origins of domesticated mammals and birds to include much material on the effects of domestication upon the different species, parallel evolutionary trends under the influence of artificial selection, heredity in domestic animals, and other subjects. —C.A.R.

### Hescheler, Karl

1920. Beiträge zur Kenntnis der Pfahlbautenfauna des Neolithikums.—Die Fauna der Pfahlbauten im Wauwylersee. Vjschr. naturf. Ges. Zürich, Jhg. 65, pp. 248-322.

The first part (pp. 248-281) gives a review of earlier investigations of the Swiss lake-dwelling fauna; the second part contains a description of remains from wild and domestic animals found in the palisade dwellings (Neolithic) of Lake Wauwyl in Switzerland. Goat and sheep—the former appearing in the lower strata more and in the upper ones much less frequently than the latter—are both of the turbary type; the “copper sheep” (*Ovis aries stuederi*) is absent. Remains of the domestic turbary pig (*Sus palustris*) are very distinct from those of the wild boar (*Sus scrofa*) found in the same levels, so that a relationship is doubted. All the dog material belongs to *Canis palustris*, and cattle also are represented by the turbary form (*Bos taurus brachyceros*) only. The few fragments of equids are probably those of a wild horse.

### Hescheler, Karl, and Rüger, J.

1939. Die Wirbeltierreste aus dem neolithischen Pfahlbaudorf Egolzwil II (Wauwilersee) nach den Grabungen von 1932-34. Vjschr. naturf. Ges. Zürich, Jhg. 84, pp. 307-330.

Report on the excavations at a settlement of lake-dwellers (Egolzwil, on Lake Wauwyl, Canton Luzern). The remains of domestic animals (33.4 per cent of the total fossil material) belonged to dog, pig, sheep, goat and cattle.

1940. Die Wirbeltierreste aus den Pfahlbauten des Baldeggersees nach den Grabungen 1938 und 1939. Vjschr. naturf. Ges. Zürich, Jhg. 85, pp. 59-70.

A description of the faunal remains from Neolithic (Seematte) and Early Bronze Age (Baldegg) sites around Lake Baldegg in central Switzerland. Among the remains from Seematte those of cattle are the most frequent, followed by pig bones; there were fewer remains of sheep, goats and dogs. In Baldegg (Canton Luzern) bones of cattle are still dominant, followed closely by sheep and goat.

Pig remains are rare. Two new arrivals, which appeared from the Late Bronze Age on—the horse and a new, larger race of dogs—are described in detail (see also Hescheler and Rüger, 1942).

1942. Die Reste der Haustiere aus den neolithischen Pfahlbaudörfern—Egolzwil (Wauwilersee) und Seematte-Gelfingen (Baldeggersee), Kt. Luzern. Vjschr. naturf. Ges. Zürich, Jhg. 87, pp. 313–478, numerous tables in text, 5 tables appended.

A systematic study of the remains of domestic animals from two Neolithic sites Egolzwil (cf. Hescheler and Rüger, 1939) and Seematte (cf. Hescheler and Rüger, 1940). Five main forms—cattle, sheep, goat, pig and dogs—are described in detail. The remains of dogs (skulls of which are the best preserved, since the animal did not serve for food) constituted about 9.5 per cent of the material; all belong to the *palustris* group. The turbary pig—remains of which were found in addition to those of the European wild boar—were 28 per cent of the total remains and were outnumbered only by cattle, the latter identified as *Bos taurus brachyceros*. Osteological differences between the brachyceros oxen and the wild urus are worked out. Goats were all of the sable-horned *Capra hircus* type.

#### Hildebrand, Milton

1955. Skeletal differences between deer, sheep, and goats. Calif. Fish Game, vol. 41, pp. 327–346, 9 figs.

This paper, useful to the anatomist working with bones from archaeological sites, is concerned with the post-cranial skeletons of domestic sheep and goats, and a North American deer, *Odocoileus*. The applicability of the information on the latter to Old World deer remains to be tested. Domestic sheep are best set apart from domestic goats by characters of the metacarpal, scapula, pelvis, and ulna. The femur is the bone least distinguishable. Individual variations are striking, and the necessity of using statistical techniques on large series is stressed.—C.A.R.

#### Hilzheimer, Max

1908. Beitrag zur Kenntnis der nordafrikanischen Schakale—nebst Bemerkungen über deren Verhältnis zu den Haushunden insbesondere nordafrikanischer und altägyptischer Hunderassen. Zoologica (Stuttgart), vol. XX (1906–1908), Heft 53, pp. 1–111, 4 tables, 10 pls.

After a detailed morphological (esp. craniological) examination of North African races of jackals and a discussion of their classification, skulls of domestic dogs from sites of ancient Egypt are described, and conclusions are drawn as to the origin of the breeds. One of the jackals, *Canis lupaster*, is considered to be certainly the ancestor for certain Egyptian domestic dogs, two others probable progenitors for the other ancient breeds in Egypt.

In four tables craniological data of wolves, jackals and domestic dogs are compared.

- 1909–10. Die Haustiere in Abstammung und Entwicklung. Naturwissenschaftlicher Wegweiser, ser. A, Bd. 11, 126 pp., 1 pl., 56 figs. Strecker & Schröder (Stuttgart).

A popular guide to domestic mammals and birds, their origin and history. After an introductory chapter, presenting general trends in the evolution of domestication, the book describes each of the domestic stocks and its history. Dog and horse are treated at considerable length; cat, rabbit, ass, pig, camel, llama, reindeer, cattle, sheep and goat are covered briefly. The text is well illustrated, from zoological and archaeological sources.

1913. Überblick über die Geschichte der Haustierforschung, besonders der letzten 30 Jahre. Zool. Ann., Bd. V, pp. 233-254. Würzburg.

A critical survey of the literature on the origin and history of the domestic cat, camel, llama and reindeer. A bibliographical list of the literature on the origin of the first two animals is added.

1926. Natürliche Rassengeschichte der Haussäugetiere. 235 pp., 124 figs. Walter de Gruyter & Co. (Berlin & Leipzig).

Problems, evidences—based largely upon investigations by the author—and recent views on the ancestry of domestic mammals are brought together in a semi-popular manual.

In the first section, which deals with the concept of domestication in general and the morphological changes in the domestic stage, special attention is devoted to the phenomenon of developmental arrest in skull-form due to domestication, which trend is traced through the various domestic groups and treated in the next section of the book.

The second part deals at length with the origin of dogs, equids, cattle, sheep, goats and pigs. The wolf is taken as the only progenitor of domestic dogs. The Russian tarpan is accepted as ancestor of the Oriental breeds, the Celtic pony regarded as a special type. For the domestic ass a monophyletic origin is suggested; any connection with the half-ass (onager) group is contested.

A discussion of buffalo, Indian oxen and yak is followed by a detailed treatment of the relationship between the urus and domestic cattle and of the post-embryonic development of the bovine skull. The urus is taken as the only ancestral form for domestic cattle, though domestication took place repeatedly in different localities and at various periods. Domestic sheep are derived mainly from the *Ovis vignei* group, argali and European mouflon being of only minor importance as ancestral forms. The domestic goat is traced back to *Capra aegagrus*, *C. prisca* and *C. falconeri*, the Kirghiz goat (cf. Philiptschenko, 1928) being seen as the only living derivation from the latter. The existence of a wild Mediterranean form of pigs (*Sus mediterraneus*) is doubted, all the domestic breeds of pigs being descendants of *Sus scrofa* or *S. vittatus*. Camel (the question of monophyletic origin is left open), reindeer, cat and rabbit are treated more briefly.

1927. Rind. In M. Ebert, Reallexikon der Vorgeschichte, Bd. XI, pp. 137-141.

A brief survey of the origin of European cattle and the cattle tribe in general. Since all the ancient as well as the now living races of domestic cattle (genus *Bos*) belong to the taurine group (parietals and interparietals displaced from forehead), all of them must be traced back to the only taurine wild ox known so far—the urus.

All *primigenius*, *frontosus* and *longifrons* (= *brachyceros*) forms are products of domestication; the hornless domestic forms, appearing in various groups of bovids

(yak, buffalo, etc.), cannot be derived from a single hornless ancestor (e.g., *Bos taurus akeratos*, as supposed by Arenander).

1928. Die Umbildung der Schädelformen der Haustiere infolge der Domestikation.—Ein Beitrag zur Rassengeschichte der Haustiere. Z. Tierz. Züchtbiol., Bd. XII, pp. 85-118, 24 figs.

Investigating the postembryonic development of the skull in domestic pigs, dogs and cattle, the author finds that wide variations in the form and shape of the skull of domestic mammals are caused by developmental persistence in different ontogenetic stages. This phenomenon of domestication is taken to explain cranio-logical distinction between certain races in spite of their monophyletic origin.

1932. Dogs. Antiquity, vol. 6, no. 23, pp. 411-419, 2 figs., 12 pls.

A discussion of certain problems related to the history of the domestic dog. The status of the dingo and of the pariah dog is examined, and a number of types belonging to different periods and countries—terriers from the Swiss lake-dwellings, mastiffs from the Neolithic Baltic countries, greyhounds from ancient Egypt—are described, mainly on the basis of pictorial evidence. It is suggested that all breeds of dogs, with the possible exception of ancient Egyptian races and their derivatives (the greyhounds), have evolved from the wolf.

1933. Untersuchungen über die Ziegen der Gattung *Capra* s. str. und deren Kreuzungen.—Ein Beitrag zur Stammesgeschichte der Hausziegen besonders Zentralasiens. Wissens. Archiv der Landwirtschaft.—B' Archiv für Ernährung der Tiere und Tierzucht, Bd. VIII, pp. 323-371.

A study of skulls and horns reveals three sharply distinct groups of wild goats: *Capra prisca* Adam., *C. hircus* L. and *C. falconeri* Wagner. Being readily crossed mutually and giving rise to fertile offspring, the three types could have produced many transitional forms by cross-breeding; only the first two, however, are taken into consideration as ancestors for the domestic breeds of goat.

The goats in central Asia, with markhor horns and bezoar characters, originated probably from a later cross-breeding with goats of the *Capra prisca* type.

1934. Eine altsumerische Fauna. Forsch. Fortschr. dtsch. Wiss., Jhg. 10, pp. 336-337.

Short preliminary report on the faunal remains from Tell-Asmar (cf. Hilzheimer, 1941) and on the frequency of domestic species at the site. A brief account is presented of the position of the tamed onager in Sumer.

1935. The evolution of the domestic horse. Antiquity, vol. 9, no. 34, pp. 133-139, 9 pls.

The author deals briefly with the taming of the Asiatic half-ass (*Equus hemionus*) by Sumerians around 3000 B.C. and with the occurrence of the domestic ass in the early periods of Egyptian history; the origin and dispersal of the domestic horse are also examined.

The habitats of the types under consideration—Przewalski's horse (*Equus equiferus* Pallas) and the tarpan (*E. gmelini* Antonius)—are traced throughout



the critical periods, and the author concludes that both recent groups of breeds, the Oriental as well as the Occidental, are derived from the Russian tarpan.

**1936.** Sheep. *Antiquity*, vol. 10, no. 38, pp. 195-206, 8 pls.

A survey of the living groups of wild sheep is followed by an examination of archaeological and philological evidence concerning the origin of the domestic sheep. The author finds three possible lines of ancestry for them, all to be looked for in Asia: the Asiatic mouflon (*Ovis orientalis*), the urial (*O. vignei*) and the argali (*O. ammon*); the latter is not considered to have been important for European breeds.

**1941.** Animal remains from Tell Asmar. *Stud. Anc. Oriental Civiliz.*, no. 20, xiii + 52 pp., 20 figs., 8 tables.

A study of fossil material collected at the Northern Palace in Tell Asmar (Mesopotamia) in 1932, 1933 and 1934-35. The position of the Asiatic onager or half-ass (*Equus onager hemippus*)—bones of which constituted 9 per cent of the total skeletal material—and its relationship to the domestic ass and the domestic horse are discussed in detail in the light of the osteological material. Other domestic species identified and treated are: *Sus* sp. (29.1 per cent of the total), *Ovis* sp. and *Capra prisca* (together 27.7 per cent), *Bos taurus primigenius* (13.5 per cent) and *Canis familiaris palustris* (8 per cent).

Table VIII (pp. 49-51) summarizes the findings and their sources.

#### Hooijer, D. A.

**1947.** Protohistoric mammals from the Linderbeek, Province of Overijssel, The Netherlands. *Proc. K. Nederl. Akad. Wetensch.*, vol. 50, no. 2, pp. 3-15, 2 pls., 13 tables.

A collection of subfossil mammals is dated at 650 B.C. on the basis of pollen analysis. A large dog is recorded, of the Great Dane-Newfoundland-St. Bernard type. The domestic cat is listed, on the basis of right humerus and tibia and left os coxae, all smaller than those of *Felis silvestris*, the European wild cat. This is the earliest record of the domestic cat in northern Europe, and also the earliest record of such a large breed of dog.—C.A.R.

#### Houbard, Albert

**1934.** Les chiens dans l'ancienne Égypte. *Chron. Égypte*, no. 17, pp. 28-34, 5 figs.

Brief discussions of representations of dogs from ancient Egypt, starting with a hunting scene on a vase from the fourth millennium B.C., which shows canids resembling a greyhound type. The author holds that by early dynastic times a great variety of dog breeds was known in Egypt.

#### Hrozny, Bedrik

**1931.** L'entraînement des chevaux chez les anciens Indo-Européens d'après un texte Mitannien-Hittite prononcé du 14<sup>e</sup> siècle av. J.C. *Archiv Orientalni*, Prague, Tom. III, pp. 430-461.

The famous Kikkuli text from the fourteenth century B.C., found in Bogaz Köy (Anatolia), is translated and explained. The text—one of the earliest literary evidences of horse breeding—is written by a Mitannian and contains a detailed guide for the treatment of race- and draft-horses. The technical terms are, in part, of Indo-European origin.

### Hue, Edmund

- 1906a. Étude sur un nouveau chien des palafittes de Clairvaux. Bull. Soc. préhist. franç., Tom. III, Ann. 1906, pp. 279–295, 1 pl.

Description of a dog-skull from the Neolithic lake dwelling at Clairvaux (Jura) and a comparison with other prehistoric canid skulls (*Canis f. palustris*, *C. f. matris optimae*, *C. f. leineri*, etc.). The new dog is craniologically distinct from all the other forms (high, convex forehead, broad jugals, slender palate) and is taken as a new type, called *Canis le mirei* Hue.

- 1906b. Note sur une mandibule de canide des palafittes de Chalain. Bull. Soc. préhist. franç., Tom. III, Ann. 1906, pp. 441–453, 2 figs.

Study of a mandible and teeth of a prehistoric domestic dog from the Neolithic dwelling places at Lake Chalain (Jura). Although few specific odontological characters are worked out, the dog is identified as belonging to the type of *Canis familiaris palustris* Rutim.

### Hummerlink, Paul

1928. Westindische Hundetypen. Naturforscher, Bd. IV, Nr. 11, pp. 550–552.

Some data are given about two ancient dogs from the West Indies, not dealt with in most treatments. The extinct “alco,” remains of which were found in caves on Jamaica, Haiti and San Domingo, was the domestic dog of the Arawak Indians and is regarded as ancestral to the Mexican pug. The “xibaro” (=hibaro) is very similar to the Aguara dog of Surinam (Netherlands Guiana), and its identity with the Brazilian roe-dog is suggested.

### Isserlin, B. S. J.

1950. On some possible early occurrences of the camel in Palestine. Palest. Expl. Quart., vol. 82, pp. 50–53.

Several cases of skeletal finds (mainly teeth) belonging to camels, discovered at Palestine sites (Gezer, Megiddo, Taanek) from the Early and Middle Bronze Age, are listed and seen as possible evidence for the occurrence of the domestic animal by that time.

### Jackson, J. W.

1932. Prehistoric domestic animals. Proc. First Int. Congr. Prehist. Protohist. Sci., pp. 154–157. Oxford Univ. Press (London).

Evidence from Neolithic domestication in Britain and other European cultures is summarized briefly and problems connected with prehistoric animals—especially ox and horse—are posed. The identity of the domestic cattle of prehistoric England (the *longifrons* type) with the *Bos brachyceros* stock of the Continent is questioned. The domestic status of horses, remains of which were found

at Neolithic sites in Great Britain (Cotswolds, Glamorgan, northern Wales), is doubted, and the possibility of an independent domestication of at least two wild species of horses—somewhere north of the Iranian Plateau and somewhere near or in Scandinavia—is suggested.

1937. The osteology: Report on the animal remains. *In* R. Mond & O. H. Myers, *Cemeteries of Armant*, vol. I, pp. 254–258. The Egypt Exploration Society, London.

Bones of ox, sheep, and pig, from cultural levels of the Amratian period in the prehistoric cemeteries of Armant (near Luxor, Egypt) are assumed to be those of domestic animals. There is a useful summary of prior finds of animals (domestic and other) in prehistoric Egypt.—C.A.R.

### Jettmar, Karl

1950. The Karasuk culture and its southeastern affinities. The Museum of Far Eastern Antiquities, Stockholm, Bull. no. 22, pp. 83–126, 16 pls.

In a short summary of publications (mainly from Russian literature) on the Karasuk culture of Minusinsk (northern Siberia), the author presents some details on the domestic stock as reflected by remains of animals sacrificed as mortuary food gifts. In graves from eighteen sites sheep constituted by far the major part of the remains, followed in frequency by cattle. Few bones belonged to horses. In one site forelegs of camels and in a grave from another site the full skeleton of a domestic dog were found.

The sudden importance of sheep-raising and its predominance in the Karasuk culture (1200–700 B.C.) contrasted with the former (Andronovo-) period, during which domestic animals were distributed about equally, is emphasized and seen as a significant feature, showing affinities to a similar process in northern Chinese cultures.

1952. Zu den Anfängen der Rentierzucht. *Anthropos*, Tom. 47, pp. 736–766.

A review of the results of numerous Russian excavations, and a survey of recent views concerning the origin of the domestication of reindeer. All the data seem to prove that the taming of reindeer could never have influenced the domestication of cattle, sheep or horses; the reverse could have been possible.

An extensive bibliography, especially from the Russian language, is appended.

### Johansen, K. F.

1919. En Boplads fra den ældste Stenalder i Svärdborg Mose. *Aarbøger*, Bd. IX, pp. 106–235.

Among the numerous animal remains from an early Stone Age settlement in the moors of Svärdborg (near Vordingborg, southwestern Zealand, Denmark), identified by H. Winge (pp. 127–134), there were bones of domestic dogs.

### Jones, F. Wood

1921. The status of the dingo. *Trans. roy. Soc., S. Australia*, vol. 45, pp. 254–263.

A craniological (mainly odontological) investigation of the dingo on the basis of much material (22 skulls). The author concludes that the dingo is not indigenous—that it arrived relatively recently in Australia. It was brought by a sea route by man from the Asian continent as already a variety of the domestic dog, and it became feral thereafter. The name *Canis dingo* is therefore rejected, and the name *Canis familiaris dingo* is suggested.

**Josien, Thérèse**

1955. La faune Chalcolithique des gisement Palestiniens de Bir Es-Safadi et Bir Abou Matar. Israel Expl. J., vol. 5, no. 4, pp. 246–256.

Description and evaluation of the skeletal remains collected during the excavations near Beer-Sheba (southern Israel) and dated to about 3000 B.C. The domestic fauna (95% of the determined material) is considered as typical for a semi-nomadic population at the dawn of domestication. It comprised mainly sheep (60.2%), followed by goat (16.7%) and ox (12.8%). Dog and horse were represented by a few fragments only.

**Kacrkowski, B.**

1928. Contribution to the studies of the origin of European sheep. Proc. roy. Soc. Edinburgh, vol. 48, part 1, no. 2, pp. 10–24.

Serological (iso-agglutination) methods were used to determine the origin of the European sheep. Two main groups, A and O, could be distinguished, the latter divided into two sub-groups, one with and the other without anti-A.

Mouflons (from the zoological gardens at Vienna and Budapest) proved to belong to group A. Since the majority of the Polish domestic sheep belong to the same group, a relationship to the mouflon is probable. English Southdown sheep show no serological affinity to mouflons.

**Keller, Conrad**

1902. Die Abstammung der ältesten Haustiere. 232 pp., 81 figs. Fritz Am-beyer (Zürich).

A comprehensive manual on the derivation and origin of most domestic mammals. Chap. 1–4 explain the methods used and give the cultural background, the zoological aspects and a review of 19th century literature and research. Each of the next eight chapters is devoted to a specific animal group and is divided into three sections: (a) an account of the fossil and archaeological evidence; (b) information on the distribution of the related wild form; (c) a discussion and a phylogenetic summary.

Dogs and cattle are dealt with extensively. Races of Old World dogs are traced back to two species of wolves (*Canis sinensis* and *C. niger*) and the jackal (*C. aureus*); the ancient New World dogs are regarded as indigenous and derived from the North American wolf (*Lupus occidentalis*). Domestic bovines are classified into a European (*Bos taurus*) group, derived from *Bos primigenius*, and an Asiatic zebu group (*B. indicus*), descended from the banteng (*Bos sondaicus*). The banteng is also considered the ancestor of the southeastern European *brachyceros* type. For sheep a triphyletic origin is suggested, for goats and for horses a diphyletic descent; Frank's classification of the latter into Occidental and Oriental breeds is retained. The camel and the domestic cat are also treated.

A discussion of the species concept and nomenclature for domestic animals is appended.

- 1919.** Die Stammesgeschichte unserer Haustiere. Natur u. Geisteswelt, No. 252; 117 pp., 29 figs. Teubner (Leipzig, Berlin).

A popular discussion of general problems of domestication is followed by a treatment of specific animals and their phylogeny. Described are the "ancient domestic mammals" (dogs, equids, pigs, ruminants), the "more recent achievements" (reindeer, rabbit) and finally the domestic birds.

- 1922.** Die Methoden der Haustierforschung. In Abderhalden, Emil, Handbuch der biologischen Arbeitsmethoden, Abt. VII, part 1, pp. 77-90.

Brief description of methods used to investigate the origins of domestic species. The author distinguishes the following methods: (a) zoogeographical; (b) anatomical; (c) prehistoric (by investigation of fossil material); (d) physiological (using fertile hybrids as criteria of close relationship and serological methods); (e) ethnographical; (f) archaeological; and (g) linguistic.

#### Kelm, Hans

- 1938.** Die postembryonale Schädelentwicklung des Wild- und Berkshire Schweines. Z. ges. Anat. 1. Z. Anat. EntwGesch., Bd. 108, pp. 499-559, 29 figs.

The wild boars of the *scrofa-vittatus* group are shown to belong to one species (*formenkreis*). Skulls of *Sus scrofa scrofa* (as representative of this wild form), from the new-born to the old animal, are compared with a corresponding ontogenetic sequence of skulls from the highly modified domestic Berkshire pig. Even at birth the skulls show a characteristic difference, but in the course of postembryonic development distinct tendencies in growth cause increasing discrepancy between the skulls of the wild boar and the Berkshire.

The author contests a "retention of juvenile characters" as solution for the characteristics of domestication, which latter he seeks to explain on the basis of a changed balance in the endocrine system.

- 1939.** Zur Systematik der Wildschweine. Z. Tierz. ZüchtBiol., Bd. XLIII, pp. 362-369, 4 figs.

A survey of the wild pigs of Eurasia. The *scrofa-vittatus* group is seen as a single species, the allopatric races of which form a clear taxocline from Europe (*Sus scrofa scrofa*) to eastern Asia (*Sus scrofa vittatus*).

#### Klatt, B.

- 1927.** Entstehung der Haustiere. Handbuch der Vererbungswissenschaft, Bd. III, 107 pp., 15 figs. Gebrüder Bornträger (Berlin).

A comprehensive treatise, dealing mainly with the origin of domestication in terms of the general aspects involved. The first part ("genesis of domestication") tries to outline the human motives that led to the rise of domestication, and the zoological background that made it possible. In the second part ("effects of domestication") the general morphological and physiological trends characteristic

of domestic animals are illustrated by rich comparative material, and an attempt is made to reveal the special evolutionary factors that seem to operate under the conditions of domestication. The third part ("history of domestic animals") is subdivided into a general section, which deals with the various methods of research (zoological, culture-historical and philological), and a specific part, wherein is outlined the origin of the main domestic mammals (in particular the dog and the ungulates).

1948. *Haustier und Mensch*. 95 pp., 33 figs. Richard Hermes (Hamburg).

A discussion of the evolutionary mechanism operating under domestication. After a short survey of the oldest historical civilizations and their domestic animals, the pamphlet investigates the conditions of the domestic environment in relation to the morphological modifications recognized among domesticated animals. The parallel occurrence of these modifications is regarded as the cardinal point in domestication and is explained by similar alterations of the hormone system, which becomes affected by the human-controlled environment.

Koby, F.

1954. Y a-t-il eu, à Lascaux, "un bos longifrons"? *Bull. Soc. préhist. franç.*, vol. 51, nos. 9-10, pp. 434-441, 3 figs.

The cattle depicted in the cave-paintings at Lascaux have been identified by prehistorians as *Bos primigenius* (the large forms with curved horns) and *B. longifrons* (smaller, thinner, and with horns shorter and more horizontal). This latter, however, is nothing more than the female of *B. primigenius*. There was no separate small species of *Bos* in the European Pleistocene. If the domestic cattle of the Neolithic and later are actually derived from small wild cattle these must have lived elsewhere, probably in western Asia, but there is no evidence for this supposition. (Zeuner [1953, *Man*, vol. 53, pp. 68-69] had already mentioned, in a discussion of the color of *Bos primigenius*, that the so-called *Bos longifrons* of Lascaux was actually the female of *B. primigenius*; Koby was presumably unaware of Zeuner's paper.)—C.A.R.

Koch, W.

1937. Das Gehörn der Schraubenziege—*Capra falconeri*. *Zool. Anz.*, Bd. 93, Nr. 7-10, pp. 275-278, 2 figs.

On the basis of differences in the shape of the horns, the markhor, *Capra falconeri* Wagner, is excluded as an ancestral type for any domestic form of goat. The heteronymous twisting in the horns of the markhor is distinct from the homonymous type of the screw-horned domestic breeds, and the cross section of the horn (keel at hind edge) is contrary to the domestic *Capra hircus* type (keel at front edge).

Kolesnik, N. N.

1936. [The origin and the geographical distribution of cattle.] (Russ.; Eng. summ.) *Akad. Nauk USSR, Leningrad, Ser. Biol.*, Nos. 2-3, pp. 375-414, 28 figs., 5 tables.

A paleozoological survey of the evolution of the Bovinae in general and the genus *Bos* in diluvial and alluvial times in particular is followed by a study of

recent breeds of cattle, their geographical distribution, and their history. The author accepts the view that *Bos primigenius* and *B. brachyceros* are both immediate ancestors of domestic cattle, and he adds two more species: *B. indicus*, which is considered forefather of the Asiatic humped cattle, and *B. turano-mongolicus*, which gave rise to the different breeds of central Asia (Kalmuck, Mongol, Yakut and Kirghiz cattle).

Cattle-breeding probably originated in several regions, but southwestern Asia (i.e., Assyro-Babylonia) and northwestern India are regarded as the most ancient centers of domestication.

### Koppers, Wilhelm

1932. Konnten Jägervölker Tierzüchter werden? Biol. gen., Bd. VIII, pp. 179-186.

In a brief discussion of the beginnings and motives of animal domestication the author holds that hunting tribes were the first breeders, that the first domestic animals were reindeer and horse, and that the cradle of domestication was the subarctic region of inner Asia; the motives were mainly practical and economic.

### Koppers, Wilhelm, and Jungblut, L.

1942-45. The water-buffalo and the zebu in central India. Anthropos, Tom. 37-40, pp. 647-666, 11 photos, 4 drawings.

Anthropological observations on Indian zebus and buffalos. In conclusion J. U. Dürst sketches the zoological characters of both the forms and then discusses their origin (pp. 661-666). The tame Indian water-buffalo (*Bubalus indicus macroceros*) is seen as the direct descendant of the wild arni buffalo (*Bubalus arni*), which became domesticated in India and was brought to Persia, where it appeared in the second century B.C. Much earlier (in the third millennium B.C.), domestic cattle of the *Bos taurus* type—direct descendants of the wild *Bos namadicus*—were introduced into India by the nomadic Chorwa from the Anau region via the Zufilcar Pass, and gave rise to the zebu stock, the marked hump being a result of selection on religious bases.

### Krämer, Hermann

1900. Die Haustierfunde von Vindonissa. Rev. suisse Zool., Tom. VII, pp. 143-272, 19 figs.

A history of domestic animals in Switzerland, outlined on the basis of the faunal remains from Vindonissa, which are described. The author compares the species of the Swiss lake-dwellings with the later forms introduced by the Romans, found in Vindonissa—large types of dogs, a new kind of sheep and big-horned goats. The discussion is based to a great extent also on representational art from early Roman times.

### Krieg, H.

1929. Über südamerikanische Haustiere. Zool. Gart., Heft 1, pp. 273-284.

Information on the pre-Columbian domestic stock of South America. Llama, alpaca and guinea pig are dealt with briefly; the domestic dog is treated at length. A consideration of the dogs of the Indians from Gran Chaco, which live in a semi-

domesticated stage, leads to the conclusion that the desired properties of advanced breeding in the dog are deficiencies ("defect mutants") in terms of natural selection.

### **Kroll, Hubert**

1928. *Die Haustiere der Bantu*. Z. Ethn., Bd. 60, pp. 177-290, 6 maps.

A detailed treatment of domestication, its role and significance, and the origin of domestic stock not only among the Bantu, but in southern and eastern Africa in general. Associated with the domestic forms all over the area, and therefore seen as the most ancient domestic animal, is a type of dog of African origin; only later a greyhound type was introduced, probably by the Hamites.

Besides the dog, cattle and goat are considered the most ancient breeds, the former being the animal of the stock-farmer, the latter associated with cultivation of plants. The first herdsmen invading the Bantu area did not possess sheep, which were introduced later. Much later, the ass, pig, horse and cat were brought. With the exception of the ass, which was descended from an indigenous form, all the breeds of southern and eastern Africa (horse, cat, pig) are regarded as of European origin.

### **Kronacher, C.**

1928. *Allgemeine Tierzucht*. Abt. 1, xxvii+482 pp., 366 figs. (3rd ed.) Paul Parey (Berlin).

The second section (pp. 59-478) is devoted to the origin of domestication and to the descent and the prehistoric and historic evolution of domestic animals. Chap. 2 and 3 consider general aspects of domestication in terms of its origins, and the morphological, physiological and psychological changes caused in the process of domestication. In chap. 4 (pp. 183-478) extensive material on the origin of the important domestic species and their early evolution is brought together, and recent views are summarized. Horse, ass, mule, cattle, sheep, goat, pig and rabbit are treated at length.

### **Krüger, W.**

1939. *Unser Pferd und seine Vorfahren*. Verständliche Wissenschaften, Bd. 41, 164 pp.

A popular account of the domestic horse and the origin of its races.

### **Krumbiegel, Ingo**

1947. *Von Haustieren und ihrer Geschichte*. Kosmos, 83 pp., 22 figs.

In a popular pamphlet, the origin, significance and earmarks of domestication are discussed and a brief history of the domestic species is given. In a tentative table (p. 34) the ancestry of the important domestic mammals and birds is summarized.

### **Kuhn, Emil**

1932. *Beiträge zur Kenntnis der Säugetierfauna der Schweiz seit dem Neolithikum*. Rev. suisse Zool., Tom. 39, no. 18, pp. 531-768.

A survey of the Swiss prehistoric fauna, based on a study of animal remains from ten sites: seven Neolithic, three Celtic-Roman, and one from the La-Tène



period. Domestic animals constituted most of the material, among which cattle were most numerous (often more than 50 per cent) in Neolithic times, followed by pigs (about 30 per cent). Sheep and goats were of minor importance. In Roman times sheep (the heavy-horned *Ovis aries studei*), pigs and cattle constituted most of the domestic fauna.

1935. Die Fauna des Pfahlbaues Obermaien am Züricher See. Vjschr. naturf. Ges. Zürich, Jhg. 80, pp. 241-330.

Systematic study of new animal remains, excavated from Obermaien (Lake Zurich) in 1933. This was the first site of lake-dwellings, the faunal remains of which were described by Rüttimeyer as early as 1860-61.

The faunal assemblage points to a late Neolithic period. Cattle and pig constitute the bulk of the domestic stock. The former is represented by two forms—a *brachyceros* and a *primigenius* type. The latter is identified as the turbary pig. All the dogs as well as the sheep belonged to the *palustris* type. The few equid remains were probably those of wild animals.

#### Kuschel, Paul

1911. Die Haustiere Ägyptens im Altertum. Diss., Zootechnische Inst. der königl. tierärztlichen Hochschule, Dresden, 42 pp. Publ. by "Görlitzer Nachrichten und Anzeiger."

A historical survey of how cattle, camel, sheep, goat, dog, cat, horse, ass and pig were reared in ancient Egypt.

#### Kwaschnin, Samarin N.

1928. Kraniologische Untersuchungen über das litauische Pferd. Z. Tierz. ZüchtBiol., Bd. XII, pp. 249-287, 14 figs.

A detailed study of twenty skulls of the Lithuanian (Shmudie) horse breed, which is nearly extinct in its pure form. The skull of the Lithuanian horse shows it to be an autonomous, ancient branch of the Oriental group, which shows many affinities to *Equus przewalskii* and especially to the tarpan type and shows also some similarities to the Arabian horse.

1931. Studien über die Herkunft des osteuropäischen Pferdes, hauptsächlich auf Grund des baltischen Materials. Acta Comm. Univ. Tartuensis (Dorpatensis), Ser. A, Tom. XXI, pp. 1-138, 4 pls., 30 figs.

A detailed osteological treatment of recent Lithuanian horses and of fossil remains of horses from Baltic sites forms the basis for an investigation of the origin of the East European domestic horse, especially its relation to the tarpan and the Przewalski horse.

All types of recent and prehistoric horses can be traced back to two basic types—Oriental and Occidental. The Lithuanian-Polish-Estonian horse group is seen as one unit belonging to the Oriental type, with close affinities to the Przewalski horse. The South Russian tarpan is considered a feral horse.

#### La Baume, Wolfgang

1949. Die ältesten europäischen Haustiere. Verhandl. dtsch. zool. Ges., pp. 74-90, Aug., 1948, in Kiel.

A review of the literature on the first occurrence of domestic animals. Only the dog is surely known from Mesolithic time. It belonged to a culture of hunters and gatherers. The beginnings of all the other domestic animals (cattle, pig, sheep, goat and horse) are found in earliest Neolithic (proto-Neolithic) times, their origin probably associated with the first cultivation of plants.

**Langton, N. and B.**

1940. The cat in ancient Egypt. 89 pp., frontispiece, 19 pls. Cambridge University Press (London).

Essentially a catalogue of the Langton Collection (cat figures from ancient Egypt), but additional comments and suggestions give a framework of the earliest culture of the cat. *Felis chaus* and *F. ochreata* are suggested as probable originals for two distinct types—one long-eared and sharp-nosed, the other short-eared and blunt-nosed—which can be distinguished among the images of domestic cats from ancient Egypt.

**Latcham, Ricardo**

1924. Los animales domesticos de la America precolombiana. Publ. Mus. Etnol. Antr., Chile, Tom. III, pp. 1-199.

An account of the domestic stock of ancient South and Central America based upon archaeological excavations. Treated in detail among the mammalian fauna are dogs (chap. 1); species of the genus *Auchenida*—llama, alpaca, vicugna and guanaco (chap. 2); and the guinea pig (chap. 4). All those animals, kept as domestic breeds prior to the Spanish invasion, are without exception derived from indigenous wild forms. The dog had the widest distribution and therefore is regarded as the first animal that was domesticated. It is represented among the various cultures by many varieties.

**Laufer, Berthold**

1917. The reindeer and its domestication. Mem. Amer. Anthropol. Ass., vol. IV, pp. 91-147.

On the basis of ethnographical data (Russian and early Chinese sources) an attempt is made to determine where and when reindeer breeding originated. It is concluded that the first domestication of reindeer took place in the Baikal region and was practiced originally by Samoyeds in the early period of their history (prior to their migration into the present northern habitats). It was later transmitted to the Lapps.

**Lawrence, Barbara**

1944. Bones from the Gobernador area. Columbia Stud. Archaeol., vol. II, no. 1, pp. 73-78.

A description and craniological study of dog skulls and mandibles found among the mammal bones discovered at Gobernador, New Mexico. Most of the bones belonged to young individuals, suggesting that the animals were used as food. Three breeds of dogs are distinguished: Basket Maker, Techichi, and a short-nosed form.

1951. Post-cranial skeletal characters of deer, pronghorn, and sheep-goat, with notes on *Bos* and *Bison*. Pap. Peabody Mus., vol. 35, no. 3, pp. 7-43, 20 figs.

This paper, with its lists of comparative characters and numerous sketches of the bones, is an aid to the archaeologist or mammalogist identifying fauna of the larger Artiodactyla from North American excavations. Only generic differentiation is attempted of *Ovis*, *Capra*, *Antilocapra*, *Odocoileus*, *Bison*, and *Bos*, except for a few characters where the mountain sheep (*Ovis canadensis*) can be distinguished. No characters of the post-cranial skeleton were found that would separate domestic sheep and goat, so they are grouped as a unit. Little or no reliance can be placed upon characters of ribs, vertebrae or many of the smaller bones of the carpus and tarsus, so such bones are not considered. *Bos* and *Bison* are very similar in their skeletal parts, although not to the degree of *Capra* and *Ovis*.—C.A.R.

**Lebel, L. D.**

1939. Origin and quality of the Don-Danube goat. [Polish; English summ.] Sbornik rabot po raswed i sekr. owez, Woroschilowsk, vol. IX, pp. 63-76.

Short account of the Don-Danube goat, which is kept all over the Don Valley down to the Sea of Azov, and which is markedly distinct, not only from the breeds of the surrounding areas but also from all the other forms described in the literature. The goat shows characters, especially in the skull and horns, very close to the extinct *Capra prisca* Adametz.

**Leister, Claude W.**

1943. Before Montefiore Joash sunshine. . . . Anim. Kingd., vol. 46, no. 3, pp. 63-70.

Popular guide to domestic cattle, their wild relatives, and their probable ancestors. Urus, zebu, and Celtic shorthorn (*Bos longifrons*) are seen as ancestors of present-day (taurine) domestic cattle. Brief discussion is also devoted to the yak, to the Bibovine group (gaur, gayal, banteng) and to the domestication of the water-buffalo.

**Lengerken, H. von**

1953. Der Ur und seine Beziehungen zum Menschen. Die Neue Brehm-Bücherei, Heft 105, 79 pp., 68 figs.

A monograph on the evolution of the urus and its bearing on man's civilization. The author deals extensively with the role of the urus as the ancestor of domestic oxen and concludes that all existing cattle except yak, buffalo, and Bali cattle originated from *Bos primigenius*.

1955. Ur, Hausrind und Mensch. 191 pp., 253 figs. Deutscher Bauernverlag (Berlin).

A comprehensive survey of the knowledge about *Bos primigenius*, its speciation and domestication among various cultures. Compiled from zoological and paleontological as well as archaeological and ethnological sources. Hundreds of pictorial representations of the urus and domestic oxen throughout all ages and cultures are added.

**Lhote, Henri**

1953. Le cheval et le chameau dans les peintures et gravures rupestres du Sahara. Bull. Inst. franç. Afr. noire, Tom. XV, no. 3, pp. 1138-1228, 20 figs.

A detailed description of the horse and camel representations in the rock paintings and rock engravings in the Sahara Desert forms the background for a discussion of the place of these animals in North African civilizations during early historical times.

**Liang, Ssu-Yung**

1934. Human, animal, and bird skeletal remains, and shell-fish remains. In Li Chi and others, Ch'êng-tzū-yai [Report on the excavation of Ch'êng-tzū-yai, a Neolithic and, subsequently, Bronze-Age site in northeast China], Arch., Sinica, no. 1 [In Chinese]. English transl., 1956, Yale Publ. Anthropol., vol. 52, pp. 1-232; see particularly p. 152.

Human occupation at this site in Shantung Province continued approximately from 2000 to 200 B.C. Nine genera of mammals were identified: rabbit, pig, dog, horse, sheep, ox, and three kinds of deer; only the dog, *Canis familiaris*, could definitely be regarded as domestic. The sheep and ox are assigned to extinct species, and horse and pig were not specifically identified. Pig and dog bones were most numerous, horse and ox bones next, deer and sheep bones next; rabbit was rare.—C.A.R.

**Linton, Ralph**

1955. Domestication of plants and animals. Chap. 8, in *The Tree of Culture*. Alfred A. Knopf (New York).

This is a non-technical summary of what an anthropologist regards as essential knowledge concerning domestication. As such, there are correlations with human culture not always known to zoologists, as the possibility that chickens may have been kept originally to guard against ghosts.

Except for the dog and the reindeer, domestic animals were tamed by agricultural people. Man's association with reindeer at first was that of herder only; all other domesticated animals are thought to have been kept first as young animals, probably as pets for children.

There were two major centers of animal domestication in the Old World: The dry, open country of Egypt and southwestern Asia and the jungle environment of southeastern Asia. In the latter area occurred the domestication of the chicken and probably an independent domestication of the pig. The Bactrian camel was domesticated in Mongolia, and the horse on the steppes somewhere west of Mongolia; possible sites for the origin of the domestic dog and water buffalo are not mentioned.—C.A.R.

**Lloyd, Seton**

1940. Iraq government soundings at Sinjar. Iraq, vol. 7, pp. 13-21, pls. 2-4, 4 figs.

The horn-cores of a water buffalo (*Bubalus*) are reported from the site of Grai Resh in northern Iraq, occurring with artifacts of the Uruk culture period.—C.A.R.

**Lloyd, Seton, and Safar, Fuad**

1945. Tell Hassuna. *J. near East. Stud.*, vol. IV, pp. 255-289, 21 pls.

Account of an excavation by the Iraq government in 1943 and 1944 at the early site of Tell Hassuna in northern Iraq. In appendix I (p. 284) there is a preliminary report on the animal bones. Most numerous among the remains were those of goat and sheep; fragments of probably domestic animals belonged to ox and ass.

**Lorenz, Konrad Z.**

1955. *Man meets dog*. x + 211 pp., illus. Houghton Mifflin Company (Boston).

The domestic dog, as determined primarily on the basis of comparative behavior, is considered to have been derived from the golden jackal, *Canis aureus*, after a long period of symbiotic relationship. As man finally moved into the far north, he cross-bred these jackal-ancestored dogs with wolves, *C. lupus*, thus establishing those breeds (Eskimo husky, chow chow, samoyed, and Russian Lajkas) which are mainly wolf-derived.

The domestic cat is descended with little change of morphology or behavior from *Felis ocreata* of Africa and Syria. This species is today easily tamed, even when caught adult, whereas the European wildcat, *F. sylvestris*, can never be tamed, even when hand-reared from a kitten.—C.A.R.

**Lortet, L., and Gaillard, C.**

1903-09. La faune momifiée de l'ancienne Égypte. *Arch. Mus. hist. nat. Lyon*, Tom. VIII, viii + 205 pp., 8 pls., 82 figs.; Tom. IX, xiv + 126 pp., 184 figs.; Tom. X, 336 pp., 223 figs.

A detailed study of the mummies excavated from animal graves in Egypt—mainly from around Roda, Thebes, Sakkara, Kom Ombo, and Gizeh—dating to the first millennium B.C.

Identified among the domestic animals are dogs, cats, oxen, sheep, and goats. Dogs, which were found together with jackals, are mostly of the pariah type; a few were a kind of greyhound. Among the numerous cat mummies two forms are distinguished: A large type, identified with the wild, indigenous *Felis maniculata*, and a smaller type, considered the domestic derivative of the former. Cattle are identified as *Bos africanus* Fitzinger and are seen as the race that supplied the "steer of Apis"; sheep mummies are regarded as of two species: *Ovis palaeoegypticus* and a mouflon type.

**Luho, V.**

1948. Über steinzeitliche Winterverkehrsmittel in Finnland. *Acta Arch.*, vol. XIX, pp. 115-144, 22 figs.

Finds of various types of sledges from prehistoric Finland (pre-Comb-Ceramic to post-Comb-Ceramic periods) are described in detail, and conclusions are drawn as to the introduction and taming of the draft-animals (dog and reindeer) associated with sledge driving. The earliest sledges from the pre-Comb-Ceramic sites (Heinola, Rantasalmi) were probably drawn by man only; from the Comb-Ceramic culture on, a new type of sledge occurs (Saarigärvi-Tarvala), together

with an increased frequency in the remains of dogs, three breeds of which are already known from this time.

The use of the reindeer as a draft-animal began later, possibly by the end of the late Stone Age.

### Lundholm, Bengt

1949. Abstammung und Domestikation des Hauspferdes. Zool. Bidr. Uppsala, Bd. 27, pp. 1-292, 6 pls., 1 map, 9 tables, 45 figs. [Eng. summ. pp. 241-251.]

An osteological comparison between fossil and recent wild horses and early domestic horses is the basis for a study of the origin of the domestic horse. Beside measurements collected from the literature, the author uses extensive new material from sub-fossil peat-bog finds—mainly from Sweden—from the Ancylus and Litorina time (7000-2000 B.C.) and from the Nordic Bronze Age (chiefly from the sacrificial site at Lake Bokarn, Uppland).

The division of the wild horse population into two groups—an eastern group, comprising the tarpan and the Przewalski horse, and a western one, represented by late- and post-glacial wild horses from central and northern Europe—is explained by the biogeographical conditions during the Ice Age. The domesticated Nordic Bronze Age horse shows a close connection to the Nordic wild horse and no resemblance to the tarpan, which fact seems to refute the monophyletic origin of the domestic horse from the latter.

In the last chapter—"domestication and its significance"—the specific effects of domestication in general are traced, and their possible causes are discussed. A comprehensive bibliography is appended.

### Lydekker, R.

1912a. The horse and its relatives. vi+281 pp., 11 figs. George Allen & Company, Ltd. (London).

In chap. 2 (pp. 71-116) various views as to the relation of the domestic horse to the wild tarpan are examined and discussed. The author finds signs of near relationship between the Mongolian tarpan (*Equus caballus przewalskii*) and the existent breeds of western Europe and their prehistoric ancestors, all of them derived from one species (*Equus caballus typicus*), which gave rise to the Mongolian ponies as well.

The differences between the eastern and western stock are only the results of different climatic conditions, modes of treatment and selection; "Oriental" and "Occidental" horses are derived from the same ancestral form. The Arab-Barb group, however, is regarded as markedly distinct from the original tarpan-like horses of western Europe and Mongolia. The origin of the Arab stock is traced back to *Equus stenonis* in the Pliocene (chap. 5, pp. 150-170). The author finds in this Arabian breed the original type from which both "Barb" (the Libyan stock) and "Turk" (the Turkoman horses of Turkestan) were early derivatives.

When dealing with the domestic ass (chap. 9, pp. 215-225), the author accepts the view that the wild animal, whose original home may have been in northwest Africa, was probably first tamed in the eastern Mediterranean countries.

1912b. The ox and its kindred. xi+271 pp., 23 pls. with 46 figs., 7 text figs. Methuen & Co., Ltd. (London).

The volume contains detailed information on the zoological position and structure of the ox, the distribution and history of wild bovines, and an account of the origin of domestic cattle and of the chief breeds by which they are represented. Special attention is devoted to the history of the extermination of the aurochs of Europe and western Asia (*Bos taurus primigenius*), taken as the principal ancestor of domestic cattle.

Humped cattle—a distinct species, *Bos indicus*—are regarded as a domesticated derivative from the wild banteng of southeastern Asia (cf. also Keller, 1902). Its connection with the *brachyceros* stock, however, is contested.

**1912c.** The sheep and its cousins. xv+315 pp., 14 pls., 61 figs. George Allen & Company, Ltd. (London).

Popular information about the races of wild and the breeds of domestic sheep and the origin and history of the latter. The Himalayan urial (*Ovis vignei*) is considered progenitor of the ancient Oriental domestic breeds and also of *O. aries palustris* from the Swiss lake-dwellings, although a taming of the indigenous wild mouflon (*O. a. musimon*) by the prehistoric inhabitants of Europe may have occurred. The specialized African breeds—the *longipes* type of ancient Egypt as well as the long-legged (*O. a. longipes*) and long-eared (*O. a. catotis*) breeds of today—are considered to be of Asiatic origin.

**Mackay, E. J. H.**

**1938.** Further excavations at Mohenjo-daro. Manager of Publication, Delhi.

A brief summary of the domestic animals represented on the seals of Mohenjo-daro from the excavations of 1927–31 (cf. Sewell, 1931) is given, and the identifications of H. Friederichs (cf. Friederichs, 1933) are discussed (vol. I, appendix 1, pp. 669–671). The animal that appears most frequently is a form of cattle, showing the characters of both the *primigenius* and the *namadicus* type, which fact may indicate a crossing of the two in the Indus valley. Among the figurines and model animals (pp. 286–292), domestic dog (of a mastiff type), cattle, horse(?), sheep, goat and pig are identified.

**Madsen, A., et al.**

**1900.** Affaldsdynger fra Stenalderen i Danmark. [Stone Age kitchen middens from Denmark.] 196 pp., 11 pls., figs. and tables in text [Fr. summ. pp. 193–196]. C. A. Reitzel (Kjøbenhavn).

A study of the kitchen midden remains from Danish Stone Age sites (Ertebølle period), collected by the National Museum of Copenhagen. Skeletal remains of domestic mammals, identified by H. Winge, belonged to two types of dogs (*Canis familiaris palustris* and *C. f. matris-optimae*), pigs and sheep (both of the turbarry type), and cattle (generally resembling *Bos taurus brachyceros* but with some features of the *primigenius* type).

**Mallowan, M. E. L.**

**1936.** Excavations at Tall Chagar Bazar and an archaeological survey of the Habur region. Second campaign. Iraq, vol. 4, pp. 91–154, pls. 12–19, 25 figs.

The area considered is part of northeastern Syria. The horse, sometimes with its trappings, is frequently represented by clay figurines, which, together with chariot wheels, are common in levels dated ca. 1900 B.C. (see Smith, 1928) and suggest the use of both draught and chariot horses.—C.A.R.

1946. Excavations in the Balih valley, 1938. Iraq, vol. 8, pp. 111–159.

Report on excavations from several sites in northeastern Syria in the valley of the River Balih (a tributary of the Euphrates), dated to the Halafian period. Proof of mixed farming was obtained as far back as the Chalcolithic; cows, sheep and goats were kept, and the domestic dog was also at the disposal of the herdsmen.

Some remains of domestic animals, found in or near Tell Mefesh, are identified by D. M. A. Bate (p. 128). They belong to a large ox, a small equid and a large goat with twisted horns—considered to be an example of an early stage in the development of the domestic Mamber goat.

1947. Excavations at Brak and Chagar Bazar. Iraq, vol. 9, pp. 1–266, 86 pls., 18 figs.

These sites are in northeastern Syria. From Brak, dated as not later than 3200 B.C., were identified a small *Equus*, pig, and ox; the latter two were probably domestic. Also from Brak, at about 2300 B.C., were identified a small *Equus*, and domestic dog, pig, goat, cattle, and probably sheep. The *Equus* could be either the domestic ass or the Syrian onager.

Remains of a goat with twisted horns are thought to be those of the typical Mamber goat. A sheep is represented by a portion of a large twisted horn core, which resembles that of some domesticated races and differs from that of the wild species. Similar horn cores associated with the Mamber goat were also found at Megiddo, in levels dated as of Chalcolithic to Early Bronze age.—C.A.R.

#### Mangelsdorf, P. C.

1952. Evolution under domestication. Amer. Nat., vol. 86, pp. 65–77.

The same factors that operate in “natural evolution” (mutation, genetic drift, hybridization, selection, etc.) were effective in the speciation of domestic animals and plants, though evolution directed by man led to much quicker changes than natural evolution. Data are taken almost exclusively from cultivated plants.

#### Mason, I. L.

1951. A world dictionary of breeds, types and varieties of livestock. Technical Communication No. 8 of the Commonwealth Bureau of Animal Breeding and Genetics, 272 pp. Slough, Buckinghamshire, England.

A dictionary of the names which have been applied to groups of horses, cattle, sheep, pigs, goats, buffaloes and asses on the basis of common origin, similarity or geographical proximity. Synonymous names are indicated and for each breed a brief discussion of origin, present distribution, breed characters and relationship to other breeds is given.

#### Mathiassen, Therkel

1944. The Stone Age settlement at Trelleborg. Acta Arch., vol. XV, pp. 77–98, 9 figs.



Among artifacts from a settlement (dating from the passage-grave period) near Trelleborg on Zealand (Denmark), a few bone artifacts, made from skeleton parts of domestic oxen, are identified (pp. 81-82).

### Matthey, Robert

1954. Chromosomes et systématique des canidés. *Mammalia*, vol. 18, no. 3, pp. 225-230, 14 figs.

Since the domestic dog has a diploid chromosomal number of 78, whereas the golden jackal, *Thos aureus*, has only 74, it is concluded that dogs cannot have been derived from this species of jackal. The number of chromosomes in the wolf has not yet been determined.—C.A.R.

### Meissner, B.

1926. Haustier. In M. Ebert, *Reallexikon der Vorgeschichte*, Bd. V, pp. 216-221. Walter de Gruyter & Co. (Berlin).

In the first part—a general consideration of the origins of domestication—it is assumed that the necessity for keeping animals as offerings for the gods had been the main motive for the taming of wild forms. This is followed by a brief account of archaeological evidences of dog, pig, and cattle from prehistoric Europe, and of cattle, sheep, goat, horse, ass and camel from the ancient Near East.

### Melnyk, Oleska

1927. Das Wildrind Osteuropas und seine Domestikation. *Z. Tierz. ZüchtBiol.*, Bd. IX, pp. 475-483.

Fossil and recent material of the genus *Bos* from Ukrainian museums is investigated. The East European domestic cattle are of *primigenius* type (although with great variability) and are supposed to have descended from *Bos urus primigenius* in the early Stone Age, their domestication being already very advanced by late Neolithic. Cross-breeding with the Asiatic *urus* (*B. namadicus*) or with the banteng may occasionally have occurred.

1928. Die neolithischen Haustiere Südosteuropas. *Z. Tierz. ZüchtBiol.*, Bd. XI, pp. 15-25.

The author summarizes briefly the material (mainly figurines) of Neolithic domestic animals from southeastern Europe (especially Ukraine) and concludes that by the fourth millennium B.C. cattle (of *primigenius* type), sheep, goats(?) and horses(?) were domesticated in this area.

### Menghin, Oswald

1931. *Weltgeschichte der Steinzeit*. xvi+648 pp. Anton Schroll & Co. (Wien).

The author claims three independent civilizations, which gave rise to animal breeding at the threshold of the Neolithic.

Widespread across southern Asia and southern Europe was a swine-breeding culture, associated with hoe-agriculture and lacking draft animals, the only domestic species besides the pig being the dog. Another civilization complex, represented by the Anau culture, rose in western Turkestan, its domestic stock comprising cattle and sheep, the former derived from *Bos namadicus*, the latter

from *Oris rignei arkar*. Later the goat was added. A third civilization is indicated by the domestication of riding animals—horse, ass and camel—its origin being sought in central Asia.

1933. Merimde-Benisalame und Ma'adi. In H. Junker, Vorläufiger Bericht über die Grabungen von Merimde-Benisalame, Anz. Akad. Wiss., Wien, Jhg. 70, pp. 83–97.

In a preliminary report on the excavations at the Neolithic settlement of Merimde-Benisalame (western Delta region of Egypt) a short account of the faunal finds is given (pp. 88, 89) and their significance in tracing early stock-farming in Egypt is emphasized. The faunal remains show close resemblance to those from Ma'adi (cf. Menghin and Amar, 1932), especially in the abundance of bones of the domestic pig.

Pig, cattle, sheep, and goat(?) are also recorded. In spite of the great amount of skeletal material no trace of either equids or camels was detected.

**Menghin, Oswald, and Amar, M.**

1932. The excavations of the Egyptian University in the Neolithic site at Ma'adi. Egypt. Univ., Fac. Arts, Publ. 10, 59 pp., 78 pls.

The bone material from the Ma'adian culture (ca. 3000 B.C.) in Lower Egypt is discussed briefly (p. 52). A considerable number of oxen, sheep, goats and pigs could be distinguished. The importance of the high frequency of pigs in early Neolithic sites from Lower Egypt, as contrasted to the few faint traces of pig-breeding in Upper Egyptian sites from the same era, is emphasized, and the marshy Delta region is considered to be the pig-breeding center of prehistoric Egypt.

**Merkens, J.**

1929. Die Abstammung des Java-Madurarindes—zugleich eine Untersuchung über die Verwandtschaftsbeziehungen von anderen Rinderrassen niederländisch Indiens nach der Präzipitationsmethode. Z. Tierz. ZüchtBiol., Bd. XVI, pp. 361–400, 20 figs., 9 tables.

An extensive series of precipitation tests was made, in order to investigate the serological relationship of cattle in the Dutch East Indies in general and of the Java-Madurese cattle in particular. The results confirmed the view that the Java and the Madurese cattle originated from a cross between banteng and zebu; both are related mutually as well, with the zebu on one side and the banteng (Bali cattle, *Bos sondaicus*) on the other.

Zebu and Friesian-Dutch (*Bos taurus*) cattle show almost the same relationship reciprocally as each of them does with the banteng, the banteng being more closely related to the buffalo (*Bos bubalis*) than the two former. The buffalo shows less affinity to the bovines *sensu stricto* than those do among themselves. It is in an intermediate position between the investigated Bovinae and the sheep.

The high titer of Shorthorn and Jersey against anti-Friesian-Dutch serum on the one hand and anti-zebu on the other seems to confirm the view of a diphyletic origin of European breeds of cattle.

**Mikesell, Marvin W.**

1955. Notes on the dispersal of the dromedary. *Sthwest. J. Anthrop.*, vol. 11, no. 3, pp. 231-245.

Wild *Camelus dromedarius* occurred in northern Africa and probably in Palestine and Arabia in Pleistocene and prehistoric times, but it became extinct in northern Africa during Early Dynastic time without having been domesticated there, leaving only a few early evidences of its presence. The most probable site of domestication was southern Arabia (Yemen and Hadramaut), where agricultural people with domestic animals (goats, cattle, asses) lived in close proximity to the desert. The dromedary first appears clearly in the historical record in Mesopotamia during Assyrian times. The domesticated animal was then introduced into Egypt in numbers by the Persians, although some individuals had probably been taken there occasionally before (cf. Free, 1944, and Forbes, 1955). From Egypt the domestic dromedary spread across the Sahara, very possibly prior to the first century A.D., the time usually assigned to this event.—C.A.R.

**Mirov, N. T.**

1945. Notes on the domestication of reindeer. *Amer. Anthrop.*, n.s., vol. 47, no. 3, pp. 393-407.

Early records and archaeological evidences of the distribution of the reindeer in past and present times are summarized, and previous investigations on the origin of reindeer-breeding are critically reviewed. A map visualizing the recent distribution of reindeer is added.

**Mohapl, Franz**

1914. Untersuchungen über das prähistorische Rind Mährens. *Mitt. landw. Lehrk. Wien*, Bd. II, pp. 75-97, 4 pls. with 8 figs.

Skull fragments of cattle from several Neolithic sites from Moravia (especially from the lake dwellings near Olmütz) are investigated. Most of the domestic specimens belong to the *brachyceros* and only a few to the *primigenius* type. It is suggested that it had been principally the small *brachyceros* ox that was distributed and kept among the Slavonian settlements during the Neolithic.

**Mond, Robert, and Myers, Oliver H.**

1934. The Bucheum. The Egypt Exploration Society, London.

J. W. Jackson reports on the remains of sacred cattle from the Baquaria and the Bucheum at Armant, Upper Egypt (New Kingdom and Roman period) (vol. I, chap. 17, pp. 137-142; pl. xevii in vol. III).

The skeletal parts examined resemble closely those of the Celtic shorthorn (*Bos brachyceros*=*B. longifrons* Owen).

**Morrison-Scott, T. C.**

1952. The mummified cats of ancient Egypt. *Proc. zool. Soc. London*, vol. 121, pp. 861-867.

About 200 skulls of mummified cats, excavated at Gizeh and dating from 600-200 B.C., form the basis for a study of ancient Egyptian cats and their identity.

A craniological examination and statistical analysis lead to the conclusion that two forms of cat were mummified. The larger form, the domestic status of which is questioned, represents *Felis chaus*. The smaller and by far the commoner mummies appear to represent a domestic form of the wild *F. libyca* Forster, called *F. libyca bubastis*.

**Morse, E. W.**

1912. The ancestry of domesticated cattle. U. S. Dept. Agr., 27th Ann. Rep., Bur. Anim. Ind., 1910, pp. 187-239, pls. XIII, XIV, 16 figs.

A treatise on cattle ancestry, introduced by a historical sketch of bovid evolution throughout the Pleistocene, wherein the probable progenitors for domestic oxen are sought. *Bos namadicus* is taken as the ancestor of *B. primigenius*, which gave rise to a number of domestic varieties (*B. trochoceros*, *B. frontosus*, *B. longifrons*). *Bos africanus* Fitzinger, proposed to designate the ancient Egyptian cattle (cf. Lortet and Gaillard, 1903-09), is regarded as a local race of the *primigenius* type. *B. brachycephalus* is seen as a derivative of a different species.

**Munro, Robert**

1902. On the prehistoric horses of Europe and their supposed domestication in Paleolithic times. Arch. Jour., vol. 59, pp. 109-143. London.

A consideration of the paleontological and archaeological evidence known at the dawn of the twentieth century on horses of the Paleolithic and Neolithic periods in Europe. The author suggests that horses were not tamed in Europe in pre-Neolithic times, but that in early Neolithic periods domesticated horses derived from wild Asian species were brought into Europe by Aryan immigrants.

**Nachtsheim, Hans**

1929. Die Entstehung der Kaninchenrassen im Lichte ihrer Genetik. Z. Tierz. ZüchtBiol., Bd. XIV, pp. 53-109, 10 figs., 6 tables, 3 colored pls.

The origin of strains in the domestic rabbit is studied on the basis of the genetics of skin and hair characters. The author lists twenty factors influencing color pattern and hair character, which rose by mutations during domestication, and which were fixed by breeding.

The ancestor of the domestic rabbit is proved to be the wild rabbit of southwestern Europe (*Oryctolagus cuniculus*) which probably was first tamed by the Romans in Spain.

1936. Vom Wildtier zum Haustier. viii+100 pp., 50 figs. Alfred Metzner (Berlin).

A survey of domestic animals and their origin. The rabbit is taken as a sample species, and its genetic characters and mechanisms are compared with those found in other domestic animals. Special emphasis is given to the parallel characters which occur independently in various groups of domestic animals, and an attempt is made to work out their genetic and physiological background.

1938. Vom Wesen der Domestikation. Biologe, Jhg. VII, Heft 10, pp. 321-329.

It is explained that mere taming of wild animals never led to the stage of true domestication. The latter was reached only by selection of mutations, deleterious in the wild stage but useful for man, over many generations.

### Nehring, Alfons

1936. Studien zur indogermanischen Kultur und Urheimat. Wiener Beiträge zur Kulturgeschichte und Linguistik, Jhg. 4, pp. 7-229.

Investigating the origin of the Indo-European civilization, the author deals (pp. 64-117) with the sources of its domestic stock, mainly from the linguistic point of view. In some forms a local origin from southeastern Europe is conceivable, as in the case of goat and pig, the latter being domesticated usually from the wild, indigenous animal everywhere. In most cases, however—sheep, dog, cattle, horse—the domestic breeds are clearly of Asiatic origin.

### Newberry, P. E.

1928. The pig and the cult-animal of Set. J. Egypt. Archaeol., vol. XIV, pp. 211-225, 2 pls., 6 figs. London.

The first sections (1-3) contain a collection of archaeological, philological and ethnological evidences for the occurrence of the domestic pig in Egypt from pre-dynastic times. In section 4, which deals with the origin of the domestic pig, current views on the subject are given, and the point is stressed that pig breeding was associated with an agricultural but not with a pastoral life. Wild, domestic and feral pigs are compared, and the last is taken to be the cult-animal of Set.

### Newbold, D.

1928. Rock-pictures and archaeology in the Libyan desert. Antiquity, vol. 2, pp. 261-291, 9 pls., 6 figs.

The area of this study is generally west of the big bend of the Nile at Dongola. The rock-carvings probably range in time from late Paleolithic to relatively recent historical time. In the pre-Christian era, the domestic camel was unknown in these deserts, and transportation was by horse, ox, or donkey. The hunting dogs shown are very spirited, and probably are of Dynastic times. The big-horned *Bos africanus* of proto-dynastic and Old Kingdom times is the commonest type of cattle represented; it was replaced in the Middle Kingdom by *B. brachyceros*. Some of the sites have only *B. africanus* represented, but others have both.—C.A.R.

### Nitsche, Max

1924. Untersuchungen über fossile Schweinereste Böhmens und ihre Beziehungen zu dem iglauer Landschwein. Z. indukt. Abstammung- u. Vererb.-Lehre, Bd. 35, pp. 59-94, 6 tables.

A study of three sub-fossil pig skulls found in the vicinity of Teplitz (Bohemia). Two skulls from the late Neolithic, identified as those of descendants of *Sus scrofa ferus* are in a stage of primitive domestication. The third skull—a peat find from Tschentschitz, belonging to the Bronze Age—is considered a feral pig and shows resemblance to a Swedish race of the turbarry pig *S. s. palustris*.

1928. Untersuchungen über fossile Pferdereste Böhmens.— Ein Beitrag zur Abstammung der Pferderassen. Z. induct. Abstammung- u. VererbLehre, Bd. 51.

A detailed description of three equid skulls, found in the environs of Teplitz and Aussig (northern Bohemia). One skull belongs to a tarpan-like form (wild), the second is regarded as a dwarfed horse of the prehistoric type found in Spain (the proposed ancestor of the Kladruber breed), and the third is related to a dwarfed form of the "Occidental" race, close to the type *Equus caballus fossilis* var. *germanicus* Nehr.

In the first part new craniometrical methods and indices for equids are suggested, which—though using traditional measurements—express the image of the skull characters actually seen. Former data from the literature are revised and compared on the basis of the new methods.

Noack, Th.

1907. Wolfe, Schakale, vorgeschichtliche und neuzeitliche Haushunde. Zool. Anz., Bd. 31, Nr. 21–22, pp. 660–695.

An investigation of north African domestic dogs and of jackals and wolves kept in captivity shows that the new environment causes rapid changes in the skull of the wild animals, resembling partly the craniological modifications typical for the domestic dog. Jackals and wolves are therefore regarded as the only ancestors of the domestic dog, with pariah dogs and dingos representing feral types.

1909. Haustierte der Altai-Kalmücken. Zool. Anz., Bd. 34, Nr. 4, pp. 683–695, 750–760, 782, 787.

In an investigation of the crania of certain domestic breeds of the Altai-Kalmucks (southeast of Biisk, the region around the head-waters of the River Ob) the author stresses the affinities of the Kalmuck dog with *Canis familiaris inostranzewi*, of the Kalmuck cattle with *Bos brachyceros*, and the resemblance of the Kalmuck horse to *Equus przewalskii*.

The identification of the Kalmuck cat with a domestic variety of the East Asian *Felis microbis* is followed by a discussion of the origin of the European domestic cat, the cradle of which is found in northern Africa.

- 1915a. Über den mumifizierten Kopf eines Inkahundes aus dem Totenfelde von Ancon in Peru. Zool. Anz., Bd. 46, Nr. 2–3, pp. 62–64, 65–70, 6 figs.

A mummified head found in a pre-Spanish cemetery at Ancon (Peru) is described, and the skull identified as *Canis ingae* (Tschudi).

The author excludes the possibility that this type descended from an indigenous South American canid and suggests a relationship to the European peat-dog group.

- 1915b. Über die Schädel vorgeschichtlicher Haushunde im Römermuseum zu Hildesheim. Zool. Anz., Bd. 46, Nr. 2–3, pp. 76–94, 9 figs.

Skulls and skull-fragments of dogs from Neolithic finds near Hildesheim (Germany) are compared to recent and fossil canids and studied in terms of their phylo-

genetic relationship. In the remains of three large dogs, a resemblance to the Indian wolf *Canis pallipes* is found; this type is named *C. pallipes domesticus* and is seen as a connecting link in the evolution of the large domestic dogs. An achievement of the Indo-European Aryans, it spread from east to west (contrary to the *C. palustris* group, which dispersed eastward) and became the ancestor of the shepherd-dog type.

**Oppenheim, Leo, and Hartmann, L.**

1945. The domestic animals of ancient Mesopotamia—according to the XIIIth tablet of the series Har.Ra-Hubullu. *J. Near East. Stud.*, vol. IV, pp. 152–177.

A translation and explanation of the famous Sumerian-Akkadian tablet which classifies sheep, goat, ox, and donkey, designating these animals with an abundance of names and attributes.

**Otto, F.**

1901. Osteologische Studien zur Geschichte des Torfschweines und seiner Stellung innerhalb des Genus *Sus*. *Rev. suisse Zool.*, Tom. IX, No. 1, pp. 43–130, pls. iii–ix.

A detailed study of the turbary pig (*Sus scrofa palustris*) from the Swiss lake-dwellings. In its first part the paper traces the evolution of the skull, noticeable in the different periods, from the earliest sub-fossils via the Celtic-Helvetian to the Bronze and Iron Age. In the second part, an examination of the crania of recent domestic pigs and wild boars, the turbary pig is represented as a probable derivative of the Asiatic boar *Sus vittatus*.

**Page, J. W.**

1939. From hunter to husbandman. 256 pp., illus. George G. Harrap & Co., Ltd. (London).

A popular treatment, principally an attempt to trace the origins and development of pastoralism and agriculture, the ancestry of domestic cattle, sheep, goat and pig, and the origin and early evolution of the domestic ass, horse, camel and reindeer.

**Patterson, Bryan**

1937. Animal remains from Alishar Hüyük. *Orient. Inst. Publ. (Univ. Chicago)*, no. 30, pp. 294–309, figs. 248–254.

Description of animal remains collected at Alishar Hüyük (Anatolia) during the excavations in 1927–32, ranging from Chalcolithic to Phrygian-Hellenistic layers. Most abundant among the bones of domestic animals were remains of sheep, which appeared to be represented by the “copper sheep” type in the Hittite levels, by a cross of the latter with the turbary sheep in the earlier strata.

Some remains of a domestic goat resembled *Capra prisca*, while horn-cores of cattle pointed to the *brachyceros* type. Pig remains—present at all levels—indicated that the Alishar swine belonged to the *Sus scrofa* group. Fragments of domestic dogs are referred to as *Canis familiaris palustris ladogensis* and *C. f. inostranzewi* respectively. Equid remains, of indeterminable type, were scarce.

**Peet, T. Eric**

1914. The Cemeteries of Abydos, Part II.—1911–1912. Egypt Exploration Fund (London), Mem. 34, pp. xvi+133, 39 pls., 89 figs.

According to the identifications of Kathleen Haddon (pp. 6–7), the Amratan levels from Abydos (30 km. north of Luxor, Egypt) yielded bones of large oxen, sheep (tentatively identified as *Ovis palaeoaegypticus*, but these could have been goats), part of a goat (*Hircus mambricus*), and a part of the mandible of a dog similar to that of a pariah dog. No statement as to possible wild or domestic status of the animals is made.—C.A.R.

**Pequart, Marthe, et al.**

1937. Tévéc, station-nécropole mésolithique du Morbihan. Arch. Inst. Paléont. hum., Mem. XVIII, 227 pp., 19 pls., 20 figs.

In the faunal assemblage from the Mesolithic dwelling place at Tévéc (on an island off the Bay of Quiberon, Morbihan, France) examined by M. Boule were remains of a domestic dog (pp. 101–102). The dog resembled *Canis familiaris palustris* from the Swiss lake-dwellings and the Danish kitchen middens.

**Petters, V.**

1934. Beitrag zur Kenntnis der südafrikanischen Haushunde. Z. Säugetierk., Bd. IX, pp. 142–163, 11 figs.

The origins of South African Kaffir dogs are described and studied. Recent specimens show a strong influence of European breeds, but the original type points to a close relationship with the North African greyhounds.

**Philipschenko, J. A.**

1928. Untersuchungen an Haustieren im Turkestan. Züchtungskunde, Bd. III, pp. 398–417, 1 map, 7 figs.

Summary of some results of an expedition to eastern Kasakstan on the Russian-Chinese border (1926–27). The fat-tailed sheep of Kasakstan is seen as a descendant of the wild argali, first tamed in this area, where once a member of the argali group—*Ovis ammon koslovi* (now restricted to the Gobi desert)—had been indigenous. The Kirghiz goat is regarded as belonging to a markhor (*Capra falconeri*) type.

1933. [Contributions to the origin of the domestic pig.] (Russ., Eng. summ.) Transcript of the conference on the origin of domestic animals, held at the Laboratory of Genetics, Acad. Sci. USSR, Leningrad, 1932, pp. 157–185, 11 figs.

Craniological studies led to the conclusion that three races of wild boars are ancestral to the domestic pig: (1) the European and Western Asiatic wild boar *Sus scrofa*, with three subspecies (*S. s. scrofa*, *S. s. attila* Thomas and *S. s. nigripes* Blanford); (2) the Eastern Asiatic wild boar *S. orientalis*, also with three subspecies (*S. o. continentalis*, *S. o. raddeanus* and *S. o. moupinensis*); (3) the South-eastern Asiatic *S. vittatus*.



**Pia, Julius**

1941. Rassenkundliche Untersuchungen an Schädelresten des altägyptischen Hausrindes. Z. Tierz. ZüchtBiol., Bd. XLVIII, pp. 17-55, 14 figs., 10 tables.

Investigation of eleven skulls of domestic cattle from various Egyptian excavations, among them two from predynastic sites. On the basis of craniometrical comparison the ancient Egyptian cattle are taken to be of *primigenius* type, most resembling the Hungarian Grey Steppe breed. The animal sculptures confirm the view that this longhorned breed was dominant in prehistoric and early dynastic Egypt.

- 1942a. Untersuchungen über die Rassenzugehörigkeit der altägyptischen Hausziege. Z. Tierz. ZüchtBiol., Bd. LI, pp. 295-307, 4 pls.

A study of about thirty skulls or skull fragments of goats from ancient Egypt, all of which are designated as typical *prisca*. Animal remains and representative art indicate that this species (*Capra prisca*), characterized by homonymous twisted horns, was the only one kept in Egypt from the first dynasty until the Late Kingdom. In prehistoric times, another, dwarfish breed of goat occurred in Egypt.

- 1942b. Beobachtungen an Schädeln des altägyptischen Hausschafs. Z. Tierz. ZüchtBiol., Bd. LIII, pp. 171-179, 2 pls.

Description of more than fifty skulls from ancient Egyptian sheep, all belonging to a spiral-horned, fleecy race which appeared about the twelfth dynasty and completely displaced the older, hairy, "goat-horned" race (cf. Dürst and Gaillard, 1902). The horns described are similar to those of the "Ram of Ammon," represented in Egyptian art from the twelfth dynasty on.

**Piggot, Stuart**

1950. Prehistoric India. 293 pp., 8 pls., 32 figs. Penguin Books, Harmondsworth, Middlesex.

A short summary of the domestic stock of prehistoric India, as reflected by the finds from Harappa (cf. Prashad, 1936) and Rana Ghundai in Baluchistan (pp. 155-158). The cradle of the domestic horse is discussed briefly (pp. 266-267).

**Pilgrim, Guy E.**

1947. The evolution of the buffaloes, oxen, sheep and goats. J. Linn. Soc. (Zool.), vol. 41, no. 279, pp. 272-286, 6 figs., 1 diagram.

Essentially an outline of the evolution of the Bovidae as shown by the fossil record, but also an account of living representatives of wild oxen, sheep and goats and their probable relation to recent domestic forms. *Ovis orientalis* is seen as ancestor of the turbary sheep; some domestic sheep are derived from *O. ammon*, while *O. vignei* is taken to be the probable progenitor of the prehistoric domestic breeds from Turkestan.

Domestic goats are derived partly from the markhor and partly from the bezoar goat (*Capra aegagrus*) or from a cross of the latter with the descendants of the Pleistocene *C. prisca*.

**Pira, Adolf**

1909. Studien zur Geschichte der Schweinerassen, insbesondere derjenigen Schwedens. Zool. Jb., Allg. Zool., Suppl. 10, pp. 233-426, 52 figs., 10 tables.

An extensive study of prehistoric pig remains from peat-moors and Neolithic sites in Ringsjön (Schönen), Gottland, Aloppe (Uppland) and Anneröd (Bohnslän). Osteological differences between wild and domestic forms are worked out (pp. 344-371).

The first domestic pigs appeared in the late Stone Age, where, besides the wild boar—*Sus scrofa antiquus* (already hunted in previous periods)—a form occurred intermediate between the latter and the turbary pig, which in its pure type (*S. s. palustris*) appears only much later. The long chain of transition stages from the wild boar to the domestic turbary pig may indicate that the tamed races have been developed in Sweden as a result of a local domestication from an indigenous wild stock.

1926. On bone deposits in the cave "Stora Förvar" on the isle of Stora Karlsö, Sweden. A contribution to the knowledge of prehistoric domestic animals. Acta Zool., Bd. VII, pp. 123-217, 18 tables.

A study of the skeletal fragments from a typical Stone Age kitchen midden, excavated in the cavern of Stora Förvar on the island of Stora Karlsö off the south-west coast of Gottland.

Remains of domestic animals are absent or rare in the lowest layers (mainly seal bones), but they become by far the majority in the upper strata, comprising bones of ox, dog, goat, sheep, pig and horse. The dog is of the peat-dog (*palustris*) type. The goat—a rare animal on Stora Karlsö—is taken to be derived from *Capra aegagrus*, while the Förvar sheep (much more frequent than goat) is considered a derivative of the mouflon (*Ovis musimon*), the rams being horned, the ewes hornless. Cattle are of the *brachyceros* type, which is regarded by the author as a domestic variation of the wild *Bos primigenius ferus*.

**Pittard, Eugene, and Reverdin, L.**

1921. A propos de la domestication des animaux pendant la période néolithique. Arch. suisses Anthropol. gén., Tom. IV, no. 3, pp. 259-271.

A reconstruction of the domestic fauna in the Swiss Neolithic, based on a statistical review of animal remains from sites near the lake of Neuchâtel.

Five domestic species—cattle, dog, pig, sheep and goat—were present from the lowest levels, the frequency of the first three decreasing in the later strata. Horses were absent. While the majority of pig bones were those of young animals, the remains of the other forms proved to be mainly those of adults.

**Pohl, A.**

- 1950-52. Das Kamel in Mesopotamien. Orientalia, vol. XIX (n.s.), pp. 251-253; vol. XXI (n.s.), pp. 373-374.

Camel representations in Mesopotamia from the third millennium B.C. are listed and seen as evidence that tamed camels were kept during the corresponding periods.

**Prashad, B.**

1936. Animal remains from Harappa. Mem. Archaeol. Surv. India, no. 51, 62 pp., 7 pls.

A systematic description of the animal remains from Harappa in the Indus valley, collected during the seasons from 1924-25 to 1930-31. The material—dated back to the third millennium B.C.—contained skulls and other skeletal parts of dog, cattle, sheep and goat, besides fragments from the one-humped camel, the Indian pig (*Sus cristatus*, all parts of young animals), the domestic ass, the domesticated buffalo and an apparently domestic cat.

The dog—named *Canis tenggeranus harappensis*—showed marked skull-affinities to the Indian wolf (*Canis pallipes*) and is considered the ancestor of the Indian greyhound. Cattle found were of the humped zebu (*Bos indicus*) and the humpless type, both regarded as descendants of *B. primigenius*. Sheep were identified with *Ovis vignei (domesticus)*. The goats of Harappa were regarded as derived from *Capra aegagrus* and their probable cradle of domestication is sought within the Indus valley.

**Pycraft, F. Z. S.**

1938. The origin of domesticated animals. Ill. London News, vol. 102, p. 444.

Popular discussion of some general aspects involved in the origin of domestic animals. Examples are taken mainly from domestic birds.

**Ralph, Elizabeth K.**

1955. University of Pennsylvania radiocarbon dates I. Science, vol. 121, pp. 149-151, 1 fig.

The  $C^{14}$  determinations for certain key levels in Belt cave, northern Iran (see Coon, 1951, 1952) are: (1) Earliest pre-pottery Neolithic, with sheep and goats supposedly domesticated ( $7790 \pm 330$  years ago); (2) Mesolithic, which contained bones of a large breed of domestic dog ( $11,480 \pm 550$  years ago).—C.A.R.

**Randall-MacIver, D., and Mace, A. C.**

1902. El Amrah and Abydos, 1899-1901. Egypt Exploration Fund (London), Mem. 23, pp. xiii+108, 60 pls.

Amratian graves from the prehistoric site of El Amrah (north of Luxor, Egypt) yielded several clay figurines of cattle (pp. 16-17, 41; pl. ix), some of which were mounted four abreast on a single base and one of which showed a remarkably large udder. These figurines lack the kind of evidence (halters, ropes, stall, mangers, fencing, etc.) that would indicate domestication, but it would appear that the people who made these rough grave-goods knew the models as household animals. Figurines of pigs were rare; remains of goats are mentioned.—C.A.R.

**Randhawa, M. S.**

1946. Role of domesticated animals in Indian history. Sci. & Cult., Calcutta, vol. XII, no. 1, pp. 5-14, 4 figs.

A popular account of the domestic stock of ancient India. The first domesticated breeds, kept by the Negritos and by the Proto-Australoid population, comprised dog, elephant and buffalo; with the invasion of Aryan-speaking tribes (around 1600 B.C.) the elephant-buffalo culture was replaced by a horse-cow culture, though the buffalo was retained in certain parts throughout later times.

Independent domestication centers are suggested for the Bactrian camel (central Asia) and the dromedary (northern Africa). Sheep and goat were probably first domesticated in the mountains of Turkestan.

**Rathjens, Carl**

1955. Die tierischen plastischen Darstellungen. Mitt. Mus. Völkerk. Hamb., vol. XXIV, pp. 114-139, figs. 181-188.

In his report on three archaeological surveys in southern Arabia, the author deals with the first occurrence of cattle, sheep, ass, horse, camel, and dog on the Arabian peninsula. The domestication of the ass is seen as one of the most ancient achievements. It was introduced from eastern Africa, where its domestication originated. Also introduced very early were ox and sheep, the former by sea and the latter by the land route from the north. The domestic horse is regarded as a much later introduction.

The domestication of the one-humped camel started prior to the third millennium B.C. in northeastern Africa, where it later disappeared. It was probably introduced from Mesopotamia into Arabia before the beginning of the second millennium B.C.

**Reinhardt, Ludwig**

1912. Kulturgeschichte der Nutztiere. In L. Reinhardt, "Die Erde und die Kultur," Bd. III. Ernst Reinhard (München).

A comprehensive compilation of archaeological and ethnological data on all animals ever domesticated or tamed in the Old and the New World. Mammals, birds, and fishes as well as "domestic" invertebrates are treated, and their evolution from the dawn of civilization throughout history is outlined. The text is illustrated by many reproductions of archaeological and zoological nature.

**Reitsma, G. G.**

1932. Het schaaap. Zool. onderzoek d. Nederl. terpen. I. Wageningen. 46 pp., 65 figs. Fonds Landbouw Export Bureau 1916-1918.

All sheep bones encountered in the "terpen" (mounds of refuge in the prehistoric swamps of Holland) originate from one identical breed, the "Terp" sheep, which is still extant as the primitive "Drentsch Heide" sheep. It is not plausible to regard the "Terp" sheep as the ancestor of the "Frisian Milk" sheep.

The encountered skulls and skull fragments of *Ovis aries palustris* have all belonged to females. *O. a. studeri* never existed; the skeletal remnants ascribed to that breed are from male specimens of *O. a. palustris*. The so-called Bronze sheep never existed as an autonomous breed, but is merely a non-horned variety of the female *O. a. palustris*. The "Drentsch Heide" sheep is, through the "Terp" sheep, the lineal descendant of *O. a. palustris*.—D.H.

1935. Het varken. Zool. onderzoek d. Nederl. terpen. II. Wageningen. 58 pp., 93 figs. H. Veenman & Sons.

In the "terpen," as well as near Swiss lake-dwellings, remains have been found of wild boars and domesticated pigs. The wild form is *Sus scrofa*, the European wild pig. The domestic pig is derived directly from *S. scrofa*; the names "*S. verrucosus*," "*S. vittatus*," and "*S. mediterraneus*" are not to be considered, since these are also derived from *S. scrofa*.

The remains of domesticated pigs found in Swiss lake-dwellings show no essential differences; such variability as is present is due to individual variation,

differences in the degree of domestication, and differences in absolute size. Thus *Sus scrofa palustris* Rüt. may be designated *S. s. domesticus palustris*. The small deviations that have been noted between this latter and the Dutch mound-hog, sometimes called *S. s. domesticus tumulorum*, are exclusively the results of differences in the degree of domestication and in differences of environment. Both represent one domesticated form of *Sus scrofa*.—D.H.

### Reverdin, Louis

**1921.** La faune néolithique de la station de Saint-Aubin, Port-Conty, Lac de Neuchâtel. Arch. suisses Anthropol. gén., Tom. IV, no. 3, pp. 251-254.

A short summary of the animal remains from two layers (III and IV) of the Neolithic site at Saint-Aubin (Switzerland). Domestic animals constituted about 70 per cent of the total. Cattle (*Bos brachyceros*) occupied first place in both levels, followed by the dog in level IV, by the pig (*Sus palustris*) in level III. Fewer remains belonged to the domestic sheep (4-9 per cent) and to the goat (*Capra hircus*) (4.4-6.6 per cent).

**1927-28.** Recherches sur les mandibules de chien du niveau inférieur néolithique lacustre. Bull. schweiz., Ges. Anthropol., Tom. IV, pp. 18-20.

Mandibles of ca. 54 dogs—a part of the faunal remains from the deepest stratum at Saint-Aubin (cf. Reverdin, 1921)—are studied. The animals were apparently slaughtered and eaten. Most of the mandibles are in the variation range of the peat-dog *Canis familiaris palustris*; some, however, deviate significantly in their jaw indices, which fact leads to the assumption that more than one form of dogs were represented among the Neolithic fauna of Switzerland.

**1928.** Sur la faune du néolithique ancien et moyen des stations lacustres. Arch. suisses Anthropol. gén., Tom. V, no. 1, pp. 41-46.

A brief summary of the frequency of domestic species out of the total faunal remains from Saint-Aubin (cf. Reverdin, 1921) and Cortaillod, in which the relative decrease of domestic animals during the transition from the early to the middle (—late) Neolithic is shown. In Saint-Aubin domestic animals (ox, pig, sheep, goat, dog) constituted 67.8 per cent of the total fauna in layer IV, and only 55.6 per cent in layer III. At Cortaillod the corresponding percentages were 56.8 in layer IV and 54.5 per cent in layer III. The decrease affected especially sheep and goat (from 20.2 per cent to 11.2 per cent in Saint-Aubin) and dogs (in both sites from 11.6 to 3.7 per cent).

**1930-31.** Sur la faune du kjokkenmodding Morbihannais, Er Yoh, et ses rapports avec celle des stations lacustres de la Suisse. Arch. suisses Anthropol. gén., Tom. VI, no. 1, pp. 79-86.

A study of the animal remains from the Neolithic kitchen middens at Er Yoh (off the coast of Morbihan, France), the results of which are compared briefly with the fauna of the Neolithic sites from Lake Neuchâtel. Most frequent remains among the domestic stock of Er Yoh were those of the turbary sheep (about 62 per cent) and small cattle of *brachyceros* type (28.5 per cent); a few remains were of a larger type of cattle and of the turbary pig (*Sus scrofa palustris*). The few equid remains are considered to belong to a wild horse.

**Revilliod, P.**

1926. Sur les animaux domestiques de la station de l'époque de La Tène de Genève et sur le boeuf brachycephale de l'époque Romaine. Arch. Sci. Phys. nat., vol. VIII, pp. 65-74.

The finds of La Tène—a settlement from the Iron Age near Geneva—are described (cf. Schwarz, F., 1918). Among 400 bones and bone fragments there were 148 of cattle, 149 of pig, 69 of sheep, 7 of goat and 26 of dog. All the cattle remains belonged to *Bos taurus brachyceros*. Pigs were represented by *Sus palustris* and sheep showed affinities to the larger specimens of the Neolithic *Ovis palustris*. The single skull of a dog seemed to be related to *Canis inostranzewi*, though in size it resembled *C. intermedius*.

**Revilliod, P., and Dottrens, E.**

1947. La faune néolithique de la couche profonde de Saint-Aubin. II. Les ossements de *Bos taurus brachyceros* Rütim. et de *Bos primigenius* Boj. Rev. suisse Zool., Tom. 54, no. 22, pp. 459-544, 12 figs.

A critical examination of the cattle remains from Saint-Aubin (cf. Reverdin, 1921, 1928; Dottrens, 1946) and a discussion of the remains of large cattle from the lake-dwellings, identified as a domestic race of the aurochs *Bos taurus primigenius*. A biometrical study revealed that sexes of the small, Neolithic *brachyceros* race were much less distinct than they are in domesticated cattle today, while dimorphism in sexual size is marked in the wild urus.

The great majority of the remains from Saint-Aubin (stratum IV) belonged to the domestic *Bos taurus brachyceros* and the few *primigenius* bones are those of wild cattle, either males or females; no reason is seen to admit the existence of a domesticated race of the urus in the early Neolithic of this site.

**Reynolds, Sidney H.**

1939. The Bovidae. Monog. Brit. Pleist. Mamm., vol. 3, pt. 6, pp. 1-65, 5 pls., 20 figs.

Although the bulk of this monograph is devoted to a study of the distribution and osteology of *Bos primigenius*, consideration is also given to *B. longifrons*, the Celtic Shorthorn. This latter is clearly the domestic ox of the British Neolithic. It is unknown from the British Pleistocene, and was introduced as a domestic animal to Ireland (which never had native cattle). The ancestry and place of domestication of *B. longifrons* are unknown; some think it was merely a domesticated and smaller variant of *B. primigenius*, but others think it a distinct wild species that became domesticated, whereas *B. primigenius* was never domesticated.

In a historical review it is shown that "urus" (not "aurochs") is the correct common name for *B. primigenius*.—C.A.R.

**Rice, Victor**

1942. Breeding and improvement of farm animals. xx+750 pp., 212 illus. McGraw-Hill Book Co. (New York and London).

Chapters 2 and 3, section I, deal briefly and in a popular way with the evolution of man and the domestic animals.

**Richter, Curt P.**

1952. Domestication of the Norway rat and its implication for the study of genetics in man. *Amer. J. Hum. Genet.*, vol. IV, pp. 273-285.

The Norway rat was domesticated for experimental purposes, and changes during the course of its domestication are analyzed. These domestic modifications seem to rest upon changes in the endocrine system and are associated with a hypofunction of the adrenals and a hyperfunction of the gonads.

It is suggested that a special selection mechanism may operate under the protected and controlled environmental conditions found under domestication.

**Ridgeway, William**

1905. The origin and influence of the thoroughbred horse. xi+538 pp., 143 figs. Cambridge Univ. Press (London).

A wealth of data on horse breeding in prehistoric and ancient historical times is brought together (pp. 82-424). On the basis of these historical and of biological-morphological evidences as well, the author favors (pp. 425-477) a North African origin for a bay domestic horse, called *Equus caballus libycus*. This variety developed during a long succession of time in Libya and came to Egypt prior to 1500 B.C., about the same time that the North Eurasian (originally dun or white) horse was brought into Mesopotamia. By 1000 B.C. the Libyan horse spread into the Near East, and by blending with the Eurasian stock gave rise to all the improved breeds of the world.

**Riedel, Alfredo**

1948. Resti di animali domestici neo-eneolitici della caverna Pocala (Aurisina) conservati nel Museo dell' Istituto Geologico dell' Universita di Padova. *Accad. Naz. dei Lincei, Rome; Rendiconti, Cl. di sci. fis., mat. e nat.*, ser. 8 A, Tom. IV, pp. 445-459, 5 figs.

A study of the neo-eneolithic faunal remains from the Pocala cavern (near Trieste, Italy), in which typical domestic forms known from the Swiss lake-dwellings were represented.

Described are: *Canis familiaris palustris*, *Sus scrofa palustris*, *Capra hircus*, *Ovis aries palustris*, and *Bos taurus brachyceros*.

1951. Risultati e significato degli studi di paleontologia degli animali domestici. *Natura*, Milano, vol. 42, fasc. 3-4, pp. 101-106.

A study of the fossil remains of prehistoric domestic animals found in Italy shows that most of the species—dog, pig, goat, sheep, and ox—belong to the tertiary types, similar to the forms of the Swiss lake-dwellings. The significance of a statistical analysis in treating sub-fossil material is discussed briefly.

**Ritzoffy, Nikola**

1932. Prinos poznavanju Mangulice. [Study of the Mangalitza pig.] *Vet. Arhiv, knjiga II*, nr. 8-9, pp. 342-412, 21 figs., numerous tables in text, 2 tables append. (Ger. summ.)

A short review of previous investigations on the origin of South Slavian breeds of swine is followed by a detailed craniological study of the Mangalitza pig, which

is kept in Croatia and Slavonia in addition to the primitive Siska pig. The cranio-logical measurements and indices lead to the view that the Mangalitza breed originated from a cross between the European wild boar *Sus scrofa scrofa* and the Mediterranean boar *S. mediterraneus*.

1933. Die Rolle der Inzucht in der turopoljer Schweinerasse. Z. Tierz. Zücht-Biol., Bd. XXVII, pp. 419-429.

The pig breed from Turopolje in Croatia is derived directly from *Sus mediterraneus* Ulmansky and as a result of inbreeding for centuries it retains ancient primitive characters.

**Robinson, A. E.**

1936. The camel in antiquity. Sudan Notes, vol. XIX, part I, pp. 47-69.

A collection of records, archaeological and ethnological, on the occurrence of the Bactrian camel and the dromedary in prehistoric and historic times. The author holds that the ancestor of both forms still lived in predynastic periods on the frontiers of Egypt, retreating later into Asia, where it speciated and where it became domesticated by 1200 B.C.

**Rostafinski, Jan**

1933. Proba systemtyki malych bosidow europy. [Systematics of the small European bovids.] Rozpr. biol. z Zak. Med. wet., vol. XI, nr. 3. (Eng. summ.)

A skull, found at Krzeszowice (Poland), is described and designated as a new race, named *Bos colliceros* Rostafinski, which in size and several characters occupies a somewhat intermediate position between *Bos frontosus* and *B. brachyceros*. In contrast with the latter the horn-cores of *B. colliceros* are keeled.

**Roy, C. R.**

1946. Unicorn in the seals of Mohenjo-Daro and its relation to the religion of the Indus valley civilization. Sci. & Cult., Calcutta, vol. XI, no. 8, pp. 408-411.

A discussion of the representations of the "unicorn," found in several sites of the ancient Indus valley cultures (Mohenjo-Daro, Harappa, etc.). The author doubts the identification of the "unicorn" with the urus, and takes it rather to represent the wild ass. The wild ass is considered a native of the Indus valley from time immemorial, the domestic form being the result of an autochthonous breeding in association with cult-ceremonies.

**Rüger, Jakob**

1942. Die Tierreste aus der spätbronzezeitlichen Siedlung Crestaulta nach den Grabungen 1935-38. Rev. suisse Zool., Tom. 49, no. 18, pp. 251-267.

A brief description of the bone material from Crestaulta (Graubünden, Switzerland), a dwelling place from the Middle Bronze, the culture of which was maintained probably up to the Late Bronze. Domestic mammals constituted the great majority of the faunal remains. The most frequent species were the sheep, followed by cattle and goat. Much fewer remains were those of the domestic pig. Bones of dog and horse(?) were scarce.



**Rumjancev, B. F.**

1936. [Origin of the domestic horse.] (Russ.; Eng. summ.) Bull. Akad. Nauk SSSR, Ser. Biol., nos. 2-3, pp. 415-448, 21 figs., 2 tables. Moskva.

The disputed *przewalski* ancestry for domestic horses is investigated by an extensive morphological comparison of the *przewalski* horse, the Mongolian domestic horse, and the tarpan. It is assumed that the *przewalski* horse—showing a marked resemblance to the half-ass group—played no part in the evolution of the domestic horse. The Mongolian horses are considered, together with the under-sized breeds of northeastern Europe (Clepper, Finnish, Vyatka horses), to be a special “northern group” of domestic horses, which originated independently from the “southern group” (represented by *Equus caballus pumpeley* from Anau; cf. Dürst, 1908) and the “eastern group,” the heavy cart-horses of western Europe.

**Sankalia, H. D., and Karve, I.**

1949. Early primitive Microlithic culture and people of Gujarat. Amer. Anthrop., vol. 51, no. 1, pp. 28-34.

Animal remains were recognized—associated with Microlithic artifacts—at the prehistoric site at Langhnaj (Gujarat, India). According to preliminary studies they comprised bones of sheep or goat, a large form of cattle, and pig, horse and dog.

**Sasaki, Kiyoshuna**

1934. Serological test for the blood relationship of some bovines with reference to the racial discernment. Z. Tierz. ZüchtBiol., Bd. XXIV, pp. 287-300, 8 figs.

The affinities of some races of cattle were tested by means of the precipitine reaction. Two races of European cattle—Holstein-Friesian (of the *Bos taurus primigenius* group) and Aberdeen-Angus (derived by Areander from the hypothetical *Bos taurus akeratos*)—could be distinguished by absorption tests. Holstein-Friesian, improved Japanese native, and their hybrids could not be distinguished mutually.

The blood serum of the South Korean cattle could be distinguished from that of the Holstein-Friesian, but not from that of the Formosan zebu (*Bos zebu indicus planus*), so that the South Korean cattle can be considered a strain from the Indian zebu. The Formosan zebu, however, is more closely related to the Holstein-Friesian than the Formosan water-buffalo.

**Sauer, Carl O.**

1952. Agricultural origins and dispersals. vi+104 pp., 4 pls. American Geographic Society (New York).

A review of “what man has done with the plants and animals at his disposal.” In chap. 2 the cradle of earliest domestication is found in southeastern Asia, where the origin of animals of the household (dog, pig) was associated with vegetative planting—in contrast to herd-animals (cattle, sheep, goat), whose origin has been related to seed farming, practiced first in southwestern Asia. Chap. 3 (pp. 40-61) describes a similar process in the New World, represented by the tropical north-western South American (dog and Muscovy duck) and Andean cultures (llama, alpaca, guinea pig), respectively.

The author accepts the view that sedentary fishing peoples became the first domesticators, that cult associations were the main cause of keeping herd-animals, and that the long and tedious work of domestication was accomplished before the Neolithic opened.

The origin of a series of herd-animals (Equidae and Bovidae) is outlined (pp. 91-95). Four maps show the hearths of domestication and the routes of dispersal of the domestic breeds.

#### Schafer, E. H.

1950. The camel in China down to the Mongol dynasty. *Sinologica, Zeitschr. für chinesische Kultur und Wissens.*, vol. II, pp. 165-195 and 263-290.

A compilation of all Chinese records mentioning the camel, from the very beginning up to the Mongol dynasty (A.D. 1369). The first appearance of the camel as a domesticated animal in the historic Chinese sources is from the northern border countries by the end of the Chou period (the end of the fourth century B.C.).

#### Schmidt, Karl P.

1938. Our friendly animals and whence they came. 64 pp., frontispiece, 11 pls. M. A. Donahue & Co. (Chicago and New York).

A popular guide to the important domestic animals, their origin and their wild ancestors. Dog, cat, cattle, sheep, goat, horse, ass and pig are treated. The story of the domestic mammals is illustrated by twelve colored plates and many text figures.

#### Schmidt, W.

1951. Zu den Anfängen der Herdentierzucht. *Z. Ethn.*, Bd. 76, pp. 1-41.

An examination and discussion of data and evidences concerning early herd-animals and their origin. Domestication of animals is seen as a gradual result of a primitive hunting civilization ("Urkultur"), nomadism associated with herd-animals being a necessary transitional stage. Man came in earliest touch with herd-animals in the steppe lands of central Asia, where the cradles of ancient domestication are sought.

Reindeer supplied the material for the earliest domestication, practiced by Samojedic Sojots by Mesolithic (or even late Paleolithic) times, followed by horses, the taming of which was started in the fifth millennium B.C. among Turk tribes in Iran. Domestic sheep and goats are secondary to horse or camel, the latter itself originally a mere follower of horse-breeding. Cattle-breeding arose also as a secondary element, but its geographical origin remains obscure.

#### Schultze, Robert

1934. Beitrag zur Monographie der Soay-Schafe. *Z. Tierz. ZüchtBiol.*, Bd. XXXI, pp. 229-237, 3 figs.

A morphological investigation of the Soay sheep, kept in a semi-domesticated stage on the Hebrides near the west coast of Scotland (cf. Ewart, 1913). Since skulls and horns exhibit the same characters as those of the wild European mouflon, the straight derivation from *Ovis musimon* is taken to be certain.

**Schwangart, F.**

1928. Zur Stammes- und Typenkunde der Hauskatze. Arbeiter Reichs-Zentrale für Pelztier und Rauchwaren-Forschung, Nr. 9, 32 pp., 9 figs. Arthur Heber & Co. (Leipzig).

*Felis silvestris* and *F. ocreata* are seen as progenitors of the domestic cat, and the main characters of both species are worked out. The suggestion of a third ancestor, *Otolobus manual*, is contested.

1931. Neuere Hauskatzenforschung. Forsch. Fortschr. dtsh. Wiss., Jhg. VII, Nr. 4, pp. 59-60.

The northern wild cat, *Felis silvestris*, is taken to be a secondary ancestor for the domestic cat besides the African *F. ocreata*.

**Schwarz, Ernst**

1922. Über europäische fossile Pferde und den Ursprung der Hauspferde. Sitz. der paläo. Ges. zu Frankfurt a. M., 1921, Paläo. Zeitschr., Bd. IV, pp. 132-134.

Two types of true horses, which roamed in western and southern Europe during the early Pleistocene, are distinguished: *Equus caballus* and *E. stenonis* (distinguished by the degree of complexity in the enamel pattern). Both forms became displaced from Europe during the glacial periods. The latter migrated to Africa and could not come back to Europe, which got separated from North Africa (where *E. stenonis* persisted until the Neolithic). Several times in inter-glacial and post-glacial periods *Equus caballus* returned to Europe from central and eastern Asia.

The domestic "Oriental" breeds (Arabian, Barb) are traced back to *Equus stenonis*. *E. caballus* gave rise to the heavy "cold-blooded" horses and to the small eastern breeds as well.

1928. Über diluviale Pferde der *Equus caballus* Gruppe. Jb. preuss. geol. Landesanst., Bd. 48.

A comprehensive study of the fossil equid material from glacial and post-glacial times, collected in museums of central Europe. The European wild horses are divided into three groups: A small form (*Equus caballus caballus*, comprising *E. robustus*, the tarpan, and the Przewalski horse), an intermediate group (*E. c. plicidens*, often the undomesticated attendant of Paleolithic man), and a large type (*E. c. robustus*=*E. robustus*, *E. mosbachensis*, *E. abeli*). The latter forms did not survive the last glacial period and had no part in the origin of the domestic horses, which in their primitive forms were all of small stature.

Domestication was either started independently in two centers, one in eastern Europe and a second in central Asia, or in a large area comprising both the centers.

1935. On ibex and wild goat. Ann. Mag. nat. Hist., vol. XVI (ser. 10), no. 94, pp. 433-437.

The genus *Capra*, considered to include all the goats, ibexes and turs, is divided into a northern (*Capra ibex*) and a southern (*C. hircus*) group. The author sees in *C. hircus aegagrus* the most primitive type, which gave rise to the majority of domestic goats.

The origin of the screw-horned breeds and their relation to *C. prisca* (cf. Adametz, 1915) is discussed in detail, the latter being regarded as an already domestic goat.

**Schwarz, F.**

1918. Tierreste aus La Tène. Anat. Anz., Bd. 50, pp. 457-472, 12 figs.

Description and short summary of faunal remains from early excavations of the Iron Age site at La Tène near Geneva (for further excavations cf. Revilliod, 1926). Domestic animals listed include horses of the Oriental type, *brachyceros* cattle (with possible incross of *Bos brachycephalus*), turbary pig (cross with the European wild boar may have occurred), two forms of sheep (*Ovis aries palustris* and a hornless type), a big-horned race of goat and the large *palustris* type of dog. None of these animals is considered a result of local domestication from indigenous wild forms.

**Schweinfurth, G.**

1912. Tierbilder und Felseneinschriften bei Assuan. Z. Ethnol., Bd. 44, pp. 627-658.

Study and interpretation of the animal representations at Aswan, which date from prehistoric times on. Among the domestic animals are cattle, represented only by the longhorned form in most ancient times, and much later by a short-horned type, which was, however, never domesticated. Dogs are mainly of a greyhound type, but pariah forms can be identified. The wild ibex is depicted frequently, but there are only few and unclear representations of a domestic goat. Camel images exist from the ancient dynasties. The pig is always shown as being hunted, which fact seems to prove its wild status.

**Scott, J. P.**

1954. The effects of selection and domestication upon the behavior of the dog. Jour. nat. Cancer Inst., vol. 15, no. 3, pp. 739-758.

On the basis of archaeological evidence and behavioral studies, it is assumed that the dog was domesticated from the wolf, *Canis lupus*, in Asia or northern Europe some time between 6000 and 8000 B.C. The jackal, *C. aureus*, is not considered to be a possible ancestor of the dog.

Dogs and wolves have identical basic traits of behavior, but as the result of artificial selection there is a great deal of variability in behavior in different breeds of dogs. The only new character, however, is with regard to the tail carriage, which varies from sickle-shaped to curled in the dog, but in the wolf is almost straight when relaxed.

Wolves are scavengers as well as hunters, and could easily assume a commensal relationship with primitive man. The peaceful and socially cooperative home life of wolves would contribute to the ease of domestication once wolf pups were taken into the human home, where they would come to regard man as part of the social unit. Selection for docility and against wildness, with concomitant changes in the hormone production of the adrenal glands (cf. Richter, 1952), would inevitably follow.—C.A.R.

Sewell, R. B., and Guhr, B. S.

1931. Zoological remains from Mohenjo-Daro. In Sir John Marshall, Mohenjo-Daro and the Indus Civilization, vol. II, chap. 31, pp. 649-673. Arthur Probsthain (London).

An account of the animal remains from the excavations of 1922-27 at Mohenjo-Daro in the Indus valley. The considerable amount of bones from the humped cattle—most of them belonging to calves—seems to indicate that large herds of this animal were maintained. The pig was present in large numbers in this area from the very earliest time, although its status of domestication cannot be taken as certain. The pig is identified with *Sus cristatus*. A fragment of an equid skull shows similarity to the "horse of Anau" (cf. Dürst, 1908).

Shaw, W. B.

1936. Rock paintings in the Libyan desert. *Antiquity*, vol. 10, pp. 175-178, 4 pls.

The site is that of Gilf Kebir, a high plateau in the Libyan desert. The cattle portrayed, tentatively identified as *Bos africanus*, are thought to belong to Old Kingdom and pre-dynastic times. Some wear halters, so were undoubtedly domesticated. Prominent udders would indicate the importance of milk.

A center of animal domestication is suggested for the Abyssinian plateau.—C.A.R.

Sickenberg, Otto

1930. Eine Wildziege der *Capra prisca*-Gruppe aus dem Plistozän Niederösterreichs. *Palaeobiologica*, vol. III, pp. 92-103, 1 fig., 2 tables, 1 pl.

Description of a skull fragment of a wild male goat from the Pleistocene, found near Schleinbach (Lower Austria). The horns show the characters of *Capra prisca*, and are similar in shape and twisting to some domestic breeds (e.g., Pinzgauer), which were considered previously of the *aegagrus* type. The ancestry of *C. prisca* for all European breeds is emphasized.

Simpson, George G.

1936. Horses and history. *Nat. Hist.*, N.Y., vol. 38, pp. 276-289, frontispiece, 6 pls.

A short and popular account of the domestic horse and its history from earliest times.

1951. Horses. xxi+247 pp., 13 pls., 17 figs. Oxford Univ. Press (New York).

A discussion of the derivation of the domestic horse; a monophyletic origin is suggested (pp. 24-33). A brief survey of early records on horse-breeding is given, and various opinions on the origin of the most ancient breeds (Barb, Arabian) are reviewed briefly (pp. 34-41).

Sirelius, U. T.

- 1916-20. Über die Art und Zeit der Zählung der Rentiere. *Trav. ethnogr. Soc. finno-ougr.*, Tom. 33, pp. 1-5. Helsinki.

The author finds the very beginnings of reindeer domestication in the use of tame reindeer as decoys while hunting wild reindeer; the use of the animal as a

beast of burden came next and the keeping of larger herds came later. Based upon a find of a drag-sledge in the moors of Saasigäroi (Finland) from the Finnish Stone Age, it is assumed that the reindeer was already in use as a draft animal at that time.

### **Slawkowski, Wilhelm**

1933. Kleinasien, die Wiege der Haustierzüchtung. *Z. Tierz. ZüchtBiol.*, Bd. XXVII, pp. 287-292.

In a brief historical review the Hittite Empire is seen as the cradle of origin of certain domestic animals. It is suggested that the first domestication of horses, shorthorned breeds of cattle, and fleecy sheep took place in Asia Minor at the beginning of the second millennium B.C.

1940. Die Haustiere Altkretas im minoischen Zeitalter. *Z. Tierz. ZüchtBiol.*, Bd. XLVII, pp. 166-178, 19 figs.

Evidence is brought together to prove that the domestic animals of ancient Crete—cattle, goat, sheep, pig, horse—were all imported, mainly from Egypt and Asia Minor but also from Syria and Mesopotamia. The sources are animal representations and ancient literary records.

### **Slijper, E. J.**

1948. *Mens en Huisdier*. [Men and domestic animals.] 2nd ed. pp. i-vi, 1-410, 22 pls., 298 figs. W. J. Thieme (Zutphen).

This book is intended for the intelligent layman; scientific terms, unsolved problems, and conflicting opinions are avoided as far as possible. The first few chapters deal with the history of the earth and its fauna, the vertebrates in particular. One chapter is then devoted to each of the domestic animals: horse, cattle, goat and sheep, pig, dog, and cat. There are further chapters on the behavior of animals (particularly domestic animals), on the prehistory of the Netherlands, and on evolution. The book is well-edited and profusely illustrated, and has extensive bibliographies.—D.H.

### **Smith, Sidney**

1928. Early history of Assyria, to 1000 B.C. xxvii+418 pp., 24 pls., 22 figs., 7 maps. Chatto & Windus (London).

A discussion (pp. 213 ff.) of the rise to power of the Mitanni kings and their nobles in what is now northern Syria; the date is ca. 1750 B.C. The Mitanni were the first to introduce the domestic horse onto the historical scene, although it had undoubtedly had a long prior history of domestication to the north (cf. Hrozný, 1931). Linguistic evidence indicates a previous and common Irano-Sanskrit experience with horse-domestication, and the building of a technical vocabulary.—C.A.R.

### **Solanet, Emilio**

1930. The criollo horse. *J. Hered.*, vol. XXI, no. 11, pp. 450-480, 20 figs.

A richly illustrated paper on the South American criollo horse, its origin and history. The author emphasizes the derivation of the criollo breed from the Spanish horse only.

**Sommerfeld, Kurt**

1927. Das Madurarind. Z. Tierz. ZüchtBiol., Bd. VIII, pp. 65-112, 9 figs.

A morphological comparison of banteng, zebu and Java-Madurese cattle. The last constitutes the most widespread breed in the Dutch East Indies and is a hybrid offspring of the others. The banteng is derived directly from the indigenous *Bos sondaicus*, which was domesticated on Bali.

**Sowerby, Arthur**

1935. The domestic animals of ancient China. China Journal, vol. 23, no. 4, pp. 233-243.

Popular account of the domestic stock of the ancient Chinese from the Shang dynasty (1776 B.C.) on, based mainly upon animal pictures on the "Oracle bones" and other Chinese artifacts, especially bas reliefs and tomb figures. Special discussion is devoted to horse, cattle (three distinct breeds already recognized in the Han period), and sheep, all of which are considered introduced forms, and to the pig of ancient China, which, in contrast to other breeds, is derived from the native wild boar.

**Staffe, Adolf**

1938. Über einen Hausschweineschädel aus dem fröhdynastischen Ägypten. Z. Tierz. ZüchtBiol., Bd. XLI, pp. 107-115, 4 figs.

A pig skull, found in the tomb of Hetep Heres (6th dynasty, 2400 B.C.), is described and considered to belong to a domestic form. In a brief discussion, the East Asian (*vittatus*) origin for the Egyptian domestic pig is contested. The latter is seen as a descendant of *Sus mediterraneus*.

1939. Die Haustiere auf den nordafrikanischen Feldbildern. Forsch. Fortschr. dtsh. Wiss., Jhg. 15, Nr. 27, pp. 344-346.

A study of the origin of the important African domestic breeds in the light of the rock paintings from eastern and western North Africa. The author accepts the view that domestication originated on a religious basis and sees in the representations primarily an illustration of sacrificial animals.

Both the *primigenius* and the *brachyceros* types of cattle are found from the prehistoric periods on; zebu representations are lacking. Two types of horses, the Oriental and the stouter Occidental, are distinguished, the latter dominating in earlier periods; an ancient domestication center for horses in northwest Africa is suggested. Sheep and goat are almost absent, a fact explained by their association with nomadic life, a settled culture being a basic condition for the practice of rock painting. One of the most frequently depicted domestic animals is the one-humped camel, which fact leads to the suggestion that the dromedary may have been a widely used beast of burden and a riding animal in North Africa in ancient times (from the third millennium B.C.).

1940. Die Frage der Herkunft des Kameles in Afrika. Z. Tierz. ZüchtBiol., Bd. XLVI, pp. 135-141.

The domestication of the camel in Africa in prehistoric times is questioned by the author, who postulates an invasion of camel-breeding tribes from southern

Arabia (via Bab el Mandeb) into eastern Africa during the third or second millennium B.C.

1943. Über zwei Funde vorgeschichtlicher Kurzhornrinder in Spanien. Z. Tierz. ZüchtBiol., Bd. LIV, pp. 99-104, 10 figs.

Skull fragments from a Neolithic site at Tartaren (Lerida), from the Central Spanish grottoes culture, are identified with a typical *brachyceros* type. The *brachyceros* breed is regarded as the earliest stock of domestic cattle kept in Iberia, long before the appearance of *primigenius* derivatives.

**Stegmann von Pritzwald, F. P.**

1924. Die Rassengeschichte der Wirtschaftstiere. viii+371 pp., 108 figs. Gustav Fischer (Jena).

Archaeological and zoological records concerning the origin and domestication of farm animals are summarized and examined in terms of their significance for studies in human history and civilization. The book deals with most of the domesticated ungulates and also with the elephant and the rabbit; numerous illustrations.

**Steinbacher, G.**

1953. Zur Abstammung des Alpakka-Lama Pacos. Säugetierk. Mitteil., Bd. I, Heft 2, pp. 78-79.

On the basis of distinctive behavior, two groups of South American tylopods are distinguished: Alpaca and vicugna on the one side, llama and guanaco on the other. The domestic alpaca is derived from *Vicugna vicugna*.

**Stekelis, M.**

1950. A new Neolithic industry: the Yarmukian of Palestine. Israel Expl. J., Jerusalem, vol. I, pp. 1-19.

Among the finds of a Neolithic culture (8000 B.C.) near Sha'ar ha-Golan in the Jordan Valley, remains of calves, goats, sheep and dogs were found (p. 16), which are considered evidence that pastoralism was known by that time.

**Studer, Th.**

1901. Die prähistorischen Hunde in ihrer Beziehung zu den gegenwärtig lebenden Rassen. Abh. schweiz. paläont. Ges., vol. 28, pp. 1-137, 9 pls., 16 figs., numerous tables.

A comprehensive investigation of the crania of subfossil and recent dogs, from which it is concluded that all the domestic breeds of today can be traced back to three main prehistoric forms, represented by *Canis familiaris palustris*, *C. f. inostranzewi* and *C. f. leineri* Studer, the latter being the ancestor of the deerhounds.

Views on the status of the pariah dogs and the dingo are reviewed briefly. A dingo-like ancestor (resembling *Canis tengeranus* of Java) is suggested for the southern breeds of domestic dogs (pariahs, greyhounds, Tibet mastiffs), while the Palearctic breeds are thought to be derived from a small canid (*Canis ferus* Bourg) or from its cross with the wolf. An extensive 19th century bibliography on dog origin is appended.



1906. Über einen Hund aus der paleolithischen Zeit Russlands. Zool. Anz., Bd. 29, Nr. 2, pp. 24-35, 2 pls.

A skull and other skeletal remains of a dog, which were found associated with Mousterian artifacts near Bologoie (Russia), are compared with remains of other fossil canids and with the dingo. The dog of Bologoie, which resembles the dingo in shape and size, is named *Canis poutiatini* and regarded as a diluvial type, the first to become tamed by man; it is thought to have given rise to *C. matris optimae* (ancestor of the shepherd dogs) as well as to *C. intermedium* (progenitor of the hunting dogs) from the Bronze Age. By crossing with the wolf the breeds of large domestic dogs (mastiffs, deerhounds) originated, while a dwarfed form of the wild hound (*C. mikii*) gave rise to the Neolithic *C. familiaris palustris*.

1907. Schädel eines Hundes aus einer prähistorischen Wohnstätte der Hallstattzeit bei Karlstein, Amtsgericht Reichenhall. Mitt. naturf. Ges. Bern, Jhg. 1907, pp. 155-168, 2 pls.

Description of a dog skull from the Hallstatt period, found near Berchtesgaden. The skull is taken to represent the first example of a prehistoric mastiff type and shows close affinities to *Canis inostranzewi*.

#### Swanton, John R.

1940. The first description of an Indian tribe in the territory of the present United States. In Studies for William A. Read: A Miscellany presented by some of his Colleagues and Friends. Edited by Nathaniel M. Caffee and Thomas A. Kirby. pp. 326-338. Louisiana State University Press (Baton Rouge).

On the basis of information derived from members of a Spanish expedition to South Carolina in 1521, and from an Indian taken back to the West Indies by that expedition, Pietro Martire de Anghierra, in his *De Orbe Novo*, reported that the Indians of the region had domestic deer. These deer, it was said, were milked, and cheese was made of the milk.

Although many other parts of this early account are shown to be accurate, Swanton denies this history of domestic deer without offering any reason for his opinion; presumably the lack of any confirmatory evidence from later periods leads him to his conclusion.—C.A.R.

#### Szalay, A. B.

1930. Polyphletische Rinderabstammung.—Eine historische Studie. Z. Tierz. ZüchtBiol., Bd. IX, pp. 165-232.

Various views on the origin of domestic cattle (whether mono-, di-, or polyphyletic) are reviewed and examined in the light of historical evidence. The author holds that the primitive domestic environment—essentially not distinct from the wild habitat—could not have caused great morphological changes (such as dwarfing) in the types of cattle, and concludes that at least five different species have been tamed in Africa and Asia, three of which (*Bos primigenius*, *B. namadicus* and *B. brachyceros*) are known. Zebus are regarded as derived from two or three independent groups, not related to the other European bovinds.

Teilhard de Chardin, P., and Young, C. C.

1936. On the mammalian remains from the archaeological site of Anyang. Palaeont. Sinica, ser. C, vol. XII, fasc. 1, 86 pp., 8 pls.

A systematic study was made of the mammalian bones recovered at Anyang (northern Honan), the old capital of the semi-historic Shang culture (ca. 1400–1100 B.C.). Remains of the dog, a “curious” pig and a massive water-buffalo were abundant. Less frequently found were bones of sheep, goat, ox, elephant and tapir.

The pig is considered to be a highly specialized breed of southern origin (called *Sus vittatus* var. *frontalis* var. nov.); the ox is taken to be a domesticated race of the urus; and the primitive-looking buffalo (*Bubalus mephistopheles* Hopw.) is regarded as the descendant of a Pleistocene Chinese buffalo, raised by man. The elephant was apparently imported from southern regions.

Tackenberg, Kurt

1954. Zum Siedlungswesen der Tripolje-Kultur. Anthropos, vol. 49, fasc. 1–2, pp. 67–87.

Summary of the Russian excavations of the Neolithic Tripolje civilization between the Sereth and Dnieper rivers. Among the skeletal material the remains of cattle, the domestic status of which was pointed out by numerous representations and figurines of bovids, were by far the most numerous; in two sites they amounted to 67 per cent of all the animal bones. On the average (summary of five localities) cattle constituted 37 per cent of the remains, pigs 23 per cent, sheep and goats 15 per cent, and dogs 5 per cent. The remainder belonged to wild animals. In the latest period a marked decrease of pig bones became obvious, while—besides oxen—sheep and goats became more numerous. This process seemed to be associated with a decline in grain culture and an increase in pastoral economy, which is explained by the bioclimatic changes during the Neolithic.

Teodoreanu, N.

1924. Recherches sur 2 cranes de *Capra prisca*. Bull. Sect. sci. Acad. roum., Tom. IX, pp. 21–24, 4 figs.

Two skulls of goats, found together with a skull of *Ovis aries* at Kronstadt (=Brasov, central Rumania), are described. In the circumference of the horn-cores and the nature of their twisting, the skulls are similar to that of *Capra prisca*, which is seen as ancestral for all the breeds of domestic goats now distributed over central Europe, Hungary and the Balkan Peninsula. These goats also have horns twisted from outside inward.

1926. Über ein Quartärpferd aus Siebenbürgen—*Equus transilvanicus*. Z. Tierz. ZüchtBiol., Bd. VI, pp. 269–276, 5 figs.

Two skulls—one of a horse, the second belonging to a dog—both from the Bronze Age, were found near St. Georghe-Bedeháza (Transylvania). The dog is identified as a variety of *Canis poutiatini*, and consequently named *C. p. var. transilvanicus*. The horse skull proved to be distinct, especially in its dental characters, from all other Quaternary horses described, and is termed *Equus transilvanicus*.

1929. Beiträge zum Studium über die Abstammung der dobrudschaner Rinder. Z. Tierz. ZüchtBiol., Bd. XVII, pp. 444–479, 9 figs., 8 tables.

An investigation of the crania of cattle from Dobruja (Rumania) and a discussion of their origin. The skulls examined showed no affinity to that of *Bos taurus primigenius*, but exhibited the typical characters of the *brachyceros* type. It is suggested that the *brachyceros* cattle were brought in prehistoric times from the southern Balkan to the Danubian region by Gothic and Thracian tribes.

**Thevenin, René**

1947. Origine des animaux domestiques. 127 pp. Presses Universitaires de France (Paris).

In a popular pamphlet, views on the origin of domestication and the rise of the domestic breeds are summarized. The first four chapters (pp. 5-24) are concerned with questions of general nature—definitions, motives, place and time of earliest domestication. Chap. 5 deals with the “companions and auxiliaries” of man (dog, cat, horse, ass, camel, llama and reindeer). In chap. 6 are discussed the origins of those animals (cattle, sheep, goat, pig and rabbit), reared for alimentary and industrial purposes.

**Thilenius, G.**

1900. Das ägyptische Hausschaf. Recueil de Travaux Relatifs à la philologie et à l'archéologie Égyptiennes et Assyriennes, Ann. XX, n. s., Tom. VI, pp. 199-212.

In a survey of animal representations from predynastic and early dynastic Egypt, an attempt is made to trace the ancestry of the domestic sheep kept in North Africa during prehistoric and ancient historic time. It is concluded that the wild Barbary sheep (*Ammotragus traglocephalus*), an autochthonous breed, was domesticated in the Neolithic period and constituted the first domestic sheep of the Egyptians. By the end of the Old Empire the fleecy sheep had been introduced from Babylonia and the autochthonous breed gradually became displaced.

**Uhden, Richard**

1929. Zur Geschichte des Kamels in Nordafrika. Petermanns Mitt., Jhg. 75, p. 307.

Brief account of camel representations in Egypt and Libya to show that camels were known and kept in Egypt during all the dynastic periods.

**Ulmansky, S.**

1914. Untersuchungen über das Wild- und Hausschwein des Pfahlbaues im Laibacher Moor und über einige von diesem Schweinen abstammenden rezenten Rassen. Mitt. landw. Lehrk. Wien, Bd. II, pp. 17-74, 6 tables, 4 pls.

Identifications of remains of wild and domestic pigs found in the kitchen middens in a lake-dwelling in the moors of Laibach (Austria). The wild boar exhibits an intermediate (“independent”) form between the *scrofa* and the *vittatus* types, and is termed *Sus mediterraneus*. The domestic pig is seen as a direct derivative from this wild form and shows close affinities to the turbary pig from the Swiss lake-dwellings.

**Van Buren, Elizabeth Douglas**

1939. The fauna of ancient Mesopotamia as represented in art. *Analecta Orientalia*, vol. 18, xi+113 pp., 23 pls.

An account of animals reproduced in Mesopotamian art from the earliest times to the fall of the Assyrian empire. The various species are treated in their systematic sequence, and archaeological as well as zoological aspects are discussed. The domestic animals dealt with include dog, horse, ass, mule, camel, goat, sheep, cattle and pig.

**Van Giffen, A. E.**

1914. Die Fauna der Wurten. *Tijdschr. ned. dierk. Ver.*, ser. II, Deel XIII, pp. 1-166, 9 pls., tables in text.

Comprehensive treatise on the faunal remains from the kitchen middens of the "terpen" (the artificial proto-historic hills in the lowlands along the Dutch and Frisian shore). The first section gives a topographical and chronological description of the terpen. The second section deals in detail with the wild fauna; domestic animals are mentioned only briefly (see, however, Van Giffen, 1929).

Most frequent among the domestic mammals were cattle, followed by sheep, dog, horse, pig (in this sequence); remains of goat were rare. On the basis of a statistical study it is shown that *primigenius* and *brachyceros* cattle cannot be derived from two distinct ancestors.

1929. On the oldest domestic animal and its significance for palethnology. Koninklijke Akad. van wetenschappen te Amsterdam, Afd. nat., Proc. Sec. sci., vol. 32, pp. 321-329, 5 pls.

Statistical studies of three large populations of subfossil dogs from the Mesolithic Danish kitchen middens, the Neolithic and Bronze Age Swiss lake-dwellings and the Frisian and Groningen terpen (late Iron Age; cf. Van Giffen, 1914); for comparison recent dogs and related wild canids (wolf, jackal) were added. It is shown that the terp-dogs, which appeared to betray much wolf blood, displayed smaller divergencies than recent dogs, but more than the lake-dwelling and kitchen midden specimens.

The earliest known European dogs (from the kitchen middens) have nothing in common with the analogous Asiatic forms (represented by the Anau material; cf. Dürst, 1908), which are derived from the Indian wolf *Canis pallipes*. The origin of the kitchen midden dogs is obscure, but they were not derived from *C. palustris* of the Swiss lake-dwellings. The terp-dogs, on the other hand, are taken to be the probable progenitors for the Cimbric-Megalithic and the recent Arctic dogs.

**Vaufrey, R.**

1939. Faune de Sialk. Mus. Louvre, Dept. Antiq. Orient., Ser. Archaeol., Tom. IV, vol. II, pp. 195-197, figs. 22, 23.

Short description of the skeletal remains found at Sialk (west of the city of Kashan, Iran), the lowest layers of which are estimated to belong approximately to the fifth millennium B.C.

The domestic animals from Sialk I (transition from the Neolithic to the Aeneolithic) included sheep, goat and cattle. From Sialk II on (already with copper artifacts), pig, dog and horse also appear. The sheep belongs to the *Ovis vignei* group, the goat is of the *Capra aegagrus* type and the horse is identified with *Equus caballus pumpelli*.

1951. Étude paléontologique. I.—Mammifères. Arch. Inst. Paléont. hum., Mem. 24, pp. 198–217.

In a discussion of the fauna associated with Natufian (Mesolithic) culture at the site of El-Khiam in eastern Palestine, the goat is listed as domestic, a small ox as probably domestic, and the pig as perhaps domestic. The goat, *Capra hircus*, is represented by three horn-cores (resembling those of *C. aegagrus*) and a variety of limb-bones, *Bos* sp. by a fragment of mandible with two milk teeth, and *Sus* sp. by a single phalanx.—C.A.R.

#### Vetulani, Th.

1928. Tarpan und polnisches Landpferd (Konik). Beitrag zur Herkunft des europäischen Hauspferdes. Biol. gen., Bd. IV, pp. 387–402.

A critical examination of the skull material of fossil equids leads the author to set up a new subspecies of the Russian tarpan called *Equus gmelini* Ant. ssp. *silvatica*, or the "forest tarpan." This form is regarded as the part of the steppe tarpan population that remained when most of the group retreated into southern Russia because of climatic changes in post-glacial times.

An analysis of the skull of a Polish country horse revealed characters of both tarpan types and also additional features peculiar to the Przewalski horse.

1934. Beitrag zur Characteristic und Abstammung der anatolischen Hausziegen. Z. Tierz. ZüchtBiol., Bd. XXIX, pp. 243–286, 6 tables, 29 figs.

The two races of Anatolian goats—the common Anatolian goat (kil-keci) and the Angora goat (tiftik-keci)—are described and investigated as to their origin and relationship to the Anatolian wild goat, *Capra aegagrus*. It is shown that the latter form cannot be considered as having any part in the ancestry of the Anatolian domestic breeds, which are regarded as two races of the *Capra prisca* type; the "kil-keci" race resembles the fossil skulls from Zloczow (cf. Adametz, 1915), and the Angora goat is related to the fossil goats from Zlota (cf. Adametz, 1928) and from Schleinbach (cf. Sickenberg, 1930).

#### Vittor, D. R.

1933. Étude zootechnique de l'élevage et l'exploitation des bovins du Sud-Indochinos en Cochinchine. Bull. écon. Indoch., Nov.–Dec. 1933, pp. 947–971, 44 figs.

An account of the wild bovids still existing in Cochinchina (southern Indo-China). A detailed description of the recent domestic stock of this area is followed by a short discussion of the origin of the latter.

Except for some introduced cattle, the main dairy stock kept in Cochinchina is derived directly or indirectly from *Bos indicus*. Domestic gaur and banteng are descendants of the wild *Bibos gaurus* and *Bibos sondaicus* respectively.

Vogel, R.

1933. Tierreste aus vor- und frühgeschichtlichen Siedlungen Schwabens. Teil I: Die Tierreste aus den Pfahlbauten des Bodensees. Zoologica (Stuttgart), Bd. 31, Heft 82, Lief. 1, vii+109 pp., 14 pls., 3 tables, 4 figs.

An extensive osteological treatment of the faunal remains from the Neolithic lake-dwellings around Lake Constance, especially from the site at Sipplingen excavated by H. Reinert in 1929-30. The domestic stock is composed of dog, cattle, sheep, goat and pig. The great speciation of the dog—the only animal not used for food purposes—seems to point to its very early domestication. The majority of the remains fall into the *Canis familiaris palustris* group, but those are often accompanied by a larger type (*C. f. intermedius*) and a dwarf form, identified with *C. f. spaletti*.

The small sheep (*Ovis aries palustris*) possessed horns in both sexes, which fact seems to exclude a mouflon ancestry but points toward an origin from the non-European *O. vignei*. A few remains were those of the domestic goat (*Capra hircus*, a screw-horned type), but the great number of bones from domestic cattle indicated their economic importance. The skeletal material is in part of *primigenius*, in part of *brachyceros*, and sometimes of mixed character.

The domestic animal found by far most frequently was the pig, the rearing of which was probably favored in prehistoric times by the then dominant oak forest. The pig is of the *scrofa* type and, showing no affinities to the Oriental *Sus vittatus*, is brought by the author in direct relationship to the European wild boar, *S. scrofa ferus*.

In the Bronze Age levels a few remains of a domestic horse appeared.

Wagner, K.

1930. Rezenten Hunderassen. Vidensk. Akad. Skr. i Oslo; Matem.-Naturv. Kl., Bd. III, pp. 1-157, 36 figs., 12 pls., 14 tables appended.

The osteological racial peculiarities of recent domestic dogs are examined in detail and compared. No conclusions are reached regarding the origin of the domestic dog, but archaeological findings and their earlier treatments are evaluated by means of the new comparative material.

Walz, Reinhard

1951. Zum Problem des Zeitpunkts der Domestikation der altweltlichen Cameliden. Z. dtsch. morgenländ. Ges., Bd. 101 (n. ser., Bd. 26), pp. 29-51.

A compilation of archaeological material on the early history of the one-humped camel (*Camelus dromedarius*) in the Orient. On the basis of the records collected, the author assumes that the domestication of the dromedary probably originated in central Arabia in the last half of the second millennium B.C.

1954. Neue Untersuchungen zum Domestikationsproblem der altweltlichen Cameliden. Beiträge zur Geschichte des zweihöckrigen Kamels. Z. dtsch. morgenländ. Ges., Bd. 104, Heft 1, pp. 45-87.

Data on the ancient history of the two-humped camel (*Camelus bactrianus*) are given, and historical as well as zoological aspects are examined. The evidence—results of archaeological excavations and early records from the areas under

consideration (China, western Turkestan, Iran, Mesopotamia)—seem to point to a central Asian origin of the domestic Bactrian camel.

**Watson, D. M. S.**

1931. The animal bones from Skara Brae. In V. G. Childe, *Skara Brae, a Pictish village in Orkney*, pp. 198–204, pls. lvii–lix. Kegan Paul, Trench, Trubner & Co. Ltd. (London).

A study of the animal remains found during the excavations at Skara Brae, a Neolithic dwelling place in Orkney (Scotland). Among the numerous cattle bones three groups were distinguished, taken to be representative of bulls, cows and bullocks of a single breed, not corresponding with *longifrons* or with *primigenius* cattle from other Neolithic, Bronze or Iron Age sites. Abundant also were bones of a slender-limbed sheep, resembling the sheep of Soay (cf. Ewart, 1913). Very rare remains of pigs (uncertain whether domesticated) seemed to indicate lack of oak or beech woods in Skara Brae times.

The three characteristic features of this faunal assemblage, the abundance of sheep, the scarcity of pigs and the complete lack of dogs, are all features contrary to those of Neolithic camps in England.

**Weidenreich, Franz**

1925. Domestikation und Kultur in ihrer Wirkung auf Schädelform und Körpergestalt. *Z. ges. Anat., Z. KonstLehre*, Bd. XI, pp. 1–52, 5 figs.

To determine the factors that caused the specific phenomena of domestication (and of human civilization as well), the nature of domestication and the parallelism between the changes produced by it are analyzed in different domestic animals. The author shows that the specific domestic adaptations were originally pathological (brachygnathy, dwarf forms) and were caused by the injurious factors of the changed environment, which led eventually to a racial fixation of body reactions to adjust this injury.

**Werth, E.**

1939. Grundsätzliches zum Problem der Haustierwerdung. *Naturwissenschaften*, Bd. 27, Heft 17, pp. 271–274.

From the chronological succession of important stages in human civilization conclusions are drawn as to the history of domestic mammals. Domestic breeds are completely lacking in the Paleolithic, but dogs and artiodactyls (bovids and pigs) were kept from the Mesolithic on. It is only in the Neolithic that the horse—first in Asia, later in Europe—was added to the domestic stock.

1940. Zur Verbreitung und Geschichte der Transporttiere. *Z. Ges. Erdk.* Berl., Hefte 5–6, pp. 181–204.

An account of the origin and dispersal of the common pack and draft animals. Bovids are regarded as the most ancient transport animals, appearing in the late Paleolithic and dominant throughout early history from the Caspian to southeastern India and also in northeastern Asia. Their center of origin is found in India. Cattle were replaced by horses in central Asia (considered the area where horse-taming originated) and northeastern Europe, while Ethiopia is seen as the original home of the domestic donkey.

Two other transport animals—yak (Tibet) and llama (Peru)—were only of local significance. The use of reindeer rose probably by association with the domestication of the horse, and the northeast Asian dog-sledge was an outgrowth of the Mongolian plough-culture.

#### Wettstein, Ernst

1924. Die Tierreste aus dem Pfahlbau am Alpenquai in Zürich. Vjschr. naturf. Ges. Zürich, Jhg. 69, pp. 78-127.

Description of animal remains in a lake-dwelling, recovered from the bottom of Lake Zurich. Most of the bones belonged to domestic species. Most frequently represented were cattle, closely followed by pigs; fewer remains were those of sheep (or goat) and dogs, with few bones of the horse. Among cattle three races could be distinguished (*primigenius*, *brachyceros*, and an intermediate type, resembling *Bos trochoceros*). Sheep were chiefly of the "copper" type (though hornless forms were represented). The goat was *Capra hircus*. The pigs of Alpenquai exhibited the characters of the *palustris* form, the equid remains were closest to *Equus caballus celticus*, and all the dogs were identified with *Canis familiaris inostranzewi*.

#### Whitehead, G. Kenneth

1953. The ancient white cattle of Britain and their descendants. 174 pp., 48 pls. Faber and Faber, Ltd. (London).

The theory that the wild white cattle of Britain are direct descendants of *Bos primigenius* is rejected, as this latter species was probably extinct in England and southern Scotland by 1000 B.C. Instead, it is thought that longhorned white cattle were brought from Italy by the Romans, who may have kept and bred them for sacrificial purposes. With the collapse of Roman power and the turmoil of the Germanic invasions, these herds became feral in the forests, from where they were subsequently driven into enclosed parks, beginning in the thirteenth century. These cattle are unknown in Ireland.

The white color is genetically dominant. Only the Chillingham herd produces 100% white calves; it is the only herd that remains pure-bred and is representative of the wild white forest cattle of the post-Roman, pre-Norman period.

The domestic polled white cattle ("British Whites"), which are today a commercial breed, may be derived from the Fjällras cattle of Scandinavia, brought to England by the Vikings.—C.A.R.

#### Wiklund, K. P.

1918. Om renskötselns uppkomst. [On the origin of reindeer.] Ymer, Arg. 38, Hefte 3, pp. 249-273.

Reviewing archaeological and paleontological evidence on the early sledge cultures, the author finds that reindeer-breeding arose independently among Chukchi and Koryak (Lapps), but in the Tungusian and Soyotian areas it was a result of cultural influence from Turko-Mongolian horse-breeding.

#### Wilckens, Martin

1905. Grundzüge der Naturgeschichte der Haustiere. Revised and rewritten by J. U. Dürst. xi + 408 pp., 85 figs. Richard C. Schmidt (Leipzig).



A summary of information on the morphology, origin, and history of the domestic animals. The introduction contains a classification of the domesticated species and deals with their geographical distribution. An attempt is made to cover all the animals ever considered to be domestic—among them various birds, fishes and insects.

Major attention is directed to domestic mammals, which are treated according to their orders: odd-toed ungulates (horse, ass, mule), even-toed ungulates (pig, camel, llama, goat, sheep, cattle), rodents (rabbit) and carnivores (cat, dog). An outline of the zoological characters of each group is followed by a discussion on its origin and taming, and finally by an account of its domestic breeds.

### Wilson, James

1909. The evolution of British cattle and the fashioning of breeds. pp. viii + 147, text figs. Vinton & Company, Ltd. (London).

No British cattle are directly descended from *Bos primigenius*, which was extinct—at least south of the Highlands—by the Bronze Age. *B. longifrons* were small black domestic Neolithic cattle, introduced from the mainland. The famous wild horned white cattle of Britain are descended from domestic white Italian cattle, which became feral after the Roman withdrawal. English medieval horned red cattle were introduced by the Angles and Saxons, and the small dun polled cattle of many coastal areas of Britain and Ireland were brought by the Norsemen. None of these cattle are economically important in the 20th century breeds, which are descended from Dutch importations, beginning in the 17th century.—C.A.R.

### Winge, Herluf

1904. Om jordfundne pattedyr fra Danmark. [On excavated mammals from Denmark.] Vidensk. Medd. dansk naturh. Foren. Kbh., Arg. 1904, pp. 193–303, pls. vii–xiii.

An account of mammal remains from prehistoric Danish sites, listed in systematic, geographical and chronological sequence. Among the faunal remains from the early Stone Age appear domestic dog and cattle; by the later Stone Age pig, sheep and horse occur, and in the Bronze Age, in addition to the former, the domestic goat.

1919. Dyreknoget fra bronzealders bopladser. [Animal bones from Bronze Age settlement.] In S. Müller, Bopladsfund fra Bronzealderen, Aarbøger for nordisk Oldkyndighed og Historia, Bd. 9, pp. 93–101.

Brief account of animal remains discovered at seven sites from Danish Bronze Age settlements. The domestic species identified comprised dog, ox, sheep and pig in all the sites; in five sites also was found the horse, among whose remains the author distinguishes members of the Oriental as well as of the Occidental race.

### Winkler, Hans

1938–39. Rock-drawings of southern Upper Egypt. Vol. I, 44 pp., 41 pls., 1 map; vol. II, 51 pp., 39 pls., 1 map. Egypt Exploration Society (London).

The early inhabitants of the desert valleys east and west of the Upper Nile are studied in the light of their rock-drawings. Vol. I deals with the eastern desert between Quena and Aswan, vol. II with the western parts—the regions of Kharga, Dakhla and Uwenat. The author distinguishes two cultures that occurred in the desert valleys in predynastic times. The most ancient population consisted of hunters who kept the dog as their only domesticated animal. Those were followed by mountain dwellers (believed to be Hamites), who had cattle and some of whom became herdsmen in isolated pasture oases.

#### Wissler, Clark

1945. The domestication of animals. *Nat. Hist. N.Y.*, vol. 54, no. 5, pp. 200–206.

In a popular survey of domestication, its sources and the possible motives that caused it are discussed. The author considers it conceivable that not man's activity but the behavior patterns of the animal to become domesticated may have been the first causes of domestication. Dog and pig are regarded as the first animals domesticated, next in order cattle and reindeer were tamed, then sheep followed by goat, still later ass followed by horse, and finally camel and elephant.

#### Woolley, C. Leonard

1934. The royal cemetery. *Ur Excavations*, vol. II. Oxford University Press (London).

A report on the animal remains discovered at Ur (Mesopotamia) is given by R. I. Pocock (pp. 409–410). Material from cattle, pigs and sheep is described briefly. No definite remains of goats and no trace of bones from horses or asses were detected.

#### Yetts, Perceval

1934. The horse: a factor in early Chinese history. *Eurasia septentrionalis antiqua*, Helsinki. Vol. IX, pp. 231–255, 11 figs.

The author gives a short summary of archaeological and ethnological evidences of horse-breeding in most ancient China. Until the second century B.C. the only horse kept by the Chinese was a domesticated variety of the small, indigenous steppe horse, a breed which was shared with the nomadic neighbors. About 126 B.C. superior breeds were introduced from the "countries of the West" (probably Bactria).

#### Zeuner, F. E.

1950. The cat. *Oryx*, vol. 1, no. 2, pp. 65–71.

The three commonly accepted species of Old World small cats—*Felis silvestris* Schreber, of the forests of Europe and Asia Minor; *F. manul* Pall., the steppe cat of central Asia; and *F. constantina* Forst., the yellow cat of Africa and southern Asia—are hardly more than geographical and ecological subspecies of a single species. The majority of specimens cannot be distinguished osteologically, nor can the domestic cat usually be separated from these wild cats except by characters of the pelage. The cat is psychologically the least domestic of animals, and it has undergone the least anatomical change. The cat was first domesticated in Egypt—some claim as early as the Fifth Dynasty—but clear evidence of do-

mestic status is lacking until the New Kingdom (16th century B.C.). The Romans carried domestic cats throughout much of Europe, where they have persisted and interbred with *F. silvestris*.—C.A.R.

1954. Domestication of animals. In *A History of Technology*, Vol. I, pp. 327-352, "From Early Times to Fall of Ancient Empires." Ed. Charles Singer, et al. Clarendon Press (Oxford).

Domestication arose as a natural symbiosis between two species of social animals, the less intelligent of which became dependent upon the more intelligent. In the primary stages of domestication, there was no concept of purpose involved, as man could not foresee, several generations ahead, the values to be derived. Later, as with reindeer domestication and attempts during Old Kingdom times in Egypt to domesticate gazelles, antelopes, and hyenas, purposive planning is apparent.

Social animals that could become scavengers if the opportunity were presented are the ones most likely to have become domesticated. The dog might best be derived from one of the smaller southern wolves, which tend to scavenge more and hunt less than do the larger northern ones. With the establishment of agriculture, there arose opportunities for symbiotic relations with the ungulates. Pet-keeping and use of pets as decoys to capture other individuals can perhaps explain the earliest phases of domestication in ungulates, but the species involved have to be psychologically adapted to breeding in captivity, must be physiologically adapted to surviving under difficult conditions (including almost complete neglect), and must then be so bred that they will become practically insensitive to the opportunity for personal freedom.

All domestic animals except the reindeer have become adapted to man's behavior; with regard to the latter, however, man's culture has become adapted to the behavior of the deer.

Much of the article is concerned with the effects of artificial selection upon different domestic mammals.—C.A.R.

1955. The goats of early Jericho. *Palest. Expl. Quart.*, Apr., 1955, pp. 70-86, 37 figs.

Animal bones from the pre-pottery Neolithic of Jericho, Palestine, are identified as wild cattle (*Bos primigenius*), gazelles, antelopes, wild pigs, domestic goats, and domestic dogs. Neither sheep nor ibex has been identified. The goats are of the *Capra aegagrus* type, with straight and upright horns. One male and two female horn-cores were recovered; comparison of these with a large series of cores from known wild and domestic straight-horned and screw-horned goats indicates that the horns of the females are useless in attempting to determine domestication. The male core is much thinner and with lateral, medial, and posterior surfaces more rounded than in any wild male *C. aegagrus*, and is correspondingly ovoid-shaped, instead of being irregularly angular. This cross section of the Jericho male horn-core more closely resembles that of domestic goats than that of the wild *C. aegagrus*, and so it is very possible that the goat of pre-pottery Jericho was domesticated.

The Neolithic goat with straight horns was replaced by goats with twisted horns early in the Bronze Age, throughout the areas of the Fertile Crescent and the eastern Mediterranean.—C.A.R.

**Zurowski, Josef**

1930. Neue Ergebnisse der neolithischen Forschung im südwestpolnischen Lössgebiet. *Prähist. Z.*, Bd. XXI, Hefte 1-2, pp. 1-26, 16 figs.

Among finds of Neolithic sites from Złota (Sandomierz, Poland) animal bones belonging to cattle (hornless and shorthorned breeds), pig, dog, sheep, and horse were identified.

## SYSTEMATIC INDEX

- Addax nasomaculata*  
     Gaillard, 1912  
*Ammotragus trageloccephalus*  
     Thilenius, 1900  
*Antilocapra*  
     Lawrence, 1951  
*Asinus atlanticus*  
     Antonius, 1937  
*Auchenida*  
     Latham, 1924  
  
*Bibos banteng*  
     Adametz, 1933  
*Bibos frontalis*  
     Hermanns, 1952  
*Bibos gaurus*  
     Vittor, 1933  
*Bibos sondaicus*  
     Vittor, 1933  
*Bison*  
     Lawrence, 1951  
*Bos*  
     Gejvali, 1937-38  
     Kolesnik, 1936  
     Lawrence, 1951  
     Melnyk, 1927  
*Bos* sp.  
     Vaufrey, 1951  
*Bos acutifrons*  
     Ewart, 1912  
*Bos africanus*  
     Breuil and el Dine, 1928  
     Lortet and Gaillard, 1903-09  
     Morse, 1912  
     Newbold, 1928  
     Shaw, 1936  
*Bos brachycephalus*  
     Gerbes, 1951  
     Morse, 1912  
     F. Schwarz, 1918  
*Bos brachyceros*  
     Antonius, 1944  
     Breuil and el Dine, 1928  
     Chlebaroff, 1929-30  
     Curwen, 1938  
     Degerbøl, 1939  
     Dürst, 1900  
     Epstein, 1933  
     Gaillard, 1934  
     Gromova, 1927  
     Herre, 1949  
     Hilzheimer, 1927  
     Jackson, 1932  
     Keller, 1902  
     Kolesnik, 1936  
     Kuhn, 1935  
     Lydekker, 1912b  
     Mohapl, 1914  
     Mond and Myers, 1934  
     Newbold, 1928  
     Noack, 1909  
     Patterson, 1937  
     Pira, 1926  
     Reverdin, 1921, 1930-31  
     Rostafinski, 1933  
     F. Schwarz, 1918  
     Staife, 1939, 1943  
     Szalay, 1930  
     Van Giffen, 1914  
     Vogel, 1933  
     Wettstein, 1924  
*Bos brachyceros arnei*  
     Amschler, 1939a, 1939b  
*Bos brachyceros europaeus*  
     Antonius, 1919  
*Bos bubalis*  
     Merkens, 1929  
*Bos colliceros*  
     Rostafinski, 1933  
*Bos frontosus*  
     Degerbøl, 1939  
     Hilzheimer, 1927  
     Morse, 1912  
     Rostafinski, 1933  
*Bos indicus*  
     Keller, 1902  
     Kolesnik, 1936  
     Lydekker, 1912b  
     Prashad, 1936  
     Vittor, 1933  
*Bos longifrons*  
     Antonius, 1919  
     Bate, 1938  
     Bryner, 1938  
     Childe, 1940  
     Clark, 1952  
     Dawkins and Jackson, 1917  
     Degerbøl, 1939  
     Ewart, 1912  
     Hilzheimer, 1927  
     Jackson, 1932  
     Koby, 1954  
     Leister, 1943  
     Mond and Myers, 1934

- Morse, 1912  
 Reynolds, 1939  
 Watson, 1931  
 Wilson, 1909  
*Bos mindorensis*  
 von Fürer-Haimendorf, 1932  
*Bos namadicus*  
 Adametz, 1936  
 Anderson, 1943  
 Antonius, 1944  
 Bisschop, 1937  
 Chlebaroff, 1929-30  
 Dürst, 1900, 1908  
 Epstein, 1933  
 Friederichs, 1933  
 Hermanns, 1952  
 Koppers and Jungblut, 1942-45  
 Mackay, 1938  
 Melnyk, 1927  
 Menghin, 1931  
 Morse, 1912  
 Szalay, 1930  
*Bos opisthonomus*  
 Bisschop, 1937  
*Bos primigenius*  
 Adametz, 1920  
 Antonius, 1919, 1944  
 Bate, 1942  
 Bogaevsky, 1937  
 Bryner, 1932  
 Cardas, 1926  
 Clark, 1952  
 Curwen, 1938  
 Degerbøl, 1939  
 Epstein, 1933  
 Ewart, 1912  
 Friederichs, 1933  
 Gaillard, 1934  
 Gerbes, 1951  
 Gromova, 1927  
 Herre, 1949  
 Hilzheimer, 1927  
 Keller, 1902  
 Koby, 1954  
     Female of  
     Color of  
 Kolesnik, 1936  
 Kuhn, 1935  
 Lengerken, 1953, 1955  
 Mackay, 1938  
 Melnyk, 1928  
 Mohapl, 1914  
 Morse, 1912  
 Pia, 1941  
 Prashad, 1936  
 Reynolds, 1939  
 Staffe, 1939, 1943  
 Szalay, 1930  
 Van Giffen, 1914  
 Vogel, 1933  
 Watson, 1931  
 Wettstein, 1924  
 Whitehead, 1953  
 Wilson, 1909  
 Zeuner, 1955  
*Bos primigenius ferus*  
 Pira, 1926  
*Bos primigenius hahni*  
 Adametz, 1925  
*Bos sondaicus*  
 Keller, 1902  
 Merkens, 1929  
 Sommerfeld, 1927  
*Bos taurus*  
 Keller, 1902  
 Koppers and Jungblut, 1942-45  
 Merkens, 1929  
*Bos taurus akeratos*  
 Hilzheimer, 1927  
 Sasaki, 1934  
*Bos taurus brachyceros*  
 Amschler, 1939b  
 Hescheler, 1920  
 Hescheler and Rüger, 1942  
 Madsen, 1900  
 Revilliod, 1926  
 Revilliod and Dottrens, 1947  
 Riedel, 1948  
 Teodoreanu, 1929  
*Bos taurus domesticus*  
 Bronholm and Rasmussen, 1931  
 Dottrens, 1946  
*Bos taurus primigenius*  
 Hilzheimer, 1941  
 Lydekker, 1912b  
 Madsen, 1900  
 Revilliod and Dottrens, 1947  
 Sasaki, 1934  
 Teodoreanu, 1929  
*Bos trochoceros*  
 Degerbøl, 1939  
 Morse, 1912  
 Wettstein, 1924  
*Bos turano-mongolicus*  
 Kolesnik, 1936  
*Bos urus primigenius*  
 Melnyk, 1927  
*Bos zebu indicus planus*  
 Sasaki, 1934  
*Bubalus*  
 Lloyd, 1940  
*Bubalus arni*  
 Koppers and Jungblut, 1942-45  
*Bubalus indicus macroceros*  
 Koppers and Jungblut, 1942-45  
*Bubalus mephistopheles*  
 Teilhard de Chardin and Young, 1936  
*Camelus bactrianus*  
 Walz, 1954  
*Camelus dromedarius*  
 Mikesell, 1955  
 Walz, 1951

- Canis*  
   Gejvali, 1937-38  
*Canis* sp.  
   Bate, 1938  
*Canis aureus*  
   Keller, 1902  
   Lorenz, 1955  
   Scott, 1954  
*Canis dingo*  
   Dürst, 1945  
   Jones, 1921  
*Canis familiaris*  
   Liang, 1934  
*Canis familiaris dingo*  
   Jones, 1921  
*Canis familiaris inostranzewi*  
   Amschler, 1939c, 1949  
   Degerbøl, 1927, 1933b  
   Gandert, 1930  
   Noack, 1909  
   Patterson, 1937  
   Studer, 1901  
   Wettstein, 1924  
*Canis familiaris intermedius*  
   Vogel, 1933  
*Canis familiaris leineri*  
   Hue, 1906a  
   Studer, 1901  
*Canis familiaris matris optima*  
   Amschler, 1949  
   Dürst, 1908  
   Hue, 1906a  
   Madsen, 1900  
*Canis familiaris palustris*  
   Amschler, 1949  
   Bylin-Althin, 1946  
   Clark, 1952  
   Degerbøl, 1933b  
   Gandert, 1930  
   Hue, 1906a,b  
   Madsen, 1900  
   Pequart, 1937  
   Reverdin, 1927-28  
   Riedel, 1948  
   Studer, 1901, 1906  
   Vogel, 1933  
*Canis familiaris palustris ladogensis*  
   Patterson, 1937  
*Canis familiaris palustris swardborgensis*  
   Degerbøl, 1933b, 1939  
*Canis familiaris spaletti*  
   Vogel, 1933  
*Canis ferus*  
   Studer, 1901  
*Canis ingae*  
   Noack, 1915a  
*Canis inostranzewi*  
   Brinkmann, 1923-24  
   Revilliod, 1926  
   Studer, 1906  
*Canis intermedius* (or *intermedium*)  
   Allen, 1920  
   Gehl, 1930  
   Revilliod, 1926  
   Studer, 1906  
*Canis le mirei*  
   Hue, 1906a  
*Canis lupaster*  
   Hilzheimer, 1908  
*Canis lupus*  
   Brinkmann, 1921  
   Lorenz, 1955  
   Scott, 1954  
*Canis matris optima*  
   Bate, 1937  
   Studer, 1906  
*Canis mikii*  
   Studer, 1906  
*Canis niger*  
   Keller, 1902  
*Canis pallipes*  
   Brinkmann, 1921  
   Gehl, 1930  
   Noack, 1915b  
   Prashad, 1936  
   Van Giffen, 1914  
*Canis pallipes domesticus*  
   Noack, 1915b  
*Canis palustris*  
   Allen, 1920  
   Brinkmann, 1923-24  
   Gehl, 1930  
   Hescheler, 1920  
   Hescheler and Rüger, 1942  
   Kuhn, 1935  
   Noack, 1915b  
   Pira, 1926  
   F. Schwarz, 1918  
   Van Giffen, 1929  
*Canis palustris ladogensis*  
   Brinkmann, 1923-24  
   Degerbøl, 1927  
   Gehl, 1930  
*Canis poutiatini*  
   Baas, 1938  
   Dürst, 1908  
   Studer, 1906  
*Canis poutiatini transilvanicus*  
   Teodoreanu, 1926  
*Canis sinensis*  
   Keller, 1902  
*Canis tenggeranus*  
   Studer, 1901  
*Canis tenggeranus harappensis*  
   Prashad, 1936  
*Capra*  
   Gejvali, 1937-38  
   Lawrence, 1951  
   E. Schwarz, 1935  
*Capra aegagrus*  
   Adametz, 1915, 1928  
   Amschler, 1929a, 1931  
   Antonius, 1944  
   Curwen, 1938

- Hilzheimer, 1926  
 Pilgrim, 1947  
 Pira, 1926  
 Prashad, 1936  
 Sickenberg, 1930  
 Vaufrey, 1939, 1951  
 Vetulani, 1934  
 Zeuner, 1950  
*Capra falconeri*  
 Adametz, 1932  
 Amschler, 1931  
 Dalimier, 1954  
 Hilzheimer, 1926, 1933  
 Koch, 1937  
 Philipschenko, 1928  
*Capra falconeri jerdoni*  
 Adametz, 1920  
*Capra girgentana*  
 Amschler, 1937  
 Crawford, 1938  
*Capra hircus*  
 Degerbøl, 1939  
 Dürst, 1908  
 Hescheler and Rüger, 1942  
 Hilzheimer, 1933  
 Koch, 1937  
 Reverdin, 1921  
 Riedel, 1948  
 E. Schwarz, 1935  
 Vaufrey, 1951  
 Vogel, 1933  
 Wettstein, 1924  
*Capra hircus aegagrus*  
 Dalimier, 1954  
 E. Schwarz, 1935  
*Capra ibex*  
 E. Schwarz, 1935  
*Capra prisca*  
 Adametz, 1915, 1928, 1932, 1941  
 Amschler, 1931, 1949  
 Antonius, 1944  
 Batu, 1939  
 Cardas, 1926  
 Crawford, 1938  
 Hilzheimer, 1926, 1933, 1941  
 Lebel, 1939  
 Patterson, 1937  
 Pia, 1942a  
 Pilgrim, 1947  
 E. Schwarz, 1935  
 Sickenberg, 1930  
 Teodoreanu, 1924  
 Vetulani, 1934  
*Equus*  
 Mallowan, 1947  
*Equus abeli*  
 Antonius, 1935b  
 E. Schwarz, 1928  
*Equus agilis*  
 Dawkins and Jackson, 1917  
*Equus asinus africanus*  
 Antonius, 1937  
*Equus caballus*  
 Amschler, 1936  
 E. Schwarz, 1922, 1928  
*Equus caballus caballus*  
 E. Schwarz, 1928  
*Equus caballus celticus*  
 Ewart, 1904  
 Wettstein, 1924  
*Equus caballus fossilis*  
 Dürst, 1908  
*Equus caballus fossilis germanicus*  
 Nitsche, 1928  
*Equus caballus libycus*  
 Ewart, 1907a, 1909  
 Ridgeway, 1905  
*Equus caballus nehringi*  
 Dürst, 1908  
*Equus caballus orientalis*  
 Amschler, 1949  
*Equus caballus plicidens*  
 E. Schwarz, 1928  
*Equus caballus przewalskii*  
 Bourdelle, 1932  
 Lydekker, 1912a  
*Equus caballus pumpellii*  
 Dürst, 1908  
 Rumjancev, 1936  
 Vaufrey, 1939  
*Equus caballus robustus*  
 Brinkmann, 1920  
 Dürst, 1908  
*Equus caballus typicus*  
 Boule, 1910  
 Ewart, 1904  
 Lydekker, 1912a  
*Equus equiferus*  
 Hilzheimer, 1935  
*Equus ferus*  
 Antonius, 1922  
*Equus gmelini*  
 Antonius, 1918, 1937  
 Hilzheimer, 1935  
*Equus gmelini silvatica*  
 Vetulani, 1928  
*Equus gracilis libycus*  
 Ewart, 1909  
*Equus hemionus*  
 Bate, 1938, 1942  
 Boule, 1910  
 Hilzheimer, 1935  
*Equus hemionus hemippus*  
 Antonius, 1937  
*Equus libycus*  
 Chubb, 1913  
*Equus mosbachensis*  
 Antonius, 1935b  
 E. Schwarz, 1928  
*Equus onager hemippus*  
 Hilzheimer, 1941



- Equus onager indicus*  
Hermanns, 1952
- Equus orientalis*  
Antonius, 1922
- Equus przewalskii*  
Andreeva, 1933  
Antonius, 1918, 1937  
Bishop, 1939  
Bourdelle, 1938  
Ewart, 1904, 1907a  
Herre, 1939  
Kwaschnin, 1928  
Noack, 1909  
Rumjancev, 1936
- Equus rectidens*  
Cardoso, 1912
- Equus robustus*  
Antonius, 1922  
Ewart, 1907a, 1909  
E. Schwarz, 1928
- Equus silvestris*  
Antonius, 1937
- Equus sivalensis*  
Ewart, 1909, 1912
- Equus stenonis*  
Boule, 1910  
Ewart, 1912  
Lydekker, 1912a
- Equus transilvanicus*  
Teodoreanu, 1926
- Felis chaus*  
Langton, 1940  
Morrison-Scott, 1952
- Felis constantina*  
Zeuner, 1950
- Felis libyca bubastis*  
Morrison-Scott, 1952
- Felis maniculata*  
Lortet and Gaillard, 1903-09
- Felis manul*  
Zeuner, 1950
- Felis microbis*  
Noack, 1909
- Felis ochreata* (or *ocreata*)  
Langton, 1940  
Lorenz, 1955  
Schwangart, 1928, 1931
- Felis silvestris*  
Hooijer, 1947  
Lorenz, 1955  
Schwangart, 1928, 1931  
Zeuner, 1950
- Felis silvestris libyca*  
Haltenorth, 1953
- Hippidium*  
Cardoso, 1912
- Hircus mambricus*  
Bate, 1938  
Dürst and Gaillard, 1902  
Gaillard, 1934  
Peet, 1914
- Hircus reversus*  
Gaillard, 1934
- Ibex nubians*  
Gaillard, 1912
- Leptobos*  
Bryner, 1932
- Llama guanicoe*  
Herre, 1952
- Lupus occidentalis*  
Keller, 1902
- Mustela putorius eversmanni*  
Ashton and Thompson, 1955
- Mustela putorius furo*  
Ashton and Thompson, 1955
- Mustela putorius putorius*  
Ashton and Thompson, 1955
- Odocoileus*  
Hildebrand, 1955  
Lawrence, 1951
- Oryctolagus cuniculus*  
Nachtsheim, 1929
- Oryx*  
Gaillard, 1912
- Otolobus manual*  
Schwangart, 1928
- Ovis*  
Carruthers, 1949  
Gejvali, 1937-38  
Lawrence, 1951
- Ovis* sp.  
Bate, 1938  
Hilzheimer, 1941
- Ovis ammon*  
Ewart, 1914  
Hilzheimer, 1936  
Pilgrim, 1947
- Ovis ammon koslovi*  
Philipschenko, 1928
- Ovis argali*  
Cardas, 1926
- Ovis aries*  
Friederichs, 1933
- Ovis aries caelotis*  
Lydekker, 1912c
- Ovis aries longipes*  
Lydekker, 1912c
- Ovis aries musimon*  
Amschler, 1949  
Lydekker, 1912c
- Ovis aries palustris*  
Adametz, 1937  
Bogaevsky, 1937  
Degerbøl, 1939  
Dürst, 1904, 1908  
Ewart, 1913  
Kuhn, 1935  
Lydekker, 1912c  
Reitsma, 1932  
Riedel, 1948

- F. Schwarz, 1918  
 Vogel, 1933  
*Oris aries studeri*  
 Dürst, 1904  
 Hescheler, 1920  
 Kuhn, 1932  
 Reitsma, 1932  
*Oris canadensis*  
 Lawrence, 1951  
*Oris longipes*  
 Dürst and Gaillard, 1902  
*Oris longipes palaeoegypticus*  
 Dürst and Gaillard, 1902  
 Gaillard, 1934  
*Oris musimon*  
 Adametz, 1937  
 Antonius, 1944  
 Cardas, 1926  
 Pira, 1926  
 Schultze, 1934  
*Oris orientalis*  
 Carruthers, 1949  
 Ewart, 1913  
 Friederichs, 1933  
 Hilzheimer, 1936  
 Pilgrim, 1947  
*Oris palaeoegypticus*  
 Lortet and Gaillard, 1903-09  
 Peet, 1914  
*Oris palustris*  
 Revilliod, 1926  
*Oris vignei*  
 Adametz, 1937  
 Amschler, 1949  
 Antonius, 1944  
 Bishop, 1939  
 Carruthers, 1949  
 Ewart, 1913  
 Friederichs, 1933  
 Hilzheimer, 1926, 1936  
 Lydekker, 1912c  
 Pilgrim, 1947  
 Vaufrey, 1939  
 Vogel, 1933  
*Oris vignei arkal*  
 Adametz, 1927  
 Dürst, 1908  
 Menghin, 1931  
*Oris vignei cycloceros*  
 Adametz, 1920  
*Oris vignei domesticus*  
 Prashad, 1936  
*Sus*  
 Gejvali, 1937-38  
*Sus* sp.  
 Bate, 1938  
 Hilzheimer, 1941  
 Vaufrey, 1951  
*Sus cristatus*  
 Adlerberg, 1933  
 Prashad, 1936  
*Sus ferus europaeus*  
 Cardas, 1926  
*Sus mediterraneus*  
 Adlerberg, 1933  
 Belic, 1939  
 Hilzheimer, 1926  
 Reitsma, 1935  
 Ritzoffy, 1932, 1933  
 Staffe, 1938  
 Ulmanský, 1914  
*Sus meridionalis*  
 Belic, 1939  
*Sus orientalis*  
 Adlerberg, 1933  
 Philpitschenko, 1933  
*Sus orientalis continentalis*  
 Philpitschenko, 1933  
*Sus orientalis moupinensis*  
 Philpitschenko, 1933  
*Sus orientalis raddeanus*  
 Philpitschenko, 1933  
*Sus palustris*  
 Bogaevsky, 1937  
 Hescheler, 1920  
 Reverdin, 1921  
 Revilliod, 1926  
 Wettstein, 1924  
*Sus scrofa*  
 Adlerberg, 1933  
 Amon, 1938  
 Belic, 1939  
 Hescheler, 1920  
 Hilzheimer, 1926  
 Patterson, 1937  
 Philpitschenko, 1933  
 Reitsma, 1935  
 Ulmanský, 1914  
*Sus scrofa attila*  
 Amschler, 1939b  
 Philpitschenko, 1933  
*Sus scrofa antiquus*  
 Pira, 1909  
*Sus scrofa domesticus palustris*  
 Reitsma, 1935  
*Sus scrofa domesticus tumulorum*  
 Reitsma, 1935  
*Sus scrofa ferus*  
 Amschler, 1949  
 Bäumler, 1921  
 Clark, 1952  
 Nitsche, 1924  
 Vogel, 1933  
*Sus scrofa nigripes*  
 Philpitschenko, 1933  
*Sus scrofa palustris*  
 Clark, 1952  
 Degerbøl, 1939  
 Gaillard, 1934  
 Havesson, 1933  
 Nitsche, 1924  
 Otto, 1901  
 Pira, 1909

- Reitsma, 1935  
Reverdin, 1930–31  
Riedel, 1948  
*Sus scrofa scrofa*  
Kelm, 1938, 1939  
Philipschenko, 1933  
Ritzoffy, 1932  
*Sus scrofa vittatus*  
Kelm, 1939  
*Sus verrucosus*  
Amon, 1938  
Reitsma, 1935  
*Sus vittatus*  
Adlerberg, 1933  
Amon, 1938  
Bäumler, 1921  
Belic, 1939  
Bylin-Althin, 1946  
Dürst, 1908  
Hilzheimer, 1926  
Otto, 1901  
Philipschenko, 1933  
Reitsma, 1935  
Staffe, 1938  
Ulmansky, 1914  
Vogel, 1933  
*Sus vittatus frontalis*  
Teilhard de Chardin and Young, 1936  
*Thos aureus*  
Matthey, 1954  
*Vicugna vicugna*  
Steinbacher, 1953

## GENERAL INDEX

- A, blood-group, sheep; Kacrkowski, 1928
- Absence of:
- dog, Star Carr, England; Fraser and King, 1954
  - northern Scotland, Neolithic; Watson, 1931
  - horse, prehistoric northern Iraq; Braidwood, 1954
  - primigene cattle, Celtic period, Switzerland; Gerbes, 1951
- Adaptations to domestication; Weidenreich, 1925
- Addax, Egypt; Gaillard, 1912
- Adrenalin, role in socialization; Funkenstein, 1955
- Aggressive animals; Funkenstein, 1955
- Agricultural association with pigs; Newberry, 1928
- Agricultural people and domestication; Linton, 1955
- and dromedary, Arabia; Mikesell, 1955
- Agriculture:
- China; Bishop, 1933
  - Denmark; Curwen, 1938
  - preceding animal domestication; Bate, 1932
  - world; Curwen and Hatt, 1953
- Allopatric races, pig; Kelm, 1939
- Alpaca; Curwen and Hatt, 1953; Herre, 1952; Krieg, 1929; Steinbacher, 1953
- Ammon, Ram of, Egypt; Pia, 1942b
- Anatomy, general:
- cats; Zeuner, 1950
  - cattle, East Indies; Sommerfeld, 1927
  - horses; Rumjancev, 1936
  - sheep, Soay; Schultze, 1934
- Anatomy, detailed:
- brachygnathy; Weidenreich, 1925
  - brain-case, canids; Dahr, 1942
  - craniometrical methods and indices, equids; Nitsche, 1924
  - craniometry, cattle; Pia, 1941
  - dentition; Herre, 1951
    - dingo; Jones, 1921
    - Equus transilvanicus*; Teodoreanu, 1926
    - horses; Boicoianu, 1932; E. Schwarz, 1922  - dwarfing, cattle; Szalay, 1930
  - dwarfism; Weidenreich, 1925
  - endocrine balance, domestic animals; Klatt, 1948
    - pigs; Helm, 1938  - gonads, hyperfunction, rat; Richter, 1952
  - horn-cores, goats; Bate, 1953; Teodoreanu, 1924; Zeuner, 1955
    - keeled, *Bos colliceros*; Rostafinski, 1933  - hump, zebu, origin of; Koppers and Jungblut, 1942-45
  - mandible; Herre, 1951
    - dog; Hue, 1960b; Reverdin, 1927-28  - metapodials, of wild and domestic sheep; Andreeva, 1933
  - osteology, animals in Switzerland; Vogel, 1933
    - cattle; Degerbøl, 1939; Hescheler and Rüger, 1942
    - dogs; Dahr, 1937; Wagner, 1930
    - goats; Hildebrand, 1955
    - horse; Kwaschnin, 1931; Lundholm, 1949; Brinkmann, 1920; Cardoso, 1912
    - Odocoileus*; Hildebrand, 1955
    - pig; Pira, 1909

Anatomy (*continued*):

- osteology,
  - sheep; Hildebrand, 1955
  - urus; Reynolds, 1939
- osteometry, cattle; Revilliod and Dottrens, 1947
- dogs; Haag, 1948
- equids; Bourdelle, 1932
- pathological characters; Weidenreich, 1925
- phalanges, cattle; Dottrens, 1946
- precipitine reaction, cattle; Sasaki, 1934
- serology, canids; Dürst, 1945
  - cattle; Merckens, 1929; Sasaki, 1934
  - sheep; Kacrkowski, 1928
- skeleton, cattle; Epstein, 1933
- skeletons, Artiodactyla; Lawrence, 1944
- skull, cattle; Herre, 1949
  - dog; Hue, 1906a
  - Don-Danube goat; Lebel, 1939
  - goat; Sickenberg, 1930
  - growth, cattle; Hilzheimer, 1926
  - domestic animals; Hilzheimer, 1928
- skulls, asses; Brinkmann, 1920
- canids; Gehl, 1930; Hilzheimer, 1908
- canids, effects of captivity; Noack, 1907
- cats; Morrison-Scott, 1952
- cattle; Chlebaroff, 1929-30; Noack, 1909; Teodoreanu, 1929
- developmental arrest; Hilzheimer, 1926
- dingo; Jones, 1921
- dog; Lawrence, 1944; Degerbøl, 1927; Noack, 1909; Studer, 1900
- equids; Vetulani, 1928
- goats; Pia, 1942a
- growth, pig; Helm, 1938
- horse; Kwaschnin, 1928; Noack, 1909; Boicoianu, 1932; Nitsche, 1924
- pig; Otto, 1901; Philiptschenko, 1933; Ritzoffy, 1932; Bäumlér, 1921; Belie, 1939
- variability, ferrets and polecats; Ashton and Thompson, 1955
- statistical studies, cattle; Van Giffen, 1914
- statistics, dogs; Van Giffen, 1929
- teeth (*see* dentition)
- Ancestry of cattle; Morse, 1912
- Ancient domestic mammals; Keller, 1919
- Anger, physiology of; Funkenstein, 1955
- Animal behavior; Slijper, 1948
- Animal breeding, independent; Menghin, 1931
- Animal representation: rock-drawings, figurines, paintings, seals, art, etc.:
  - Africa, north, rock-drawings, horse and camel; Lhote, 1953
  - north, rock-paintings, domesticants; Staffe, 1939
  - northeast, representations of camel; Uhden, 1929
  - northeast, rock-drawings of domesticants; Breuil and Kemal el Dine, 1928
- Asia, southwestern, representations of domesticants; Friederichs, 1933
  - China; Sowerby, 1935
  - Crete; Slawkowski, 1940
- Egypt, engravings, cattle; Caton-Thompson and Gardner, 1934
- figurines, cattle; Randall-MacIver and Mace, 1902
- figurines, sculptures, paintings, domesticants; Gaillard, 1912
- representations of cats; Langton, 1940
  - of dogs; Houbard, 1934
  - of domesticants; Pia, 1941, 1942a, b; Schweinfurth, 1912
  - of fauna; Boessneck, 1953
  - of sheep; Thilenius, 1900
- rock-drawings, dog and cattle; Winkler, 1938-39
- Europe, representations of horse; Hermes, 1935-36

Animal representation (*continued*):

- France, cave-paintings, cattle; Koby, 1954
  - representations of equids; Bourdelle, 1938; Bourdelle and Trombe, 1946
- Indus Valley, seals, domesticants; Mackay, 1938
- Mesopotamia, images, domesticants; Heinrich, 1936
  - representations of camel; Pohl, 1950-52
  - of domesticants; Van Buren, 1939
- Near East, representations of cattle; Dürst, 1900
- Palaeartic, representations of dogs; Hilzheimer, 1932
- Sudan, rock-drawings, domesticants; Newbold, 1928
- Sumeria, sculpture of goat; Amschler, 1937
- Switzerland, representations of domesticants; Kramer, 1900
- Ukraine, figurines, cattle; Tackenberg, 1954
  - figurines, domesticants; Melnyk, 1928
  - representations of domesticants; Bogaevsky, 1937
- Antelope, Beatrix, Egypt; Gaillard, 1912
  - domestication of, Egypt; Zeuner, 1954
- Anti-A, sheep; Kacrkowski, 1928
- Apis, steer of; Lortet and Gaillard, 1903-09
- Archaeological sites (*see* Local place names)
- Arni buffalo; Koppers and Jungblut, 1942-45
- Artifacts:
  - Denmark; Mathiassen, 1944
  - Mesopotamia, with water buffalo; Lloyd, 1940
- Artiodactyla, bones of, North America; Lawrence, 1951
- Aryans and origin of dog; Noack, 1915b
- Asino-hemion, type of equid; Bourdelle and Trombe, 1946
- Ass, domestic; Antonius, 1918; Bourdelle, 1932; Lydekker, 1912a
  - Asia, central; Menghin, 1931
  - China; Erkes, 1940
  - Egypt; Hilzheimer, 1935
  - Iraq; Lloyd and Safer, 1945
  - Syria; Mallowan, 1947
- Ass, half-ass; Bourdelle and Trombe, 1946
- Ass, wild:
  - Africa, northwestern; Lydekker, 1912a
  - Egypt; Gaillard, 1934
  - France; Boule, 1910; Bourdelle, 1938
  - Indus valley; Roy, 1946
- Aurochs (*see* Urus; also Reynolds, 1939)
- Autochthonous domestication, pig, Sweden; Pira, 1909
- Baboons; Funkenstein, 1955
- Banteng; Adametz, 1933; Ewart, 1912; Keller, 1902; Melnyk, 1927
  - East Indies; Merckens, 1929; Sommerfeld, 1927
  - Indo-China; Vittor, 1933
- Battle-ax; Childe, 1941
- Battle-ax people, Europe, eastern; Clark, 1941
- Beatrix antelope, Egypt; Gaillard, 1912
- Beaver, giant; Galbreath, 1947
- Bees, Central America; Curwen and Hatt, 1953
- Behavior, dog and wolf; Scott, 1954
- Bergen Museum, dogs in; Brinkmann, 1921
- Bibliography of camel; Hilzheimer, 1913
  - of cat; Hilzheimer, 1913
  - of dog, 19th century; Studer, 1900
  - of domestic animals, Near East; Dyson, 1953
  - of fauna of ancient Egypt; Boessneck, 1953
  - of horse; Lundholm, 1949
  - of reindeer; Jettmar, 1952; Hatt, 1919
- Bibovine group; Leister, 1943
- Biocoenosis, natural; Hediger, 1938
- Biogeographical conditions, glacial; Lundholm, 1949

- Biological inferiority and domestication; Hediger, 1938  
 Birds, domestic; Reinhardt, 1912; Wilckens, 1905  
     origin of; Pycraft, 1938  
 Blood-groups, sheep; Kaerkowski, 1928  
 Bones, identification; Lawrence, 1944  
     individual variation; Hildebrand, 1955  
 Bovidae, evolution; Pilgrim, 1947  
 Bovids, wild; Antonius, 1919  
     evolution of; Morse, 1912  
     Indo-China; Vittor, 1933  
 Bovinae, evolution; Kolesnik, 1936  
     inter-relationships among; Merckens, 1929  
 Breeds of domestic animals; Mason, 1951  
 Bridoon-bit; Hermes, 1936  
 Buffalo, African, in Egypt; Gaillard, 1933  
     water; Koppers and Jungblut, 1942-45  
         China; Bishop, 1939  
         East Indies; Merckens, 1929  
         Formosa; Sasaki, 1934  
         Iraq; Lloyd, 1940  
         Philippines; von Fürer-Haimendorf, 1932  
 Camel and/or dromedary; Forbes, 1955; Hilzheimer, 1913  
     Africa, north; Lhote, 1933; Staffe, 1939, 1940  
         northeast; Robinson, 1936  
     Arabia; Walz, 1951  
     Asia; Robinson, 1936  
         central; Menghin, 1931; Walz, 1954  
         China; Erkes, 1940; Schafer, 1950  
         Egypt; Caton-Thompson, 1934; Free, 1954; George, 1950  
         Mesopotamia; Pohl, 1950-52  
         Near East; Albright, 1940; Mikesell, 1955  
         Palestine; Isserlin, 1950  
         Sahara; Newbold, 1928  
 Camel-hair, Egypt, early Dynastic; Caton-Thompson, 1934  
 Camelidae, South America; Herre, 1952; Latcham, 1924; Steinbacher, 1953  
 Canids, wild, North America; Haag, 1948  
 Captivity, effects on skull; Noack, 1907  
 Carabao (*see* Buffalo, water)  
 Caravans, desert travel by; Forbes, 1955  
 Carbon-14 determinations, Iran; Ralph, 1955  
 Cart-horse, Europe, west; Rumjancev, 1936  
 Cat; Haltenorth, 1953; Hilzheimer, 1913; Lorenz, 1955; Schwangart, 1928, 1931;  
     Zeuner, 1950  
     adrenal physiology; Funkenstein, 1955  
     Anatolia; Gejvali, 1938-39  
     Asia, central; Noack, 1909  
     Denmark; Curwen, 1938  
     Egypt; Brunton and Caton-Thompson, 1928; Langton, 1940; Morrison-Scott,  
         1952  
     Holland; Hooijer, 1947  
 Cattle-breeders, Ukraine; Hancar, 1951  
 Cattle, breeds and/or types; Lydekker, 1912b  
     Aberdeen-Angus; Ewart, 1912; Sasaki, 1934  
     Afrikaner; Epstein, 1933  
     Albanese; Chlebaroff, 1929-30  
     Bechuana; Epstein, 1933  
     brachycephalid; Adametz, 1925  
     brachyceros, Egypt; Bisschop, 1937  
     brachyceros-type; Adametz, 1933  
     British white; Whitehead, 1953  
     Cadrow; Ewart, 1912

Cattle, breeds and/or types (*continued*):

- Celtic shorthorn; Childe, 1940; Ewart, 1912; Mond and Myers, 1934; Reynolds, 1939  
 Damara; Epstein, 1933  
 dun-polled; Wilson, 1909  
 Fjällras; Whitehead, 1953  
 Friesian-Dutch; Merkens, 1929  
 Galloway; Ewart, 1912  
 Hamitic longhorn; Epstein, 1933  
 Holstein-Friesian; Sasaki, 1934  
 horned red; Wilson, 1909  
 Hottentot; Epstein, 1933  
 Hungarian Grey Steepe; Pia, 1941  
 identification of; Bronholm and Rasmussen, 1931  
 Illyrian; Chlebaroff, 1929-30  
 Japanese native; Sasaki, 1934  
 Java-Madurese; Merkens, 1929; Sommerfeld, 1927  
 Jersey; Merkens, 1929  
 Kalmuck; Kolesnik, 1936; Noack, 1909  
 Kirghiz; Kolesnik, 1936  
 Korean, south; Sasaki, 1934  
 longhorn, Hamitic; Bisschop, 1937; Epstein, 1933  
 long-horned; Caton-Thompson and Gardner, 1934; Curwen, 1938; Dürst, 1900; Newbold, 1928; Schweinfurth, 1912; Pia, 1941  
 longhorned white; Whitehead, 1953; Wilson, 1909  
 Macedonian; Chlebaroff, 1929-30  
 Madurese; Sommerfeld, 1929  
 Mongol; Kolesnik, 1936  
 Montagne; Cardas, 1926  
 Montenegrin; Chlebaroff, 1929-30  
 oriental; Ewart, 1912  
 polled; Auld, 1927  
 polled white; Whitehead, 1953  
 Rhodope; Chlebaroff, 1929-30  
 Sanga; Bisschop, 1937  
 short horned; Caton-Thompson and Gardner, 1934; Curwen, 1938; Epstein, 1933; Schweinfurth, 1912; Slawkowski, 1933; Merkens, 1929  
 Watusi; Epstein, 1933  
 wild white; Whitehead, 1953  
 Yakut; Kolesnik, 1936  
 Zulu; Epstein, 1933
- Cattle, domestic and/or possibly domestic; Antonius, 1919; Dürst, 1900; Ewart, 1912; Hahn, 1909; Hilzheimer, 1927; Koby, 1954; Kolesnik, 1936; Leister, 1943; von Lengerken, 1953, 1955; Lydekker, 1912b; Morse, 1912; Pilgrim, 1947; Sauer, 1952; Szalay, 1930
- Africa; Bisschop, 1937  
 south; Epstein, 1933  
 Anatolia; Slawkowski, 1933  
 Balkans; Chlebaroff, 1929-30  
 British Isles; Reynolds, 1939; Whitehead, 1953; Wilson, 1909  
 Bukhara; Adametz, 1936  
 Denmark; Bronholm and Rasmussen, 1931; Mathiassen, 1944  
 East Indies; Merkens, 1929; Sommerfeld, 1927  
 Egypt; Adametz, 1920; Winkler, 1938-39  
 Egypt, southwest; Shaw, 1936  
 Eurasia; Bryner, 1932  
 Europe; Clark, 1947; Jackson, 1932  
 Europe, northern; Herre, 1949  
 France; Adametz, 1925  
 Holland; Van Giffen, 1914  
 Indo-China; Vittor, 1933  
 Indus Valley; Sewell and Guhr, 1931  
 Iran; Amschler, 1939a, b



- Cattle, domestic and/or possibly domestic (*continued*):  
 Iraq; Lloyd and Saber, 1945  
 Mesopotamia; Heinrich, 1936  
 Moravia; Mohapl, 1914  
 Pakistan; Mackay, 1938  
 Palestine; Vaufrey, 1951  
 Spain; Adametz, 1925; Staffe, 1943  
 Sudan; Newbold, 1928  
 Switzerland; Dottrens, 1946; Gerbes, 1951; Revilliod and Dottrens, 1947  
 Turkestan, western; Menghin, 1931  
 Ukraine; Melnyk, 1927
- Cattle, wild; Lydekker, 1912b  
 Egypt; Gaillard, 1934  
 Eurasia; Bryner, 1932  
 France; Koby, 1954  
 Palestine; Bate, 1932, 1942
- Chariot-horses; Mallowan, 1936
- Cheese from deer milk, South Carolina; Swanton, 1940
- Chicken (*see* Fowl, jungle)
- Chromosome number, canids; Matthey, 1954
- Chronology of domestication (*see* Sequence of domestication)
- Civilization, general; Hehn, 1902  
 Africa, north; Lhote, 1953  
 Indo-European; Nehring, 1936
- Civilization and cattle; von Lengerken, 1953  
 and domestication; Stegmann von Pritzwald, 1924; Weidenreich, 1925
- Civilizations, independent; Menghin, 1931
- Classification of animals, Sumeria; Oppenheimer and Hartmann, 1945
- Climatic change, Sudan; Bate, 1953  
 and pig distribution; Amon, 1938  
 and tarpan distribution; Vetulani, 1928  
 Ukraine, Neolithic; Tackenberg, 1954
- Color similarities, banteng and brachyceros cattle; Adametz, 1933
- Commensalism, wolf and man; Scott, 1954
- Convergent evolution; Cabrera, 1932
- Co-operative social life, wolves; Scott, 1954
- Co-variation, length and breadth of brain-case, canids; Dahr, 1942
- Coyote; Dahr, 1937; Galbreath, 1947
- Cross section of horn of goat; Koch, 1937
- Cult-animal of Set, Egypt; Newberry, 1928
- Cult-association, oxen; Hahn, 1909
- Cultivated plants; Mangelsdorf, 1952
- Cultivation of plants, Africa, and goats; Kroll, 1928
- Cultural background, domestication; Keller, 1902  
 loans, China; Bishop, 1939
- Culture:  
 Amratian, Egypt, cattle figurines; Randall-MacIver and Mace, 1902  
 domestic animals; Jackson, 1937  
 fauna; Peet, 1914  
 Anau, Turkestan, SSR, domestic animals; Menghin, 1931  
 Andronovo, northern Siberia, domestic animals; Jettmar, 1950  
 Badarian, Egypt, fauna; Brunton and Caton-Thompson, 1928  
 comb-ceramic, northeastern Europe, domestic animals; Gandert, 1930  
 Ertebøle, Denmark, domestic animals; Madsen, 1900  
 Halafian, Syria, domestic animals; Mallowan, 1946  
 Karasuk, northern Siberia, domestic animals; Jettmar, 1950  
 Maglemosian, England, fauna; Fraser and King, 1954  
 Minussinsk, Siberia, origin of horse; Amschler, 1934  
 Mullerup, Denmark, domestic animals; Curwen, 1938  
 Natufian, Palestine, dog; Bate, 1937  
 fauna; Bate, 1932, 1937; Vaufrey, 1951  
 Protoeskimoid, arctic Siberia, dog; Flor, 1930  
 Protosamojed, arctic Siberia, reindeer; Flor, 1930

Culture (*continued*):

- Shang, northern China, fauna; Teilhard de Chardin and Young, 1936  
 Tripolje, Ukraine, domestic animals; Bogaevsky, 1937; Hancar, 1951  
 fauna; Gromova, 1927; Tackenberg, 1954  
 Uruk, Iraq, water buffalo; Lloyd, 1940  
 Yarmukian, Palestine, domestic animals; Stekelis, 1950  
 Culture, swine-breeding, southern Asia and Europe; Menghin, 1931  
 adapted to reindeer behavior; Zeuner, 1954
- Dairy purposes and origin of domestication; Curwen and Hatt, 1953  
 Dawn of domestication, Palestine; Josien, 1955  
 Deer, domestic, South Carolina; Swanton, 1940  
 Defective mutations, dogs; Krieg, 1929  
 Degree of domestication, pigs; Reitsma, 1935  
 Desert travel by animals; Forbes, 1955  
 Desert valleys, culture of, Egypt; Winkler, 1938-39  
 Dingo (*see* Dog, breeds, dingo)  
 Diphyletic ancestry, horse; Chubb, 1913  
 Diphyletic origin of cattle, Europe; Merckens, 1929; Morse, 1912  
 of dog; Noack, 1907  
 of goats; Keller, 1902  
 of horses; Keller, 1902  
 of pig; Belic, 1939  
 Dispersal, routes of; Sauer, 1952  
 Docility, selection for; Richter, 1952; Scott, 1954  
 Dog, breeds and/or types; Ash, 1927; Hilzheimer, 1932  
 African, ancient; Kroll, 1928  
 Aguara; Hummerlink, 1928  
 alco; Hummerlink, 1928  
 Arctic; Van Giffen, 1929  
 basket maker; Lawrence, 1944  
 borzoi; Brinkmann, 1921  
 Brazilian roe-dog; Hummerlink, 1928  
 Cimbric-Megalithic; Van Giffen, 1929  
 deerhound; Brinkmann, 1923-24; Studer, 1901, 1906  
 dingo; Baas, 1938; Dahr, 1937, 1942; Dürst, 1945; Etheridge, 1916; Jones, 1921;  
 Noack, 1907; Studer, 1901  
 Russia; Studer, 1906  
 Egyptian; Houbard, 1934  
 Eskimo; Allen, 1920  
 Finnish; Brinkmann, 1923-24  
 gray deerhound; Brinkmann, 1923-24  
 Great Dane-Newfoundland-St. Bernard; Hooijer, 1947  
 greyhound; Brinkmann, 1921; Lortet and Gaillard, 1903-09; Studer, 1901  
 Africa; Kroll, 1928  
 Egypt; Schweinfurth, 1912  
 Indian; Prashad, 1936  
 North African; Petters, 1934  
 husky; Haag, 1948  
 Kaffir; Petters, 1934  
 Kalmuck; Noack, 1909  
 mastiff, Pakistan; Mackay, 1938  
 mastiffs; Studer, 1906, 1907  
 Mexican pug; Hummerlink, 1928  
 "palustris-svärdborgensis;" Degerbøl, 1927  
 pariah; Amschler, 1939b; Dürst, 1945; Noack, 1907; Peet, 1914; Studer, 1901  
 Egypt; Schweinfurth, 1912  
 peat-dog; Brinkmann, 1923-24  
 Sweden; Pira, 1926  
 Switzerland; Reverdin, 1927-28  
 pug, Mexican; Hummerlink, 1928  
 roe-dog, Brazilian; Hummerlink, 1928

Dog, breeds and/or types (*continued*):

- shepherd; Noack, 1915b; Studer, 1906
- short-nosed; Lawrence, 1944
- Techichi; Lawrence, 1944
- terp-dogs; Van Giffen, 1929
- Tibetan mastiffs; Studer, 1901
- turbary; Brinkmann, 1923-24; Gandert, 1930
- Dog, domestic and/or possibly domestic; Ash, 1927; Cabrera, 1932; Hilzheimer, 1932; Linton, 1955; Lorenz, 1955; Matthey, 1954; Scott, 1954; Studer, 1901; Wagner, 1930
- Africa, north; Noack, 1907
- China; Bishop, 1933, 1939; Liang, 1934
- Denmark; Degerbøl, 1927, 1933; Johansen, 1919
- Egypt; Adametz, 1920; Hilzheimer, 1908; Winkler, 1938-39
- England; Fraser and King, 1954
- Eurasia; Dahr, 1942
- Eurasia, southern; Menghin, 1931
- Europe; Dahr, 1937; Hue, 1906a; Van Giffen, 1929
- northeastern; Gandert, 1930
- Finland; Luho, 1948
- France; Hue, 1906b; Pequart, 1937
- Germany; Baas, 1938; Gehl, 1930
- Holland; Hooijer, 1947
- Illinois; Galbreath, 1947
- Iran; Bate, 1937
- North America; Allen, 1920; Haag, 1948
- Palestine; Bate, 1932, 1937, 1942; Zeuner, 1955
- Russia; Studer, 1906
- Scandinavia; Brinkmann, 1921, 1923-24
- Siberia; Flor, 1930
- South America; Krieg, 1929
- Sudan; Bate, 1949, 1953
- Switzerland; Brinkmann, 1923-24
- West Indies; Hummerlink, 1928
- Dog head, mummified, Peru; Noack, 1915a
- Dog, wild, Australia (*see* Dingo)
- Dogs, semi-domesticated, Grand Chaco; Krieg, 1929
- used as food; Gandert, 1930; Lawrence, 1944; Reverdin, 1927-28
- Domestic animals, surveys of:
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  - Regional:
    - Africa, east; Kroll, 1928
    - north; Staffe, 1939
    - south; Kroll, 1928
    - Anatolia; Gejvali, 1937-38; Patterson, 1937
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    - Asia, central; Hermanns, 1949
    - southwest; Friederichs, 1933; von Fürer-Haimendorf, 1955
    - Austria; Amschler, 1939c
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    - Central America; Latcham, 1924
    - China; Sowerby, 1935
    - north; Anderson, 1943; Bylin-Althin, 1946; Teilhard de Chardin and Young, 1936
    - Crete; Slawkowski, 1940
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- Italy; Riedel, 1948, 1951
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- South America; Latcham, 1924
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  - definition of; Dobzhansky, 1955
  - determination of, by goat horn-cores; Zeuner, 1955
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  - dog, behavior; Scott, 1954
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  - pig; Pira, 1909
  - crania; Bäumlér, 1921
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  - agricultural people; Linton, 1955
  - behavior of domesticable animals; Wissler, 1945
  - decoy-use in hunting; Sirelius, 1916-20; Zeuner, 1954
  - economic use of young; Clark, 1948
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  - hunting tribes, importance of; Koppers, 1932
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  - pet-keeping; Linton, 1955; Zeuner, 1954
  - psychological factors; Hediger, 1938
  - reindeer, herding of; Linton, 1955
    - influence of; Jettmar, 1952
    - on horse-breeding; Werth, 1940; Wiklund, 1918
  - religious; Meissner, 1926; Roy, 1946; Sauer, 1952; Staffe, 1939
  - with cattle; Hahn, 1909
  - scavenging, in dog; Haag, 1948

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- social factors, man and animals; Zeuner, 1954
- symbiosis, natural; Zeuner, 1954
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- Domestication, site of; Feige, 1927, 1928
- Geographical:
  - Abyssinia; Shaw, 1936
  - Anatolia; Slawkowski, 1933
  - Asia, southeastern; Linton, 1955; Sauer, 1952
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  - Egypt; Linton, 1955
  - Orient; Hehn, 1902
  - South America; Sauer, 1952
  - sub-Arctic; Koppers, 1932
  - Turkestan, western; Hermanns, 1949
- Domestication, study of: Antonius, 1922; Braidwood, 1954; Herre, 1939, 1955; Keller, 1902; Klatt, 1927
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  - alpaca, Peru; Curwen and Hatt, 1953
  - ass, Africa, eastern; Rathjens, 1955
  - Ethiopia; Werth, 1940
  - Mediterranean area, eastern; Lydekker, 1912a
  - banteng, Java; Sommerfeld, 1927
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  - camel, Asia, central; Forbes, 1955; Randhawa, 1946; Walz, 1954
  - Mongolia; Linton, 1955
  - cat, Africa, north; Noack, 1909
  - Egypt; Zeuner, 1950
  - cattle, Asia, southwestern; Kolesnik, 1936
  - Bactria and periphery; Hermanns, 1952
  - Europe, north; Herre, 1949
  - India; Dürst, 1900; Werth, 1940; Kolesnik, 1936
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  - Russia; Studer, 1906
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  - dromedary, Africa, north; Randhawa, 1946
  - Africa, northeastern; Rathjens, 1955
  - Arabia; Albright, 1950; Forbes, 1955; Mikesell, 1955; Walz, 1951
  - fowl, jungle, Asia, southeastern; Linton, 1955
  - goat, Turkestan; Randhawa, 1946
  - "herd animals," Asia, southwest; Sauer, 1952
  - South America; Sauer, 1952
  - horse, Africa; Ridgeway, 1905; Sommerfeld, 1927
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  - China; Erkes, 1940
  - Eurasia, north; von Fürer-Haimendorf, 1955
  - Europe, eastern; Clark, 1941
  - Iran; Hehn, 1902
  - Oriental, Africa, north; Chubb, 1913
  - Russia, southern; Curwen and Hatt, 1953
  - Scandinavia; Jackson, 1932
  - sub-Arctic; Koppers, 1932
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  - llama, Peru; Curwen and Hatt, 1953
  - pig, Asia, southeastern; Linton, 1955
  - pig, Tschuwasian breed, Tien-Shan; Havesson, 1933
  - rabbit, Spain; Nachtsheim, 1929
  - reindeer, Asia, central; Laufer, 1917
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  - sub-Arctic; Koppers, 1932

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  sheep, Africa, north; Thilenius, 1900  
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  Turkestan; Randhawa, 1946  
  turkey, Central America; Curwen and Hatt, 1953  
Donkey (*see* Ass, domestic)  
Dorcas gazelle, Egypt; Gaillard, 1912  
Draft animal; Menghin, 1931; Werth, 1940  
  dog used as; Luho, 1948  
  reindeer used as; Sirelius, 1916-20  
Draft horses, European; Chubb, 1913  
  northeastern Syria; Mallowan, 1936  
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Dromedary, wild, extinction of; Mikesell, 1955  
  North Africa; Mikesell, 1955  
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  Switzerland; Vogel, 1933  
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  Egypt; Bate, 1953; Pia, 1942a  
  Sudan; Bate, 1949, 1953  
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  differences in, and variation in animals; Reitsma, 1935  
  effect of; Weidenreich, 1925  
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  Palestine; Bate, 1942  
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  convergent; Cabrera, 1932  
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  natural; Mangelsdorf, 1952  
  parallel; Herre, 1952  
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     horse; Malloyan, 1936  
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     cat, northern Europe; Hooijer, 1947  
     dog, Denmark; Degerbøl, 1927  
         Germany; Baas, 1938  
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     gifts, mortuary; Jettmar, 1950  
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     China; Bishop, 1939  
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     Anatolian; Vetulani, 1934  
     Angora; Adametz, 1941; Batu, 1939  
     Angora, Anatolia; Vetulani, 1934  
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     big-horned; Kramer, 1900  
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     Girgentinian goat; Adametz, 1932, 1941

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- Mamber; Gaillard, 1934; Mallowan, 1946, 1947
- Pinzgauer; Sickenberg, 1930
- screw-horned (*see* spiral-horned)
- spiral-horned; Antonius, 1944; Bate, 1940; Koch, 1937; Mallowan, 1946, 1947; E. Schwarz, 1935
- straight-horned, Asia, southwest; Zeuner, 1955
- twisted-horned (*see* spiral-horned)
- Goats, domestic and or possibly domestic; Adametz, 1928; Dalimier, 1954; Hilzheimer, 1933; E. Schwarz, 1935
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- Asia; Batu, 1939
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- Egypt; Adametz, 1920; Pia, 1942a; Randall-MacIver and Mace, 1902
- Europe; Adametz, 1915
- Europe, central and southeastern; Teodoreanu, 1924
- Iraq; Lloyd and Safer, 1945
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- Palestine; Vaufrey, 1951; Zeuner, 1934
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- Sumeria; Amschler, 1937
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- Goats, wild; E. Schwarz, 1935
- bezoar; Amschler, 1929a; Bate, 1942 (possibly ibex); Dalimier, 1954; Pilgrim, 1947; Vetulani, 1934
- markhor; Dalimier, 1954; Koch, 1937; Philiptschenko, 1928; Pilgrim, 1947
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- Golden Fleece, history of Merino sheep; Burns and Moody, 1935
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- Grave-goods, figurines, cattle, Egypt; Randall-MacIver and Mace, 1902
- Graves, Amratian, animal figurines; Randall-MacIver and Mace, 1902
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- Har. Ra-Hubullu tablet, Mesopotamian animals; Oppenheim and Hartmann, 1945
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- Herdsmen, mountain, with cattle, Egypt; Winkler, 1938-39
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- Herdsmen-cultures, Tibet; Hermanns, 1949
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- Barb; E. Schwarz, 1922; Simpson, 1951
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- criollo; Cardoso, 1912; Solanet, 1930
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- Lithuanian-Polish-Esthonian group; Kwaschnin, 1931
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- Shmudie; Kwaschnin, 1928
- Siwalik; Ewart, 1909, 1912
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- Africa, north; Lhote, 1953; Ridgeway, 1905
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- Asia Minor (*see* Anatolia)
- Bactria; Hancar, 1952
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- Europe; Hermes, 1935-36; Munro, 1902
  - east; Kwaschnin, 1931
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- Iran; Amschler, 1935; Childe, 1940
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- Scythia; Amschler, 1933
- Sumeria; Amschler, 1935
- Horse, harness, riding, etc.
  - bridle; Hermes, 1936
  - chariots; Antonius, 1944; Childe, 1941
  - chariot wheels; Mallowan, 1936
  - harness; Hermes, 1936; Mallowan, 1936
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  - China; Erkes, 1940
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  - Eurasia; Dobzhansky, 1955
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  - France; Reverdin, 1930-31
  - Palestine; Bate, 1932
  - Pyrenees; Bourdelle and Trombe, 1946
- Hunters with dogs, Egypt; Winkler, 1938-39
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  - banteng and zebu; Merckens, 1929
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  - cattle; Melnyk, 1927
  - dogs; Ash, 1927
  - gaur and cow; Hermanns, 1952
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  - wolf and dog; Brinkmann, 1923-24
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- Ibex; E. Schwarz, 1935; Schweinfurth, 1912
  - Egypt; Gaillard, 1912
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- Indians (American) and domestic deer; Swanton, 1940
- Indices, mandibles, dogs; Reverdin, 1927-28
- Indo-Europeans and origin of dog; Noack, 1915b
- Inferiority, biological, and domestication; Hediger, 1938
- Insects, domestic; Wilckens, 1905
- Introduction and/or dispersal of:
  - buffalo, water, to Persia; Koppers and Jungblut, 1942-45
  - into Philippines; von Fürer-Haimendorf, 1932
  - cat into Europe; Haltenorth, 1953
  - cattle, Auvergne breed, to France and England; Adametz, 1925
  - brachyceros, into Egypt; Bisschop, 1937
  - longhorn, out of Egypt; Bisschop, 1937
  - taurus, to India; Koppers and Jungblut, 1942-45
  - dingo into Australia; Baas, 1938; Etheridge, 1916; Jones, 1921
  - dog, greyhound, into eastern Africa; Kroll, 1928
  - dog into North America; Haag, 1948
  - dogs, Eurasia; Noack, 1915b
  - into Europe; Allen, 1920

Introduction and/or dispersal of (*continued*):

- dogs, into Finland; Luho, 1948
  - into North America; Allen, 1920
- domestic animals, into Africa; Adametz, 1920
  - into British Isles; Dawkins and Jackson, 1917
  - into Europe; Hehn, 1902
  - into southern Arabia; Rathjens, 1955
- dromedary, North Africa; Mikesell, 1955
  - into eastern Africa; Staffe, 1940
- goat, Angora, into Anatolia; Batu, 1939
- goats, Asia, central; Amschler, 1931
- horse, into Anatolia; Clark, 1941
  - into Egypt; Ridgeway, 1905
  - into Near East; Ridgeway, 1905
  - to historical peoples; Smith, 1928
- pack and draft animals, Asia; Werth, 1940
- reindeer to Finland; Luho, 1948
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- sheep, fat-rumped, to Bukhara; Adametz, 1927
- yak, Asia, central; Amschler, 1932
- zebu, into northwestern Africa; Bisschop, 1937
  - into Africa; Epstein, 1933
- Invaders, mounted; Hancar, 1952
- Invertebrates, domestic; Reinhardt, 1912
- Irano-Sanskrit vocabulary and horse domestication; Smith, 1928
- Italian white cattle, British Isles; Wilson, 1909
- Jackal; Dahr, 1937, 1942; Degerbøl, 1933b; Dürst, 1945; Keller, 1902; Matthey, 1954; Noack, 1907; Scott, 1954; Van Giffen, 1929
  - Africa, north; Hilzheimer, 1908
  - Egypt; Lortet and Gaillard, 1903-09
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- Jungle and domestication; Linton, 1955
- Jungle fowl (*see* Fowl, jungle)
- Keel of horn, goat; Koch, 1937
- Kikkuli text; Hrozy, 1931
- "Kish" goat; Crawford, 1938
- København Museum, dogs in; Brinkmann, 1921
  - sub-fossil materials in; Degerbøl, 1933b
- Linguistic evidence and domestication; Nehring, 1936
- Linguistics, comparative; Hehn, 1902
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- Llama; Curwen and Hatt, 1953; Herre, 1952; Hilzheimer, 1913; Krieg, 1929; Steinbacher, 1953; Werth, 1940
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  - Agrirento, Sicily, spiral-horned goat; Adametz, 1932, 1941
  - Alishar Hüyük, Anatolia, domestic animals; Patterson, 1937
  - Aloppe, Sweden, pigs; Pira, 1909
  - Alpenquai, Switzerland, domestic animals; Wettstein, 1924
  - Altai Mts., Siberia, goats; Amschler, 1931
    - horses; Amschler, 1933
  - Anau, Turkmen SSR, dog; Bate, 1932; Dürst, 1908; Van Giffen, 1929
    - fauna; Dürst, 1908
    - horse; Amschler, 1936; Rumjancev, 1936
  - Ancon, Peru, mummified head of *Canis ingae*; Noack, 1915a
  - Anneröd, Sweden, pigs; Pira, 1909
  - Anyany, northern China, fauna; Teilhard de Chardin and Young, 1936

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 Assuan (*see* Aswan)  
 Aswan, Egypt, animal representations; Schweinfurth, 1912  
 rock-drawings; Winkler, 1938-39  
 Athlit caves, Palestine, fauna; Bate, 1932  
 Badari, Egypt, shorthorned cattle; Caton-Thompson and Gardner, 1934b  
 Baldegg, Switzerland, domestic animals; Hescheler and Rüger, 1940  
 Balih (valley), Syria, domestic animals; Mallowan, 1946  
 Banahilk, Iraq, fauna; Braidwood, 1954  
 Beer-Sheba, Palestine, domestic animals; Josien, 1955  
 Belt Cave, Iran, Carbon-14 determinations; Ralph, 1955  
 fauna; Coon, 1951  
 Berchtesgaden, Germany, dog; Studer, 1907  
 Bern, Switzerland, cattle; Gerbes, 1951  
 Biisk, central Asia, domestic animals; Noack, 1909  
 Bir Abou Matar (*see* Beer-Sheba)  
 Bir Es-Safadi (*see* Beer-Sheba)  
 Bludenz, Austria, fauna; Amschler, 1939c  
 Bogaz Köy, Anatolia, Kikkuli text found; Hrozny, 1931  
 Bokarn (Lake), Sweden, horses; Lundholm, 1949  
 Bologoie, Russia, *Canis poutiatini*; Studer, 1906  
 dog; Gandert, 1930  
 Brak, Syria, domestic animals; Mallowan, 1947  
 Bukhara, Turkestan, fat-rumped sheep; Adametz, 1927  
 Bundsø on Jylland, Denmark, fauna; Degerbøl, 1939  
 Chagar Bazar, Syria, horse; Mallowan, 1936  
 Chalain (Lake), France, dog; Hue, 1906b  
 Ch'êng-tzù-yai, Shantung, China, fauna; Liang, 1934  
 Ch'i Chia P'ing, Kansu, China, domestic animals; Bylin-Althin, 1946  
 Clairvaux, France, dog; Hue, 1906a  
 Constance (Lake), Switzerland, domestic animals; Vogel, 1933  
 Cortailod, Switzerland, domestic animals; Reverdin, 1928  
 Crestaulta, Switzerland, domestic animals; Rüger, 1942  
 Dakhla, oasis, Egypt, rock-drawings; Winkler, 1938-39  
 Djebel Ouenat (*see* Ouenat)  
 Dobruja, Rumania, cattle; Teodoreanu, 1929  
 Egolzwil, Switzerland, domestic animals; Hescheler and Rüger, 1939, 1942  
 El Amrah, Egypt, cattle figurines; Randall-MacIver and Mace, 1902  
 El Khan, Iraq, fauna; Braidwood, 1954  
 El-Khiam, Palestine, fauna; Vaufray, 1951  
 Ellebeck, Germany, dog; Gehl, 1930  
 El-Mughara (*see* Wadi El-Mughara)  
 El-Omari, Egypt, fauna; Debono, 1948  
 Engel Peninsula, Switzerland, cattle; Gerbes, 1951  
 Er Yoh, France, fauna; Reverdin, 1930-31  
 Errindlev, Denmark, dogs; Brinkmann, 1921  
 Esh Shaheinab (*see* Shaheinab)  
 Fayum, Egypt, camel hair; Caton-Thompson, 1934  
 fauna; Caton-Thompson and Gardner, 1934  
 Frankfurt, Germany, dog; Baas, 1938  
 Ganties-Montespan river, Pyrenees Mts., horses; Bourdelle and Trombe, 1946  
 Gezer, Palestine, camel; Isserlin, 1950  
 Gilf Kebir, Libyan Desert, animal representations; Shaw, 1936  
 Girgentini (*see* Agrigento)  
 Gizeh, Egypt, cats; Morrison-Scott, 1952  
 mummified animals; Lortet and Gaillard, 1903-1909  
 Glamorgan, Wales, horses; Jackson, 1932  
 Glastonbury, Great Britain, domestic animals; Dawkins and Jackson, 1917  
 Gottland, Sweden, pigs; Pira, 1909

Local place names, archaeological sites, etc. (*continued*):

- Governador, New Mexico, U.S.A., dogs; Lawrence, 1944  
 Grai Resh, Iraq, water buffalo; Lloyd, 1940  
 Grimaldi, caves of, asses; Boule, 1910  
 Groningen, Holland, terpen dog; Van Giffen, 1929  
 Gujarat, India, domestic animals; Sankalia and Karve, 1949  
 Habur (valley), Syria, domestic animals; Mallowan, 1946  
 Halaf (*see* Tell Halaf)  
 Harappa, Indus Valley, domestic animals; Piggot, 1950; Prashad, 1936  
   unicorn; Roy, 1946  
 Hassuna (*see* Tell Hassuna)  
 Hebrides, Scotland, Soay sheep; Schultze, 1934  
 Heinola, Finland, hand-drawn sledges; Luho, 1948  
 Helwan, Egypt, dromedary; George, 1950  
 Hemaniah (*see* Badari)  
 Hildesheim, Germany, dogs; Noack, 1915b  
 Hotu Cave, Iran, fauna; Coon, 1951  
 Husum, Germany, dog; Gehl, 1930  
 Jarmo, Iraq, fauna; Braidwood, 1952; Braidwood and Braidwood, 1950  
 Jericho, Palestine, goats; Zeuner, 1955  
 Kashan, Iran, domestic animals; Vaufrey, 1939  
 Kharga (oasis), Egypt, rock-drawings; Winkler, 1938-39  
 Kiel, Germany, dog; Gehl, 1930  
 Kiev, Ukraine, fauna; Gromova, 1927  
 Kish, Mesopotamia, equids; Amschler, 1936  
   Girgentini goat; Amschler, 1937  
 Klausdorf, Germany, dog; Gehl, 1930  
 Klausenberg, Transylvania, *Capra prisca*; Adametz, 1941  
 Koko-Nor, Tibet, yak; Amschler, 1932  
 Kom Ombo, Egypt, fauna; Gaillard, 1934  
   mummified animals; Lortet and Gaillard, 1903-09  
 Kom W (*see* Fayum)  
 Krzeszowice, Poland, *Bos colliceros*; Rostafinski, 1933  
 Kronstadt, Rumania, *Capra prisca*; Teodoreanu, 1924  
 Ladoga (Lake), Denmark, dog; Degerbøl, 1933b  
 Laibach (moors), Austria, pigs; Ulmansky, 1914  
 "Lake Village" (*see* Glastonbury)  
 Langhnaj, India, domestic animals; Sankalia and Karve, 1949  
 Lascaux cave, France, cattle; Koby, 1954  
 La Tène, France, domestic animals; Revilliod, 1926; F. Schwarz, 1918  
 Lerida, Spain, cattle; Staffe, 1943  
 Linderbeek, Holland, dog and cat; Hooijer, 1947  
 Lo Han T'ang, Kansu, China, domestic animals; Bylin-Althin, 1946  
 Lundby Bog, Denmark, dogs; Degerbøl, 1933b  
 Ma'adi, Egypt, fauna; Menghin, 1933; Menghin and Amar, 1932  
 Maikop, Caucasus Mts., animal representations; Friederichs, 1933  
 Mefesh (*see* Tell Mefesh)  
 Megiddo, Palestine, camel; Isserlin, 1950  
   goat; Mallowan, 1947  
 Merimde-Benisalame, Egypt, fauna; Menghin, 1933  
 Minusinsk, northern Siberia, domestic animals; Jettmar, 1950  
 Minussinsk (Sajan), Siberia, horse; Amschler, 1936  
 M'lefaat, Iraq, fauna; Braidwood, 1954  
 Mohenjo-Daro, Indus Valley, animal representations; Friederichs, 1933  
   domestic animals; Mackay, 1938; Sewell and Guhr, 1931  
   unicorn; Roy, 1946  
 Morbihan (*see* Er Yoh)  
 Mullerup, Denmark, dog; Degerbøl, 1933b  
 Nauenberg, *Capra prisca*; Adametz, 1941  
 Neuchatel (Lake), Switzerland, domestic animals; Pittard and Reverdin, 1921  
 Newstead, Scotland, horse; Ewart, 1907a  
 Obermeilen, Switzerland, domestic animals; Kuhn, 1935  
 Olmütz, Moravia, cattle; Mohapl, 1914

Local place names, archaeological sites, etc. (*continued*):

- Omsk, Siberia, Academy of; Amschler, 1931
- Ouenat, Libyan desert, fauna; Breuil and Kemal el Dine, 1928
- Pocala (cave), Italy, domestic animals; Riedel, 1948
- Quena, Egypt, rock-drawings; Winkler, 1938-39
- Rana Ghundai, Baluchistan, domestic animals; Piggot, 1950
- Ringsjön, Sweden, pigs; Pira, 1909
- Roda, Egypt, mummified animals; Lortet and Gaillard, 1903-09
- Rantasalami, Finland, hand-drawn sledges; Luho, 1948
- Saasigäroï (moors), Finland, drag-sledge; Sirelius, 1916-20
- Saint-Aubin, Switzerland, cattle; Dottrens, 1946; Revilliod and Dottrens, 1947
- dogs; Reverdin, 1927-28
- domestic animals; Reverdin, 1921, 1928
- St. George-Bedeháza, Transylvania, dog and horse; Teodoreanu, 1926
- Sakkara, Egypt, mummified animals; Lortet and Gaillard, 1903-09
- Salers, France, cattle; Adametz, 1925
- Sandomierz, Poland, domestic animals; Zurowski, 1930
- Satrupholm Moor, Germany, cattle; Herre, 1949
- Schaffis, Switzerland, *Capra prisca*; Adametz, 1941
- Schleinbach, Austria, goat; Sickenberg, 1930; Vetulani, 1934
- Seematte, Switzerland, domestic animals; Hescheler and Rüger, 1940, 1942
- Sha'ar ha-Golan, Palestine, domestic animals; Stekelis, 1950
- Shaheinab, Sudan, fauna; Bate, 1953
- Shah Tepe, Iran, fauna; Amschler, 1939a, b
- Sialk, Iran, domestic animals; Vaufrey, 1939
- Sinjar (*see* Grai Resh)
- Sipplingen, Switzerland, domestic animals; Vogel, 1933
- Sjöholmen, Sweden, dog; Dahr, 1937
- Skara Brae, Scotland, domestic animals; Watson, 1931
- Star Carr, England, fauna; Fraser and King, 1954
- Stora Förvar (cave), Sweden, fauna; Pira, 1926
- Stora Karlsö (island), Sweden, fauna; Pira, 1926
- Strandegaard, Denmark, cattle; Bronholm and Rassmussen, 1931
- Susa, Iran, horse; Amschler, 1936
- Svårdborg Moor, Denmark, dogs; Degerbøl, 1927, 1933b; Johansen, 1919
- Taanek, Palestine, camel; Isserlin, 1950
- Tall Chagar Bazar (*see* Chagar Bazar)
- Tartaren, Spain, cattle; Staffe, 1943
- Tell Asmar, Mesopotamia, domestic animals; Hilzheimer, 1934, 1941
- Tell Halaf, Mesopotamia, animal representations; Friederichs, 1933
- Tell Hassuna, Iraq, fauna; Lloyd and Safer, 1945
- Tell Mefesh, Syria, domestic animals; Mallowan, 1946
- Tepe Sialk, Iran, equids; Childe, 1941 (*see also* Sialk)
- Teplitz, Bohemia, horses; Nitsche, 1928
- pigs; Nitsche, 1924
- Téviec, France, dog; Pequart, 1937
- Thebes, Egypt, mummified animals; Lortet and Gaillard, 1903-09
- Toukh, Egypt, fauna; Gaillard, 1934
- goats; Bate, 1953
- Trelleborg, Denmark, cattle; Mathiassen, 1944
- Tripolje, Ukraine, horses; Amschler, 1936
- Troy, Anatolia, domestic animals; Gejvali, 1937-38, 1938-39
- Tschuwasia, Kazan, pig; Havesson, 1933
- Turopolje, Croatia, pig; Ritzoffy, 1933
- Umm-es-Sawan (*see* Fayum)
- Ur, Mesopotamia, domestic animals; Woolley, 1934
- Ur, Sumeria, animal representations; Friederichs, 1933
- Girgentini goat; Amschler, 1932
- horse genealogy; Amschler, 1935
- spiral-horned goat; Adametz, 1932, 1941
- Uwenat (oasis), Egypt, rock-drawings; Winkler, 1938-39
- Vindonissa, Switzerland, domestic animals; Krämer, 1900
- Wadi El-Mughara caves, Palestine, dog; Bate, 1937

Local place names, archaeological sites, etc. (*continued*):

- Wauwyl (Lake), Switzerland, domestic animals; Hescheler and Rüger, 1939
- fauna; Hescheler, 1920
- Wellington caves, New South Wales, dingo; Etheridge, 1916
- Windmill Hill, England, fauna; Childe, 1940
- Wurten, Holland, fauna; Van Giffen, 1914
- Zloczow, Poland, *Capra prisca*; Adametz, 1915
- goats; Vetulani, 1934
- Zlota, Poland, *Capra prisca*; Adametz, 1928
- domestic animals; Zurowski, 1930
- goat; Vetulani, 1934
- Zufilcar Pass, cattle through to India; Koppers and Jungblut, 1942-45
- Zürich, Switzerland, domestic animals; Wettstein, 1924
- Lox ear, goat; Dalimier, 1954

## Man, evolution of; Rice, 1942

Man's behavior adapted to reindeer behavior; Zeuner, 1954

Markhor horns; Hiltzheimer, 1933

Mastodon, American; Galbreath, 1947

Mechanism of evolution and domestication; Klatt, 1927, 1948

Mendes, Ram of; Dürst and Gaillard, 1902

Migrations, dog; Noack, 1915b

Milking, cattle, Libyan Desert; Shaw, 1936

deer, South Carolina; Swanton, 1940

goats; Coon, 1951

Mitanni kings and introduction of horse; Smith, 1928

Mixed farming, Syria; Mallowan, 1946

Modifications of cranium, dog; Noack, 1907

Monophyletic ancestry, cattle; Van Giffen, 1914

origin, horse; Lundholm, 1949

Mortuary food-gifts; Jettmar, 1950

Mounds of refuge, Holland; Reitsma, 1932, 1935

Mounted invaders, radiation center of; Hancar, 1952

Mousterian artifacts with dog, Russia; Studer, 1906

Mule, Asia, southwest; Friederichs, 1933

China; Erkes, 1940

first occurrence; Amschler, 1933

Mummies, animals; Lortet and Gaillard, 1903-1909

dogs, South America; Cabrera, 1932

Mummified cats, Egypt; Morrison-Scott, 1952

Mummified head, dog, Peru; Noack, 1915a

Mutations; Mangelsdorf, 1952

defective, dogs; Krieg, 1929

deleterious in wild; Nachtsheim, 1938

in domestication, rabbit; Nachtsheim, 1929

selection of; Nachtsheim, 1938

## Names of breeds; Mason, 1951

Natural area, domestication; Feige, 1928

Natural evolution; Mangelsdorf, 1952

Neolithic cattle, British Isles; Wilson, 1909

Neoteny, pig; Bäumlér, 1921; Kelm, 1938

Nomadic pastoralism, Ukraine; Hancar, 1951

Nomadic, semi-, population; Josien, 1955

Nomadism, reindeer; Hatt, 1919

Nomads and domestication; von Fürer-Haimendorf, 1955

Nomenclature, domestic animals; Keller, 1902

Nor-adrenalin, role in socialization; Funkenstein, 1955

Nubian wild goat; Gaillard, 1912

O, blood-group, sheep; Kaczkowski, 1928

Oases, cattle in, Egypt; Winkler, 1938-39

- Offerings for the gods; Meissner, 1926  
 Onager; Rumjancev, 1936  
   France; Boule, 1910; Bourdelle, 1938  
   Mesopotamia; Hilzheimer, 1934, 1935, 1941  
   Near East; Antonius, 1935a  
   Syria; Malloy, 1947  
 Ontogenetic sequence, pig; Kelm, 1938  
   stages; Hilzheimer, 1928  
 Oracle bones, pictures on; Sowerby, 1935  
 Orbital plane, canids; Dahr, 1937  
 Origins of domestication; Meissner, 1926  
 Ovipositor, Illinois; Galbreath, 1947  
 Ox-buffalo, Egypt; Brunton and Caton-Thompson, 1928  
 Oxen (*see* Cattle)  
 Pack animal, reindeer used as; Sirelius, 1916-20  
 Pack animals; Werth, 1940  
 Pack horses, Europe, eastern; Clark, 1941  
 Parallel characters, domestic animals; Nachtsheim, 1936  
   under domestication; Weidenreich, 1925  
 Parallel evolution; Herre, 1952  
 Parallel modifications; Klatt, 1948  
 Pastoral culture; Flor, 1930  
 Pastoralism, Asia; Curwen and Hatt, 1953  
   and domestication; Page, 1939  
   increase of, in Ukraine; Tackenberg, 1954  
   lack of, in China; Bishop, 1933  
   not associated with pigs; Newberry, 1928  
   Ukraine; Hancar, 1951  
 Pasture oases, cattle in, Egypt; Winkler, 1938-39  
 Pathological characters, fixation of; Weidenreich, 1925  
 Pedigree chart, horse, Ur, Mesopotamia; Amschler, 1935  
 Pelages of cats, wild and domestic; Zeuner, 1950  
 Peoples:  
   Akkadians, camel; Forbes, 1955  
   Arawak, "alco" dogs; Hummerlink, 1928  
   Aryan tribes, southern Asia, horse; Antonius, 1918  
   Assyrians, cattle; Dürst, 1900  
   camels; Forbes, 1955  
   Babylonians, cattle; Dürst, 1900  
   Bantu, domestic animals; Kroll, 1928  
   Bedouins, dromedary; Forbes, 1955  
   Chorwa, southwestern Asia, cattle; Koppers and Jungblut, 1942-45  
   Chukchi, reindeer-breeding; Wiklund, 1918  
   Egyptians, origin of domestic animals; Adametz, 1920  
   cattle; Dürst, 1900  
   dromedary; Forbes, 1955  
   Hamites, dispersal, Africa; Adametz, 1920  
   Egypt, cattle-herders; Winkler, 1938-39  
   greyhound into eastern Africa; Kroll, 1928  
   Koryak (Lapps), reindeer-breeding; Wiklund, 1918  
   Lapps, acquiring of reindeer; Laufer, 1917  
   Mitanni, introduction of horse; Smith, 1928  
   Negritos, India, original domestic animals; Randhawa, 1946  
   Persians, dromedary into Egypt; Mikesell, 1955  
   Proto-Altaian, central Asia, horse; Flor, 1930  
   Proto-Australoids, India, domestic animals; Randhawa, 1946  
   Romans, cats into Europe; Zeuner, 1950  
   Samoyeds, origin of reindeer domestication; Laufer, 1917  
   Sumerians, Gergentini goat; Adametz, 1941  
   onager; Hilzheimer, 1934, 1935, 1941



Peoples (*continued*):

- Sumerians, sheep and goat; Adametz, 1920
- Physiological adaptations to survival, domestication; Zeuner, 1954
- Physiological background of domestication; Nachtsheim, 1936
- Physiological factors in domestication; Herre, 1951
- Pig-breeding center, Egypt; Menghin and Amar, 1932
- Pigmentation of domestic animals; Feige, 1927, 1928
- Physiology:
  - absorption tests, cattle; Sasaki, 1934
  - adrenal production, wolf and dog; Scott, 1954
  - adrenals, hypofunction, rat; Richter, 1952
- Pigs, breeds and/or types:
  - Berkshire; Kelm, 1938
  - Dutch mound-hog; Reitsma, 1935
  - Mangalitza; Cardas, 1926; Ritzoffy, 1932
  - Siska; Ritzoffy, 1932
  - South Slavian; Ritzoffy, 1932
  - Tschuwasian; Havesson, 1933
  - turbary; Gaillard, 1934; Havesson, 1933; Madsen, 1900; Nitsche, 1924; Otto, 1901; Pira, 1909; Ulmanský, 1914
- Pigs, domestic and/or possibly domestic:
  - Austria; Ulmanský, 1914
  - Bohemia; Nitsche, 1924
  - China; Bishop, 1933, 1939
  - Egypt; Menghin, 1933; Menghin and Amar, 1932; Newberry, 1928; Randall-MacIver and Mace, 1902; Staffe, 1938
  - Eurasia; Adlerberg, 1933; Belic, 1939; Philpitschenko, 1933
  - southern; Menghin, 1931
  - Europe; Clark, 1947; Reitsma, 1935
  - central; Ritzoffy, 1932, 1933
  - Holland; Reitsma, 1935
  - Indonesia; Adlerberg, 1933
  - Iran; Amschler, 1939b
  - Palestine; Vaufrey, 1931
  - Sweden; Pira, 1909
  - Switzerland; Otto, 1901
- Pigs, wild:
  - Eurasia; Adlerberg, 1933; Amon, 1938; Belic, 1939; Kelm, 1939; Philpitschenko, 1933
  - Europe; Reitsma, 1935
  - Paleartic; Kelm, 1938
  - Palestine; Bate, 1942
  - Sweden; Pira, 1909
- Pisang (*see* Goat, bezoar)
- Place names, local (*see* Local place names)
- Plants, cultivated; Mangelsdorf, 1952
- Plough-culture; Hahn, 1909
- Mongolian; Werth, 1940
- Polecat, Asiatic; Ashton and Thompson, 1955
- European; Ashton and Thompson, 1955
- Polled cattle, genetics; Auld, 1927
- Polyphyletic ancestry of cattle; Szalay, 1930
- Polyphyletic origin of horse; Ewart, 1904, 1909
- Pony, Mongolian; Lydekker, 1912a
- Shetland; Bourdelle and Trombe, 1946; Chubb, 1913
- Post-glacial climatic change and tarpan; Vetulani, 1928
- Poultry (*see* Fowl, jungle)
- Pre-adaptation for domestication; Hediger, 1938; Zeuner, 1954
- Precipitation tests, cattle; Merckens, 1929
- Protein, pig as major source, China; Bishop, 1933
- Purpose, lack of in origin of domestication; Zeuner, 1954

Purposive planning, domestication, Egypt; Zeuner, 1954

Queen Hatshepsut; Chard, 1937

Rabbit, Europe; Nachtsheim, 1929

Racial fixation of characters; Weidenreich, 1925

Radiation center, mounted invaders; Hancar, 1952

Rage, endocrine factors in; Funkenstein, 1955

Ram of Ammon, Egypt; Pia, 1942b

Ram of Mendes; Dürst and Gaillard, 1902

Rat, domestication of; Richter, 1952

Refuge mounds, Holland; Reitsma, 1932, 1935

Reindeer; Flor, 1930; von Fürer-Haimendorf, 1955; Hatt, 1919; Hilzheimer, 1913; Jettmar, 1952; Laufer, 1917; Linton, 1955; Luho, 1948; Mirov, 1945; W. Schmidt, 1951; Sirelius, 1916-20; Werth, 1940; Wiklund, 1918; Zeuner, 1954

Riding animals; Menghin, 1931

Routes of dispersal; Sauer, 1952

Saarigärvi-Tarvala sledge; Luho, 1948

Sacred cattle, Egypt; Mond and Myers, 1934

Sacrificial animals and domestication; Staffe, 1939

Sacrificial purpose for breeding cattle; Whitehead, 1953

Sahara Desert, transportation across; Newbold, 1928

and dromedary; Lhote, 1953; Mikesell, 1955

and horse; Lhote, 1953

Scavenger wolves as potential dogs; Zeuner, 1954

Scavengers and domestication of wolves; Scott, 1954

Sculpture, animal, Egypt; Pia, 1941

Seals, Sweden; Pira, 1926

domestic animals on, Indus Valley; Mackay, 1938

with horse pedigree, Ur; Amschler, 1935

Selection; Herre, 1951

artificial; Epstein, 1933; Herre, 1952; Klatt, 1927, 1948; Mangelsdorf, 1952;

Nachtsheim, 1929, 1938; Richter, 1952; Scott, 1954

artificial, religious; Koppers and Jungblut, 1942-45

natural; Krieg, 1929

Selective breeding; Dalimier, 1954

Selective slaughtering, goats; Coon, 1951

Semi-domesticated dogs, Gran Chaco; Krieg, 1929

Semi-nomadic population, Palestine; Josien, 1955

Sequence of domestication; Werth, 1939; Wissler, 1945

Set, cult-animal of, Egypt; Newberry, 1928

Settled culture and rock-painting; Staffe, 1938

Sexual differentiation in cattle; Revilliod and Dottrens, 1947

Sheep, breeds and/or types; Lydekker, 1912c

bronze; Reitsma, 1932

Bukharian; Carruthers, 1949

copper; Antonius, 1944; Ewart, 1913; Dürst, 1904; Patterson, 1937

Drentsch Heide; Reitsma, 1932

English southdown; Kaczkowski, 1928

fat-rumped; Adametz, 1927; Ewart, 1914

fat-tailed; Philpitschenko, 1928

fleecy; Slawkowski, 1933

Förvar; Pira, 1926

Frisian milk; Reitsma, 1932

goat-horned; Adametz, 1937; Pia, 1942b

Heidschnucke; Adametz, 1937

Hissar; Amschler, 1929b

long-tailed; Ewart, 1912

merino; Burns and Moody, 1935

Montagne; Cardas, 1926

Sheep, breeds and/or types (*continued*):

- peat (*see* turbary)
- Polish; Kaczkowski, 1928
- primitive; Amschler, 1929b
- screw-horned (*see* spiral-horned)
- Shetland; Ewart, 1913
- Soay; Adametz, 1937; Ewart, 1913; Schultze, 1934
- southdown, English; Kaczkowski, 1928
- spiral-horned; Dürst and Gaillard, 1902; Ewart, 1912; Mallowan, 1947
- terp; Reitsma, 1932
- turbary; Adametz, 1937; Dürst, 1904; Ewart, 1913; Madsen, 1900; Patterson, 1937; Pilgrim, 1947
- twisted-horned (*see* spiral-horned)
- Tzourcana; Cardas, 1926
- Wallachian; Dürst and Gaillard, 1902
- Zackel; Adametz, 1937
- Sheep, domestic and or possibly domestic; Burkhil, 1935; Burns and Moody, 1935; Ewart, 1912, 1913, 1914; Fairservis, 1955; Hilzheimer, 1936; Lydekker, 1912c
- Africa, north; Thilenius, 1900
- Bukhara; Adametz, 1927
- Egypt; Adametz, 1920
- Eurasia; Adametz, 1937
- Europe; Clark, 1947
- Holland; Reitsma, 1932
- Iran; Amschler, 1939a, b
- Iraq; Lloyd and Safer, 1945
- Mesopotamia; Adametz, 1927; Heinrich, 1936
- Siberia, northern; Jettmar, 1950
- Sudan; Bate, 1949, 1953
- Sumeria; Adametz, 1920
- Switzerland; Dürst, 1904
- Tadzhikistan; Amschler, 1929b
- Turkestan, western; Menghin, 1931
- Sheep, wild; Carruthers, 1949; Heinrich, 1936; Hilzheimer, 1936; Lydekker, 1912c.
- argali; Ewart, 1912, 1913, 1914; Philiptschenko, 1928
- Barbary; Thilenius, 1900
- mouflon; Adametz, 1937; Dürst, 1904; Ewart, 1912, 1913, 1914; Kaczkowski, 1928; Pira, 1926
- urial; Adametz, 1937; Ewart, 1912, 1913, 1914
- Sites, archaeological (*see* Local place names)
- Skin, rabbit, genetics of; Nachtsheim, 1929
- Sledge, dog; Werth, 1940
- use with reindeer, Finland; Sirelius, 1916-20
- Sledge-cultures, Eurasia, north; Wiklund, 1918
- Sledge-driving; Luho, 1948
- Sledges, Finland; Luho, 1948
- Slender-limbed horses; Ewart, 1909
- Small wild cattle, Eurasia; Koby, 1954
- Social animals' adaptations to domestication; Zeuner, 1954
- Social animals and adrenal hormones; Funkenstein, 1955
- Social life, wolves, cooperative; Scott, 1954
- Speciation of camel, Asia; Robinson, 1936
- of domestic animals; Mangelsdorf, 1952
- Spirited dogs, Sudan; Newbold, 1928
- Statistical analyses of sub-fossil materials; Riedel, 1951
- Statistical study, cattle ancestors; Van Giffen, 1914
- Statistics; Dahr, 1942
- of cat skulls; Morrison-Scott, 1952
- large series; Hildebrand, 1955
- Steer of Apis; Lortet and Gaillard, 1903-09
- Steppe tarpan, Russia; Vetulani, 1928
- Stock-farmer, Africa; Kroll, 1928
- Stock-farming, Egypt; Menghin, 1933

- Stunted pig; Belic, 1939  
Subspecies, ecological, of cats; Zeuner, 1950  
Survival by flight; Funkenstein, 1955  
Swine (*see* Pigs)  
Swine-breeding culture; Menghin, 1931
- Tail carriage, dog; Scott, 1954  
Tamed horse, Paleolithic; Munro, 1902  
Tamed reindeer; Hatt, 1919  
Taming, domestication not following; Nachtsheim, 1938  
Taming of wild animals; Meissner, 1926  
Tasmanian devil; Etheridge, 1916  
Tasmanian wolf; Etheridge, 1916  
Tapir, China, north; Teilhard de Chardin and Young, 1936  
Taurine cattle; Leister, 1943  
Taxocline, pig; Kelm, 1939  
Teeth, Wellington Caves, New South Wales; Etheridge, 1916  
Terpen, dogs from, Holland; Van Giffen, 1929  
    fauna of, Holland; Van Giffen, 1914  
    pig from, Holland; Reitsma, 1935  
    sheep from, Holland; Reitsma, 1932  
Tillage, Ukraine; Hancar, 1951  
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